Title: Pennsylvania State Horticultural Association news, v. 9

Place of Publication: State College, Pa.

Copyright Date: 1932

Master Negative Storage Number: MNS# PSt SNPaAg096.2

Volume:

9

Pennsylvania State Horticultural Association News

Vol. IX *State College, Pa., March, 1932* *No. 1*

Proceedings of the State Horticultural Association of Pennsylvania for 1932

Seventy-third Annual Meeting

Held in Harrisburg, January 19-21

Pennsylvania State Horticultural Association News

Published by the Association

Issued Quarterly at State College, Pa. Subscription, 50c

Entered as second-class matter at the Post Office at State College, Pa.

Vol. IX *State College, Pa., March, 1932* *No. 1*

Proceedings of the State Horticultural Association of Pennsylvania for 1932

Seventy-third Annual Meeting

Held in Harrisburg, January 19-21

Pennsylvania State Horticultural Association News

Published by the Association

Issued Quarterly at State College, Pa. Subscription, 50c

Entered as second-class matter at the Post Office at State College, Pa.

Vol. IX *State College, Pa., March, 1932* *No. 1*

Proceedings of the State Horticultural Association of Pennsylvania for 1932

Seventy-third Annual Meeting

Held in Harrisburg, January 19-21

State Horticultural Association of Pennsylvania

OFFICERS FOR 1932

President . . . . . R. T. Criswell, Chambersburg

Vice President . . . . . F. G. Reiter, Mars

Secretary . . . . . R. H. Sudds, State College

Treasurer . . . . . C. B. Snyder, Ephrata

Executive Committee: The above officers and C. J. Tyson, Gardners; Sheldon Funk, Boyertown; and H. F. Hershey, Hamburg.

STANDING COMMITTEES

Legislation and Representatives on Agricultural Council: C. J. Tyson, Gardners, Ch.; H. S. Nolt, Columbia; W. W. Livingood, Robesonia.

State Farm Products Show and Exhibition: H. S. Nolt, Columbia, Ch.; J. L. Mecartney, State College; Paul Thayer, Carlisle.

Insect Pests: T. L. Guyton, Harrisburg, Ch.; H. N. Worthley, State College; H. E. Hodgkiss, State College.

Plant Diseases: H. W. Thurston, State College, Ch.; R. S. Kirby, State College; K. W. Lauer, Harrisburg.

Game Laws: J. A. Runk, Huntingdon, Ch.; F. E. Griest, Flora Dale; T. L. Guyton, Harrisburg.

True-To-Name Trees: F. N. Fagan, State College, Ch.; F. M. Trimble, Harrisburg; G. L. Baugher, Aspers.

SPECIAL COMMITTEES

Peach Rates: Sheldon Funk, Boyertown, Ch.; C. E. Raffensberger, Biglerville; H. W. Skinner, Chambersburg; S. E. Linde, Orefield.

Inspection Rates: Paul Thayer, Carlisle, Ch.; M. A. Slade, Biglerville; H. A. Shank, Lancaster; E. A. Meyer, Biglerville; E. A. Nicodemus, Waynesboro.

Shenandoah-Cumberland Four State: R. T. Criswell, Chambersburg; Ch.; E. A. Nicodemus, Waynesboro; C. E. Raffensperger, Biglerville; G. A. Stuart, Harrisburg.

Proceedings of the State Horticultural Association of Pennsylvania for 1932

PRESIDENT'S ADDRESS

R. T. Criswell, Chambersburg, Franklin County

When this Association convened in this room a year ago, there was some concern about what the coming year had in store for us. There was some anxiety over business and financial conditions. But who among us had any thought that the year 1931 would be as disastrous in a business way as it has been?

In 1930 the drought caused fruit growers and other farmers enormous losses. A large crop in 1931, for the most part of high quality fruit, has been disposed of or will be disposed of at either an actual loss or practically no profit in many instances, although compared to other lines of farming the fruit industry has been less unprofitable. Compared to other sections of the country, Pennsylvania probably was hit as hard as any other state in the marketing of its peaches but it is faring better in the disposition of its apples than most other states. Compared to manufacturing enterprises, retail stores, and other businesses, the fruit industry in Pennsylvania has probably been better during the past year than the bulk of them. We should, therefore, be encouraged to stem the tide of adversity, feeling confident when this depression has run its course and the necessary financial readjustments have been made, that we shall find our business again on a profitable basis. Whether in adverse or prosperous times the production of fruit and vegetables in Pennsylvania is economically sound and we should confidently expect that they will be profitable over a period of years, whatever adversities we may go through in a particular season.

Our present difficulties have been brought about largely by our own follies. Surely when the wheels of industry stop by reason of production being in advance of current needs we might conceivably have a gleeful holiday and make merry over leisure while we were still enjoying the fruits of our past industry did we but manage properly. With our facilities for production it is possibly entirely practicable for us to so arrange our affairs that we could still enjoy prosperity when we can lay aside our tools. The problem of how to accomplish this is one for all of us to think about and work upon.

SECRETARY'S REPORT

R. H. Sudds, State College, Centre County

Our meeting place this year is again in the South Office Building, and from the indications of the 1931 Farm Show we have not been unwise, after all, in taking this room. The Show Building last year was and still is not altogether ideal as a meeting place; it is not accessible under the present traffic conditions. We also think there will be fewer interruptions here, so we are back in the same place.

Our memberships have fallen off slightly, but not alarmingly. Last year we had 805 members, whereas this year there are 763—not a very great drop, after all. M. A. Moore, Lititz, wins the new membership prize.

In regard to our financial condition, you will see from the report of our Treasurer, Mr. Snyder, that we are in very good shape. While the revenue may be lower this year, we are, nevertheless, in sound condition.

Concerning publications, I promised you last year that we would have bigger and better ones; this has been fulfilled. I had hoped to expand our publications during 1932 so that you would get it every two months. But, in view of the advertising situation—you know commercial concerns have been pretty well affected by the financial conditions—it has been necessary to postpone that for perhaps a year or so. Our news letters are carried mostly by the advertising in them, and it is necessary to have advertising so that we can publish such a large number of pages. In regard to advertising, be sure, when you write to advertisers in our publications, that you mention having seen the ad in the Pennsylvania State Horticultural Association publication. The advertisers like to know if they are getting some return for the ten dollars per page which they spend.

I have been unable to collect advertising bills for last year's program and proceedings from R. W. Doebler, Turbotville; this advertiser is indebted to the Association to the amount of $20.

I have written him about it repeatedly, but I can't get an answer—why, I don't know. There is nothing wrong with his advertising material.

In 1933 the famous experimental orchard at State College, planted by J. P. Stewart, will be 25 years old. There will be several celebrations held there at that time; the nature and extent of these is not yet settled. At least one of these affairs should be held there by this Association. Progress announcements will be made from time to time.

Mr. Criswell did not tell you, in his report, that he has been very active, attending at his own expense various fruit meetings at Washington and New York. He is also working on freight rates for export apples that go from this state to seaports, and he will also attend a future meeting in regard to the quarantines and embargoes on foreign plant products.

TREASURER'S REPORT, 1932

C. B. Snyder, Ephrata, Lancaster County

Receipts

1931			
Jan.	22	Cash balance on hand	$ 58.24
Jan.	22	R. H. Sudds, memberships and adv.	76.00
Jan.	23	R. H. Sudds, memberships and adv.	235.25
Jan.	23	Wm. J. Noll, membership	3.00
Feb.	12	R. H. Sudds, memberships and adv.	143.25
Mar.	4	R. H. Sudds, memberships and adv.	224.00
Mar.	21	R. H. Sudds, memberships and adv.	121.00
May	9	R. H. Sudds, memberships and adv.	123.30
May	9	D. M. Wertz, refund of premium	6.25
July	6	R. H. Sudds, memberships and adv.	66.00
Oct.	5	R. H. Sudds, memberships and adv.	46.00
Oct.	20	R. H. Sudds, memberships and adv.	52.00
Oct.	26	Interest on $500 Liberty Bond	21.25
Oct.	26	Interest on two $100 Apartment Bonds	12.00
Oct.	26	Interest on $100 Certificate in Bank	4.00
Nov.	14	D. M. James, for B. S. Flora adv.	2.00
Nov.	10	R. H. Sudds, memberships and adv.	13.00
Nov.	11	Titus Nursery Company	10.00
1932			
Jan.	7	R. H. Sudds, memberships and adv.	32.50
Jan.	12	R. H. Sudds, memberships and adv.	46.00
Jan.	14	R. H. Sudds, memberships and adv.	40.00
			$1335.04

Disbursements

1931			
Jan.	26	Mary E. Bowmaster, expense to Harrisburg meeting	$ 15.80
Jan.	29	E. C. Auchter, expenses to Harrisburg meeting	11.66
Jan.	31	C. H. Gould, expenses to Harrisburg meeting	35.62
Feb.	7	J. R. Magness, expenses to Harrisburg meeting	13.49
Feb.	11	Dunmire Printing Co., Printing	10.29
Feb.	18	Mary E. Bowmaster, stenographic services	70.00
Feb.	21	Dunmire Printing Co., Post cards for dues notices	10.65
Feb.	25	Dunmire Printing Co., Printing Proceedings	465.50
Apr.	23	Dunmire Printing Co., 500 stamped envelopes	13.96
June	4	Dunmire Printing Co., 2000 Envelopes for News Letters	16.00
June	25	Mary E. Bowmaster, Stenographic service	7.00
June	25	Dunmire Printing Co., Printing News Letters	108.00
July	6	F. G. Jacoby, Treasurer's bond premium	7.50
July	23	R. H. Sudds, Expense to Apple Grade Conference, Washington, D. C.	27.08
Sept.	8	Mae Corson, Stenographic services	3.00
Oct.	5	Dunmire Printing Co., Printing News Letter	126.00
Oct.	19	Dunmire Printing Co., Bill and Letter heads	13.45
Oct.	21	Dunmire Printing Co., Printing	13.96
Oct.	26	Mae Corson, Stenographic service	2.00
Dec.	16	Oskamp Nolting Co., 1 loving cup	15.46
Dec.	17	Dunmire Printing Co., Envelopes for 1932 Program	5.75
Dec.	19	Mary E. Bowmaster, Stenographic service	20.00
			1,012.17
1932			
Jan.	19	Cash balance in bank	322.87
			$1,335.04

Two $100.00	Mortgage Bonds	$ 200.00
One	Liberty Bond	500.00
One	Bank Certificate	100.00
	Cash Balance	322.87
		$1,122.87

We, the undersigned auditing committee, have duly examined the accounts of C. B. Snyder and found them correct as stated above.

W. W. Livingood, Chairman
Rev. I. M. Lau
M. E. Johnston

REPORT OF THE INSECT PEST COMMITTEE

"Like the poor, the bugs are always with us; sometimes it is one or two kinds, but more often it is quite a collection of insect species", says the program. This sentence pretty well summarizes the insect condition as it occurs in the orchards of the state year after year. There are certain old timers that seem to persist and hold their numbers; in spite of the combined efforts of orchardists and entomologists, they continue each year to take a toll from our profits. Not only is the loss occasioned by the poor grade of fruit produced, but a much heavier loss is incurred by the cost of spray applications in material and labor. As a whole, 1931 was not especially unusual in the amount of damage caused by insects, although certain species did considerable damage in restricted localities. Because of the closeness of money, many orchardists were forced to omit certain important orchard practices and thus leave their orchards open to a heavier loss than usual.

The information as to the occurrence and damage caused by the horticultural insects has been furnished by the various agencies with which the members of this committee are associated. Professor Hodgkiss has furnished a very complete report for the greater part of the state. This record cannot be given in all its detail, but it will serve as a basis of all that is to follow. Fifty species are recorded as doing damage to horticultural crops, thirty-two of which were found in apple. The rosy aphis, green aphis, codling moth, red spider, San Jose scale, scurfy scale, oyster shell scale, tree hoppers (several species), tent caterpillars and fall webworms are rather general over a large part of the state, and caused damage in certain localities.

The apple and thorn skeletonizer, an insect fairly new to this country, was found doing considerable damage in Forest and Crawford Counties. As implied by the name, the larvae of this moth skeletonize the leaf of the apple, sometimes completely browning the leaves of the tree. Round-headed apple tree borers, flat-headed apple tree borers and certain bark beetles were found locally through the state and caused considerable

damage. The bark beetles tend to follow in orchards which have suffered from lack of fertilizer or water, and in the areas where the drought was severe in 1930 will likely continue to cause loss. The pistol case bearer appeared in several orchards in different parts of the state and caused severe loss in spite of attempts at control. The cigar case bearer was evident in the northeastern counties. A general infestation of the canker worm occurred through the western counties. However, they were not as numerous as in 1930, and did not cause as much defoliation as in previous years.

The plum curculio which we all remember so well in 1930 and which gave promise of being a major pest this year, did not occur in large numbers except in a few restricted localities in the northeastern counties; its cousin, the apple curculio, was reported as occurring locally and much less in number than it has in the last five years.

The codling moth,—one of the old offenders and a pest which seems to be always with us and ever ready to jump right in and cause a great loss if we for one moment hesitate in our spray applications or try to economize by picking out only such trees as may give promise of a crop,—was present in 1931, living up to its reputation. The reports coming to the committee indicate that this insect was present in force all over the state, and that it was severe in certain commercial orchards, including parts of Franklin, Adams, York, and Cumberland Counties, causing as much as fifty per cent wormy fruit in a few instances. Although we have talked about this insect for years and have felt at times as though we knew something about its control, it still stands out as the major pest in the apple orchard. Reports from all parts of the state show that the number overwintering in the orchard is about one-half that of this time last year. This should not be interpreted to mean that we are to let up in any way in our fight to control this insect. Along with these, certain leaf rollers were general in the western and northwestern counties. The red-banded leaf roller and a few similar species did very considerable damage in the central and eastern counties in September and October.

Another old timer which has lain more or less inactive for some time, although it has been known to occur each year in restricted localities, is the "railroad worm" or apple maggot. It is reported as severe in Luzerne, Wyoming, Bradford, Northampton and parts of Cumberland and York Counties. Importance of controlling this insect is of special interest to those growers who are interested in the export trade, particularly to England. Some of our growers experienced inconvenience this past season in having their fruit returned to them after it had been sold for export trade due to government inspectors finding the maggot.

The leaf blister mite occurred in a scattering infestation over the state, not occasioning any great loss in any particular locality.

Leaf hoppers of one species or another occurred in outbreak proportions in the southeastern apple growing section. The numbers became quite abundant in the later part of the growing season.

An interesting new insect has come to our attention many times the past season. It is one of the giant hornets which has been introduced into this country recently. It is now found in certain localities east and north of the Susquehanna River; recently it has been reported from State College. This insect has rather peculiar habits and is probably most often noticed in its habit of gnawing off the bark of certain trees. Outstanding of these are the smaller twigs of lilac. The females are equipped with a stinger which is quite fierce in its proportions and just as efficient as it looks. The committee would hesitate to say that this would some time become a major pest, but it may cause considerable damage to nurseries and to young trees in the orchards.

Of the two red bugs, the one we entomologists call Malinus, assumed outbreak proportions in the northeastern counties and was generally abundant in several localities. Its cousin, Mendax, was comparatively scarce all over the state.

Certain stink bugs were found feeding on the fruit of apple and peach in Beaver, Lawrence, Fayette, and Erie Counties. In the east, the Japanese beetle did very considerable damage to the early ripening apples in the Philadelphia area.

In the nuseries, the San Jose scale continues to be the major pest of the apple stock. In the western half for instance, one-half of the nurseries inspected had rather severe outbreaks of this insect. In the eastern nurseries, the apple tree borer did some damage and certain other borers were responsible for heavy losses to other fruit and ornamental stock. The San Jose scale not only increased in nurseries but also in orchards. We said something like this last year in our report, but we believe there was more marking of fruit due to this scale this year than there has been in Pennsylvania the past ten or fifteen years. We attribute this entirely to faulty spray applications.

A late survey of the orchards in the southeastern part of the state shows an unusual number of aphids and red spider eggs on the trees. This may point to a severe outbreak of these pests in 1932.

Peach Orchards.—Reports from all over the state indicate that in general the plum curculio was less important this year than it has been for some time, although certain local outbreaks were reported from the eastern part of the state. The peach lecanium scale was very abundant in the central and southern counties. This is another insect which will multiply at an alarming rate if complete spraying is not practiced. Peach tree borers were found to be severe all over the state in untreated orchards. These borers also did considerable damage in the nurseries to small trees. Certain bark beetles of the shot-hole borer variety were found in orchards in low vitality due to the drought of the preceding year.

Reports on the Oriental fruit moth indicate that in all the areas except in the northwest, the insect did about one-half the damage in 1931 as it did in 1930. Counts of fruit grown near Harrisburg gave an average of nearly fifteen per cent wormy fruit in the varieties up to and including the Elberta. There was about twice this amount in varieties ripening later. Some injury to apples was reported for this species.

The mite which caused the silvering of the peach leaves was generally abundant throughout the state and caused considerable damage. These mites are rather small and difficult to see, and seem to be on the increase in their severity. In the Philadelphia area, the Japanese beetle occurred in sufficient numbers to cause damage to the early fruit.

Pear Orchards.—Green aphids, codling moths, pear slugs, and pear Psylla were general wherever pears were grown in the state. The slugs caused complete browning of the leaves on unsprayed trees in many cases. Round-headed borers, bark beetles, blister mites and the pear midge were also abundant in certain restricted localities. Curculio and San Jose scale were not reported as doing a great damage in any of the commercial pear orchards. The red spider and plant bugs caused concern to some growers.

Cherry Orchards.—There was a general outbreak of aphids, and reports came in from all over the state of the damage caused by this insect. Weather conditions and parasites are the controlling factors determining the abundance of this species. By the middle of summer, the parasites were on the job and many colonies were completely killed out.

The leaf slugs were present and defoliated many unsprayed trees. Both the peach tree borer and certain bark beetles were present in some localities. The cherry maggot was very scarce, and only a few reports were received of damage by this insect. Webworms appeared to be unusually numerous this season, and fed very extensively on unsprayed cherry foliage.

Grapes.—The usual grape insects were present in the vineyards. In unsprayed vineyards the grape berry moth caused a heavy loss. There was a general outbreak of the leaf hopper throughout the state, and it was especially heavy this year in the eastern part. In the early part of the year, the grape flea beetle occurred abundantly in the eastern counties. Cane galls and Phylloxera were local and reported occasionally. The Japanese beetle caused trouble to local grape plantings in the Philadelphia district and probably will cause a great deal of concern when once it is established in large numbers in the grape-growing districts of the state.

To Summarize: The horticultural interests of the state suffered from the attack of several insects in 1931. Codling moth and San Jose scale took a heavy toll in poorly sprayed orchards. San Jose scale was the major pest of fruit nursery stock. The plum curculio was not present in the large numbers expected at this time last year. The Oriental fruit moth for

the most part, was about one-half as numerous as in 1930. Certain leaf feeders such as the pear slug, cherry slug and webworms were present in numbers, and caused severe defoliation in unsprayed orchards.

As has been stated, this report is the result of the joint effort of your committee and the men associated with it.

T. L. Guyton, Chairman.
H. N. Worthley.
H. E. Hodgkiss.

CONTROL OF CEDAR APPLE RUST BY THE ERADICATION OF RED CEDARS

K. W. Lauer, Bureau of Plant Industry, Harrisburg, Dauphin County

The Bureau of Plant Industry of the Pennsylvania Department of Agriculture has been active during the past two years in protecting apple orchards from cedar apple rust. This disease is known among pathologists as an alternate host disease in that it passes a part of its life on each of two different plants before it completes its life cycle. The hosts or carriers of cedar apple rust are the common red cedar and certain varieties of apples. The fungus passes back and forth regularly from one host to the other spending the summer on the apple where it does the greatest amount of damage.

When red cedar trees are numerous in the vicinity of an apple orchard the damage caused by the disease is frequently so severe that it ruins the apple crop entirely. Severely infested orchards often show the foliage so badly damaged that the trees appear at a distance to be almost as brown as though the leaves were badly scorched. The disease is known to have been so severe in several instances that it completely defoliated the trees by August. These trees put out a new set of leaves the same year but were unable to survive the rigors of the following winter. Any reduction in the normal healthy leaf tissue not only hinders the development of the fruit but also the growth of the tree.

An interesting fact of this disease is that certain varieties are very susceptible to the disease while others are highly resistant. A few of the susceptible varieties are York, Jonathan, Wealthy, Rome, Smokehouse, Ben Davis, and Grimes; Stayman, Delicious, Baldwin and Northern Spy are resistant to leaf injury but susceptible to fruit infection. It appears that most of our common varieties are susceptible to either leaf or fruit infection and in several cases to both. R. S. Kirby reports both Summer and Winter Rambo and Smokehouse as being very susceptible to fruit infection. He also found the Delicious, Rome, Golden Delicious, York, Paragon, Stayman, Northern Spy, McIntosh, Wealthy, Winter Banana, and Yellow Transparent as being subject to fruit infection.

The department of agriculture is interested in protecting orchards from cedar apple rust by having the red cedars in the

immediate vicinity of the orchard removed. Removal of such trees can usually be brought about through the cooperation of the orchard owner and the neighboring cedar tree owners with the department. Orchard owners whose trees are suffering damage from this disease should get in touch with this department. Under an amendment of 1929 to the Plant Pest Act, the department is authorized to compensate cedar owners for the loss of any cedar trees removed at the direction of the department to protect apple orchards from the cedar apple rust fungus.

During 1930 and 1931, 60,242 red cedar trees were removed as a protection to ten different orchards containing 17,244 apple trees. These orchards were located in Adams and Franklin Counties. The cedar trees removed belonged to sixty-four farmers who were paid a total of $1,469.88 for the loss of their trees. Cedar trees removed under this plan remain the property of the owner. The cost of removing cedar trees over this two-year period averaged $.0852 per apple tree protected or less than nine cents per tree. In one year the increased returns to the grower would be paid many times over even though his infection before the cedars were removed was less than 5 per cent.

A REPORT OF FURTHER EXPERIMENTS WITH CHEMICALLY-TREATED BANDS FOR CODLING MOTH CONTROL

H. N. Worthley, State College, Centre County

Records of codling moth catch in bait pails show a great scarcity of adult codling moths in August of 1931 as compared with the same month in 1930. In consequence, the late penetration of larvae into the fruit which was of such great concern in 1930, was almost absent in 1931, and the natural population of hibernating larvae is much lower now in most orchards than it was a year ago. However, many orchards contained such large numbers of moths of the overwintering generation of 1930-31 that damage was severe, and the codling moth population in many plantings still remains at a dangerous level. For instance, a hasty survey in October of 1931 in five commercial orchards in the Biglerville section revealed an average of 83% injured fruit, 21% wormy fruit, and 34 worms per hundred apples. Barring the operation of natural agencies, the writer feels that in these orchards and doubtless in many others, a reasonable spraying schedule must be temporarily supplemented with other artificial means of killing the codling moth, before the infestation will be reduced to the point where spraying alone can be depended upon to produce satisfactory results.

Treated bands very effective in 1930.—As a measure to supplement spraying in heavy codling moth infestations, the use of chemically-treated bands for trapping and killing cocooning larvae has seemed to offer much promise. The Proceedings of the State Horticultural Association of Pennsylvania for 1931 contain an account of the work of the Pennsylvania Experiment Station with chemically-treated bands in 1930. The results reported at that time were of a preliminary nature, being based on an early examination of one-sixth of the total number of bands employed. In order to complete the record, and to indicate the final effect of the bands on larvae wintering in them, table 1 has been prepared.

TABLE 1.—CHEMICALLY-TREATED BANDS FOR CODLING MOTH CONTROL
State College, Pa., 1930-1931

Bands Tested			No. Moths Emerged		Per Cent Moth Control	
Type	No.	Total larvae caught	Summer 1930	Spring 1931	Summer 1930	Spring 1931
Beta-naphthol red engine oil aluminum stearate double-dipped	16	8360	4	0	99.7	100.0
Beta-naphthol red engine oil double dipped	16	9221	9	1	99.3	99.9
Beta-naphthol red engine oil (commercial)	8	4562	6	6	99.1	99.7
Untreated	8	2129	315	1057	.....	.....

The percentages of moth control given in Table 1 are based on a comparison of the percentage of moth emergence from the treated bands with that from the untreated bands. All the bands employed were almost completely effective in preventing the emergence of moths.

Types of bands tested in 1931.—The trials of 1930 were so encouraging that this phase of our codling moth experimental program was enlarged in 1931. Five different types of band were obtained from E. H. Siegler of the Federal Bureau of Entolomogy. These were supplied in widths of four, three and two inches. The bands manufactured in Pennsylvania under the "Government formula" developed by Siegler were tested, as were two types of band manufactured in Indiana under formulae developed at the Indiana Agricultural Experiment Station. A report having been received that the use of tar oil winter wash for scale and aphis control had shown results against hibernating codling moth larvae led us to try bands soaked in this material. Table 2 explains the constitution of these various bands, and gives the designations by which they will be reported in this paper.

TABLE 2.—TYPES OF CODLING MOTH BAND TESTED-1931
All bands of single-faced corrugated strawboard

Gov't No. 1 Single-dipped, 4″, 3″, 2″ width
Gov't No. 2 Double-dipped, 4″, 3″, 2″ width
Gov't No. 3 Single-dipped, 4″, 3″, 2″ width, 0.5 oz. aluminum stearate added
Gov't No. 4 Double-dipped in roll, 3″, 2″ width
Gov't No. 5 Single-dipped in roll, 3″, 2″ width
Penna. (Comm'l) Double-dipped in roll, 4″, 2″ width
Above bands treated with 1 lb. beta-naphthol dissolved in 1.5 pints red engine oil.
Indiana Beta. Single-dipped in roll, 4″ width
Indiana Alpha. Single-dipped in roll, 4″ width, 1 cake parawax added
Beta—betanaphthol } 1 lb. in 1.5 pints
Alpha—alphanaphthylamine } diamond paraffin oil
Tar Oil. A commercial winter wash. 2″ bands soaked in undiluted wash

The effectiveness of the bands and the ability of bands of the various widths to trap the larvae were tested on a total of two hundred thirty trees located in three different orchards, namely; the experimental block of the department of zoology and entomology at State College, the orchard of Fred Greist at Floradale in Adams County, and the orchard of E. A. Nicodemus at Waynesboro in Franklin County. The bands were examined (without disturbing) at intervals throughout the season when protruding dead larvae, pupae, and empty pupal skins were picked off and recorded. They were removed from the trees in November, at which time all dead individuals found between the band and the tree were recorded. They were then kept in the screened insectary at State College until late December, when they were torn apart for the completion of the record. Sound living larvae from the various types of band have been allowed to spin new cocoons in untreated strawboard. Moth emergence records will be obtained from these in the spring.

Wide bands versus narrow bands—Some demand has been created, particularly in the middle west, for a four-inch band, the claim being made that longer, darker tunnel afforded causes more larvae to remain within the shelter of the wide band. In order to test this point, and following a suggestion made by Siegler, bands of the same treatment, but of different widths were compared in the following manner.

The tree-trunk to be banded was measured with a piece of cord, which was then doubled to determine half the circumference of the trunk. A piece of wide band was cut to this measure and fastened to the east half of the trunk, and a similar piece of narrow band to the west half of the trunk, the ends of the two bands meeting on a north and south line. The next tree in the series had the wide band to the west and narrow band to the east, and so on until the series was completed.

By this means it was thought to avoid errors due to any uneven load of fruit in different portions of the tree, and any possible tendency on the part of the larvae to seek shelter on

the more protected side of the trunk. A catch of larvae no greater in one half-band than in the other (a 50-50 ratio) would indicate that band-width was not an important matter. The size of the difference in numbers of larvae caught in the two halves would be a measure of their relative attractiveness to the cocooning larvae.

One hundred sixteen trees were banded for these comparisons. In few cases did the wide half catch more than sixty percent of the total larvae trapped. In one case the narrow half caught fifty-six percent, leaving forty-four percent for the wide band. Within these limits the various combinations tested showed considerable variation, with the narrow half in the lead on some trees, and the wide half on others. A summary of the results at State College is given in table 3.

TABLE 3.—CATCH OF CODLING MOTH LARVAE IN PAIRED HALF-BANDS OF DIFFERENT WIDTHS
State College, Pa., 1931

Type of band	Total larvae per tree	Larvae per linear inch of band 4″ half	2″ half
Gov't No. 1	255	5.8	4.6
	349	7.8	8.0
Gov't No. 2	310	7.5	5.9
	226	7.3	3.8
Gov't No. 3	316	7.6	4.6
	432	9.3	5.8
Penna	235	4.0	5.3
	94	2.8	1.5
Untreated	83	3.0	0.7
	94	1.8	1.1
Average		5.7	4.1
Per cent of total (4″ vs. 2″)		58.1	41.9
Per cent of total (4″ vs. 2–2″)		54.4	45.6

In the ten trials reported in table 3, the narrow half-band led by a narrow margin in two cases. The average of all trials showed a 58-42 ratio in favor of the wide band. Similar tabulation of the results obtained at Floradale gave a 53-47 ratio, while at Waynesboro the ratio was 47-53, the narrow half in the lead. Trials with four-inch versus three inch, and three-inch versus two-inch bands, were even less conclusive, and will not be reported.

In examining the records for hints regarding the reasons for the variations noted above, it was soon noticed that the number of larvae trapped by the bands was different in the different orchards, and that the more larvae trapped, the greater the preference for the wide band. To make this point clear, table 4 has been prepared.

Of the three records given in table 4, only that obtained at State College appears to show any real preference on the part of the larvae for the four-inch band. Here there were over two hundred larvae per band, while at Floradale and Waynesboro there were less than one hundred larvae per band. The record

strongly suggests that it is not the greater darkness of the four-inch tunnel, but the fact that more larvae can get into it without crowding, that determines the superiority of the wide band.

TABLE 4.—CODLING MOTH POPULATION DETERMINES NEED FOR WIDE BANDS
4″ vs. 2″ bands, 1931

Locality	% in wide half	Ave. larvae per band	% wormy fruit	Notes
State College	58.1	239.4	73.1	Unsprayed. Fair crop, trees well-scraped.
Floradale	53.3	84.2	20.0	Last 2 sprays omitted; light crop, trees well-scraped.
Waynesboro	47.2	45.0	9.5	Well-sprayed; big trees hard to scrape. Wormy fruit removed in July

The kind of single-faced corrugated strawboard employed in making codling moth bands contains thirty-six holes per foot. When applied to the tree-trunk seventy-two tunnels per foot are provided. However, the most effective bands kill larvae before they have time to spin cocoon to obstruct the tunnel, and after death they shrivel and dry up. One live larva and four or five dead ones have been taken from a single tunnel. The writer does not recall finding more than three cocoons in the same two-inch tunnel, so that narrow bands treated with a slow-acting material would accommodate fewer larvae than the same width of band impregnated with a mixture that will kill the larvae before they spin up. With bands treated with the Government formula it is doubtful if wide bands will be necessary unless two hundred larvae per foot of band are expected. It might be mentioned that on the five well scraped trees reported last year as catching 96% of all the larvae on the trees the larvae were present at the rate of one hundred eighty-six per foot of two inch band.

Where larger numbers of larvae are expected, a second two-inch band placed beside the first should be about as effective as a single band of four-inch width, as indicated in the comparison given at the bottom of Table 3.

How good are the different materials tested?—Mortality records from the half-band series of treatments were kept, and were supplemented by similar records from an additional one hundred fourteen trees on which whole bands of the different types were used. The results were not greatly different in the different localities, so they have been combined, and are presented in table 5.

Insofar as the bands prepared under the "Government formula" are concerned, results in 1931 check closely with those obtained in 1930. The addition of aluminum stearate to the formula (Govt. No. 3) and double-dipping (Govt. Nos. 2 and 4 and Penna.) increased the effectiveness of the bands. At Floradale and Waynesboro Govt. bands 2 and 4 were torn apart in November, so that a width comparison could be sent to Mr. Siegler. At this time a high percentage of larval control was not evident. At State College late in December Govt. band No. 2 showed 98.1 percent control of larvae.

TABLE 5.—EFFECTIVENESS OF TREATED BANDS, 1931
All widths All localities

Type of band	Total larvae trapped	Summer—1931 Moths emerged No.	Summer—1931 Moths emerged %	Summer—1931 Moth Control %	Mid-winter—1931-32 Living larvae No.	Mid-winter—1931-32 Living larvae %	Mid-winter—1931-32 Control of larvae %
Govt. No. 1	3235	16	0.49	98.1	719	29.8	61.5
Govt. No. 2	2368	5	0.21	99.2	324	18.3	77.0*
Govt. No. 3	2733	4	0.14	99.4	154	7.6	90.4
Govt. No. 4	1336	1	0.07	99.7	141	14.1	82.3*
Govt. No. 5	1323	7	0.54	97.9	248	25.1	68.7
Penna.	5595	19	0.34	98.7	726	17.4	78.1
Indiana Alpha	3235	22	0.67	97.4	979	41.4	48.0
Indiana Beta	3025	101	3.30	87.0	1396	61.4	23.0
Tar Oil	885	18	2.03	88.1	541	81.9	0.0
Untreated	563	143	25.39	.....	335	79.7	.....

*Examined in November. Other bands examined in late December and January.

In the prevention of mid-summer moth emergence alphanaphthylamine in the Indiana formula gave results approximately equal to the single-dipped "Government formula" bands, but the Indiana Beta band did not approach the others in effectiveness. In addition, the Indiana bands seemed to lose strength as the season advanced and contained many living larvae at the time of the final examination. Tar oil as used gave unsatisfactory results.

Amount of material in band influences effectiveness.—In the preparation of bands, the corrugated strawboard is run through a hot bath of the chemical dissolved in oil, or a roll of the strawboard is dipped in the bath. Upon cooling, the chemical crystallizes out. In bands prepared under the "Government formula" a greasy mixture of oil and chemical incases the whole band. This layer is built even thicker by running or dipping the bands again (double-dipping). In the Indiana bands, doubtless due to the less viscous oil used, and to its later evaporation, no greasy layer is in evidence. The bands appear to have soaked up the oil, leaving a powdery coating of crystals on the surface. This makes them lighter and easier to handle than the bands treated with red engine oil.

When it was discovered that the Indiana bands had not maintained their effectiveness, it was thought that this fact might be accounted for by the amount of the chemical mixture deposited in the bands. Accordingly measured lengths of various four-inch bands were weighed, in duplicate, and compared with the weight of untreated strawboard. The results are given in table 6.

TABLE 6.—AMOUNT OF CHEMICALS IN TREATED BANDS.

Type of band	Weight-Grams per foot	Grams chemical per foot
Govt. No. 4, 4"	63.0	44.2
Govt. No. 3, 4"	58.1	39.3
Govt. No. 1, 4"	51.2	32.4
Penna., 4"	45.2	26.4
Indiana Alpha, 4"	22.1	3.3
Untreated, 4"	18.8	.....

Granting that a uniform grade of strawboard was used in all bands, the right-hand column in table 6 gives a rough idea of the weight of chemicals deposited per foot of band. The figures are subject to some error due to the fact that the lengths used were remnants, and had lost some of the coating in handling. Unfortunately, no Indiana Beta band was available. This loss seemed greatest in the most heavily treated bands. The Pennsylvania band is double-dipped, and prepared according to the Government formula. Its lower weight is doubtless due to the type of red engine oil used. That in the Government bands in 1931 is called Niantic oil, and evidently gave the heavier coating. Efficiency of the bands seems to be determined by the amount of the chemicals deposited in them. The results seem to indicate that the extra expenditure for the heavier coatings is not justified by the small increase in the control of mid-summer moths afforded. However, only 65% of the normal amount of rain fell at State College in the period from July 1 through November 30, so that the bands can be said to have suffered only 65% of the normal amount of weathering. With normal or excessive weathering, and the possibility of a partial third brood of codling moth such as occurred in the southern part of the state in 1930, the bands used should offer the most promise of maintaining their efficiency throughout the season.

Do all the worms on the tree get into the band?—In the report last year figures were given to show that ninety-six percent of all larvae were taken under the bands. This seemed reasonable, since cage experiments in New Jersey have shown over ninety percent of the moths emerging from under the rough bark of the trunk. However, in Indiana, reports state that "more than half and sometimes as many as 80 percent" of the larvae can be trapped. In view of this wide variation, eight of the banded trees at Greist's were examined carefully during the summer for pupal skins, and were gone over very thoroughly in November, at the time the bands were removed.

In all, 530 individuals were removed from the eight trees, of which 388, or 73.2 percent, were in the bands. The favorite cocooning places outside the bands seemed to be the narrow crotches that could not be scraped clean, and pruning scars and cankers among the upper branches, together with bark scales on the trunk and main branches that had not been removed, or had loosened up after the scraping, which was done in June. All these shelters were more abundant at Floradale than at State College. Apparently the thoroughness with which other favorable hibernating places can be removed from the trees will determine to a large extent the proportion of the total population trapped by the bands. With a highly effective band, control of the moth population of an orchard will vary from 70 to 95 percent, depending upon the smoothness of the trees.

What is the place of treated bands in the codling moth control program?—The decision to use chemically-treated bands in addition to spraying and packing house sanitation rests, of course, with the individual grower, and should be based on a thorough knowledge of the codling moth situation in his own plantings. The experience of the Experiment Station with the codling moth and with the practice of banding, may justify the following suggestions.

First—determine the amount of wormy fruit. If this does not run to fifteen per cent or more of the crop, banding is not likely to catch enough worms to justify the expense (See table 4). Banding should not be considered for young, smooth-barked trees, but only for trees large enough to have rough, scaly bark.

Second—re-examine past spraying operations to determine how these may be improved from the standpoint of timeliness, thoroughness, and use of proper materials. If the best job possible has been done to no avail in cleaning up the codling moth, banding may be considered. It should be understood, however, that chief reliance must be placed on spraying, and that bands are a supplement, to aid in the reduction of heavy infestations.

Third—if "plague spots" such as packing sheds, storage cellars, and cider mills, exist in the orchard, and have complicated the problem of codling moth control, consider the advisability of banding fifteen or more rows about such spots.

If banding is decided upon, the course of economy would suggest a 2-inch band applied in June, and a second 2-inch band to be placed above the other in August, if the numbers of larvae present are large. Trees may be prepared for banding at any time before June. Be careful and thorough in removing every possible flake of loose bark. If many hibernating larvae are found, catch the scrapings on a sheet, and gather and burn them. In June apply the bands snugly about the trunks, corrugated side against the bark.

The cost of banding.—No extensive figures relating to the expense incident to the banding of trees are available. At Floradale the tree-trunks averaged nearly four feet in circumfer-

ence. Two hundred fifty trees required one 1000 foot roll of band, and took one man eighty-one hours to scrape. Placing bands on two-hundred fifty well shaped trunks of this size should be less than a day's work for two men. On this basis the total cost for banding in a similar orchard should not exceed five dollars per acre.

SOME TESTS OF SPRAY MATERIALS AGAINST SAN JOSE SCALE AT THE PENNSYLVANIA STATE COLLEGE

H. N. Worthley, State College, Centre County

During the fall of 1931, while making fruit counts in connection with codling moth control experiments in Franklin and Adam Counties, the writer was surprised to find considerable amounts of scale-marked fruit in various widely-scattered apple orchards. The situation, while not serious, seemed threatening, and led to a decision to bring the matter to the attention of this group.

Habits and Injury.—In early fall scales in all stages of development will be found on the bark of limbs and twigs, and if numerous, on the fruit. Winter temperatures kill the older and younger scales, those about one-third grown remaining alive. These continue growth in the spring, becoming mature at about apple-blossom time. Two forms of scales may be seen. The female scale is nearly circular, 1/12 inch in diameter, with a raised nipple at the center, while the male scale is oval, 1/25 inch long, with a nipple near the larger end. These ash-grey scales cover and protect the living insects beneath. The adult males are tiny, two-winged yellow flies. These seek out the plump, sac-like yellow females, which remain beneath the scale covers, and which after mating, produce living young over a period of about a month. The young scale insects are like tiny yellow lice. They crawl about for a time and then settle down to feed. At the first molt the females lose eyes, legs and feelers, becoming mere yellow sacs fastened to the tree by their thread-like mouth-parts. The successive molted skins mixed with a waxy secretion, form the protecting scale.

There are probably four complete generations of scales produced each year in Pennsylvania, and each maturing female in the spring will, under favorable conditions, have progeny numbering millions by fall. The pumping of sap by all these tiny beaks is a great drain on the trees. As late as 1922, during an outbreak of San Jose scale in Illinois, one thousand acres of mature apple trees were killed outright. Infested fruit has a mottled appearance, due to a red area about each scale. The scales are most abundant about the stem and calyx ends of the fruit.

Control.—Lime sulphur, 1.03 specific gravity (dormant strength) has been the standard remedy for San Jose scale for

years. Outbreaks due to neglect, and calling for drastic action, have resulted in the use of dormant spray oils which, when properly applied at 2 percent or more of actual oil have given as good or better control than lime sulphur. With oils as well as lime sulphur, only those insects hit by the spray will be killed, so thorough application must be the rule. Due to the enormous reproductive powers of this insect, a very high kill is demanded in the dormant or delayed dormant spray.

In most discussions of scale control no mention is made of the effect of materials used in the foliage sprays in killing the crawling and newly-settled young. That the summer applications may be very important in scale control will be shown.

Experiments with dormant sprays.—In 1931 single rows of badly-infested mature apple trees were sprayed with a series of dormant and delayed dormant combination sprays. Count trees of Grimes and Stark were selected, and the percentage of living scales was determined by the examination of two thousand scales on two and three year old wood both before and after treatment. The results appear in Table 1.

TABLE 1.—CONTROL OF SAN JOSE SCALE IN DELAYED DORMANT APPLICATION
State College, Pa., 1931

Row	Treatment	% Live Scales		Per Cent Reduction
		Before	After	
1	Lime sulphur, 1.03 Lead arsenate, 3 lbs. nicotine sul., 1 pint	50.3	4.35	91.4
2	Diamond paraffin oil, 4 gals. in Bordeaux, 8-8-100	36.6	0.00	100.0
3	"Dendrol" spray oil, 4 gals. with Bordeaux substitute	45.1	2.90	93.6
4	"4840" spray oil, 4 gals. with flotation sulphur, 20 lbs.	54.1	2.05	96.2
5	Diamond paraffin oil, 4 gals.—blood alb. emul. Lime sulphur, 1.008	47.8	3.50	92.7
15	Check-rows 1-5, Grimes	47.7	48.6	0.0
6	Tar oil winter wash, 5 gals.—dormant	51.5	7.29	85.8
7	Check-row 6, Stark	52.2	47.1	9.8

The spray combinations used were prepared as follows:

Row 1. The standard delayed dormant spray.

Row 2. Two pounds of copper sulphate were dissolved in two gallons of water, and the solution stirred into four gallons of raw oil. In another container two pounds of quicklime were

slaked in two gallons of water. The two mixtures were combined with stirring, pumped over twice with a bucket-pump, and added to a 6-6-100 Bordeaux mixture in the spray tank.

Row 3. The Bordeaux substitute (a copper-lime mixture thought to be less injurious to fruit than Bordeaux) was run through the strainer into about ten gallons of water in the tank, with the agitator running. Four gallons of "Dendrol" miscible oil were added, with water to make one hundred gallons.

Row 4. Twenty pounds of the flotation sulphur paste were thinned with water, and worked through the strainer into five gallons of water in the spray tank, with agitation. Four gallons of the miscible oil were poured in, and water added to cover the paddles. After about three minutes agitation water was added to make one hundred gallons.

Row 5. Three ounces of a mixture composed of one part dark powdered blood albumen and two parts fullers earth was made into a paste with water and added to five gallons of water in the tank, agitator running. Four gallons of raw oil were added. As the tank was filled to one hundred gallons, lime sulphur concentrate to make 1.008 specific gravity (about 2.5 gallons) was added.

The sprays above were applied on April 17, with the trees in a typical delayed dormant stage of development.

Row 6. A commercial tar oil winter wash, five gallons per hundred, as a straight dormant application on April 8.

None of the oil sprays caused more injury to the buds than the standard delayed dormant spray used on row 1. Bordeaux mixture and the Bordeaux substitute as used in the later foliage applications, caused severe russeting of the fruit.

It appears in Table 1 that the oil sprays as used gave better control than lime sulphur, with the exception of tar oil winter wash. Subsequent to the counts a few living scales were found in row 2. The scale population was high, some trees being visibly weakened by the scale attack. The mature trees used received about eight gallons of spray per tree, with every effort at thoroughness of application. Ten to twelve gallons per tree should have been used to insure the highest degree of control.

Experiments with foliage sprays.—The same rows of trees noted in Table 1 received five foliage applications, a different combination spray being used in each row. All drop fruit throughout the season, and all picked fruit, from certain count trees showing a good set, was scored for scale injury. The results appear in Table 2, as per cent of scale-marked fruit.

It is apparent in Table 2 that the Bordeaux sprays, in which copper replaced sulphur as the fungicide, allowed San Jose scale to develop practically unchecked. Many of the fruits in rows 2 and 3 were incrusted with scales at picking time. As shown in row 4 flotation sulphur was much less effective than lime sulphur in holding down the scale. The percentage figures are somewhat misleading, however, for in row 4 there were relatively few scales per apple as compared with rows 2 and 3. That the lime

TABLE 2.—EFFECT OF FOLIAGE SPRAYS ON SAN JOSE SCALE

Row	Materials in 5 foliage sprays	Grimes	Jonathan	Ben Hur	Rome	York
1	Lime sulphur, 1.008 Lead arsenate, 3 lbs.	4.6		3.0		
2	*Bordeaux, 8-8-100 Lead arsenate, 3 lbs.	67.4	69.1	55.4		
3	*Bordeaux sbustitute Lead arsenate, 3 lbs.	83.8	75.2	57.2	73.8	
4	Flotation sulphur, 20-100 Lead arsenate, 3 lbs.	52.5			41.0	41.8
5	Lime sulphur, 1.008 Lead arsenate—casein, 3 lbs.; Hyd. lime, 3 lbs.	7.6				
6	As row 1					33.7
	*Checks	80.0	77.7			89.8

sulphur used in row 1 should have produced such a high percentage of scale-free fruit is evidence of the beneficial effect of this material. In row 6, summer strength lime sulphur followed tar oil winter wash, which failed to control scale in the spring. Under these conditions it could not be expected to hold the scale in check. Incidentally, the difference between rows 1 and 2 should convince any grower that his success in fighting San Jose scale will not be affected by any failure on the part of his neighbors to secure control.

Summary.—In a series of San Jose scale sprays at State College in 1931 dormant oils gave better control than winter strength lime sulphur, while tar oil winter wash failed to kill a satisfactory percentage of scales. Following a satisfactory dormant kill of scales liquid lime sulphur in the five foliage applications held scale in check, while flotation sulphur and copper sprays failed. Following an unsatisfactory dormant kill of scale, liquid lime sulphur failed to prevent scale increase. The vast difference in the amount of scale-marked fruit on adjacent trees receiving different spray materials is convincing proof that the individual grower need not fear the effect on his own plantings of scale infestations in neighboring orchards.

OLD IDEAS OF INSECT CONTROL IN A NEW SETTING

H. E. Hodgkiss, State College, Centre County.

Insects exert an important influence on man. The attraction often is irresistible. A natural reaction is to ward off the condition. Consequently the occurrence of insects creates an attitude of hate—a desire to destroy them. This warfare progressed for centuries in a somewhat blind, haphazard fashion. Individual attempts to combat invasions of the pests were as a rule unsuccessful, consequently such experiences led to collective

efforts which were more productive although their greatest hindrance was the lack of information on the growth and seasonal activities of the insects. The accumulation of such facts was slow but the realization of the tremendous problem became the incentive to organized effort which is a comparatively recent development. Our knowledge of insect suppression has grown tremendously during the past three decades. The successful conduct of most of the battles against fruit insects has won the confidence and aroused new interest on the part of growers toward insect control. The intrinsic worth of many of the repressive measures is now a subject for starting perennial arguments and these are indicative of a healthy condition that has developed within the industry.

There are two schools of thought with respect to suppressive practices. One is that economy in insect control is obtained through the use of a minimum dosage of the insecticide and a maximum amount of the liquid in the form of a spray to the tree. The second theory employs maximum dosages and minimum amounts of material per unit concerned. Two phases of the situation often overlooked in discussing insect suppression valuations are; (1) that insofar as the insects are concerned the presence of the pests on a plant is a menace, and (2) that the job is to remove the menace before it becomes serious enough to endanger the crop. Costs of insect suppression are relative and decrease proportionately with the yield. True economy is obtained by preventing the multiplication of the insect hordes ordinarily present in an orchard. The precise system to use is not the objective. Whether the practice is designated right or whether it is considered to be wrong is an item in the procedure. The purpose is to obtain control.

The past few years may go down in entomological history as one of the most turbulent periods in modern fruitgrowing. These experiences are in accord with the spirit of the times. The old order of things appeared to be entirely turned aside. There was a concerted urge for easier means of securing protection from insects. If the purpose had been what it appeared to be these efforts would have been worthwhile. The unfortunate result of this agitation, however, has been to unsettle the confidence which had been developed by years of experimentation and fortunate experience with insect control practices.

We are beginning to observe the results of these fads in an increasing difficulty to control particular species of insects in apple plantings. Now is an appropriate time to stop and take stock of the present situation. It is not too late to orient ourselves and try to discover why we are unable to rid the orchards of insects that for nearly three decades were easily suppressed.

Fifty species of insects were listed during 1931 as attacking pome and stone fruits and grapes. I have selected three of these for the purpose of this discussion.

The San Jose Scale.—The San Jose scale was outstanding in its superabundance particularly in the Cumberland valley,

lower Susquehanna river areas, and in the western tier counties. The reason for this was not obscure. The long period of comparative freedom from scale damage to fruits lulled many growers into a false sense of security. During recent years these men neglected the very essence of protection and sought to gain economy in initial spraying costs by either omitting the scale strength applications of proven insecticides or failing to remember that the insect thrives on the newer growth of the outer and inner branches and in the tops of the trees. The condition in rather restricted areas is so serious at the present time that important questions are arising as to the effectiveness of control practices.

Most insecticides advocated for the destruction of the San Jose scale are efficient when they are diluted correctly and if the trees are covered thoroughly. Where the applications are incomplete the amount of protection obtained from the use of any of these materials is relatively small. Those of us who went through the period when the whole aspect of fruit production was changing on account of the tremendous destructiveness of the San Jose scale realize the extent of the realignments in apple growing that took place until effective control measures were devised. *The San Jose scale can be controlled. Whether or not history will repeat itself depends upon the attitude of the individual grower to this particular problem and the degree of his determination to suppress the insect.*

The Rosy Apple Aphis.—The rosy apple aphis is somewhat periodical in its abundance and destructiveness. It appears to build up in numbers during extended periods of dry weather and under this condition often reaches the proportions known as an outbreak. On account of its alternation of food plants the increase varies directly according to the numbers leaving the summer host and returning to the trees. A rather dry warm autumn is conducive to the concentration of migrating adults on the trees with a proportional increase in egg laying individuals and consequently the numbers of eggs deposited may be large.

Eggs of the rosy apple aphis are not often detected by the fruit grower although his attention may be directed to an abundance of those of other species deposited on the bud spurs, or on the succulent growth of terminals, or in the centers of the trees. Such observations have been responsible for an interest in suppressive measures through applications designed as ovicides. The economy of an ovicide for this purpose was recognized long before the standard control practice was devised. The results of experiments on the use of insecticides for egg killing are well known although perhaps they have escaped the attention of many in this audience. It may therefore not be out of place to call attention to some of the earlier investigations conducted in the eastern fruit growing area in an attempt to find a suitable ovicide for this purpose.

A series of experiments was conducted at the New York Agricultural Experiment Station during 1905 and 1906. There

was a rather high per cent of kill by certain common insecticides. The outstanding ones were the lime sulphur wash and commercial spraying oils. Field experiments using these substances did not result in an appreciable reduction of damage and for this reason further efforts were designed against the young nymphs at the hatching period. More recently an extensive series of experiments was conducted in New Jersey and as a result of these tests the conclusion was reached that the most effective means of control was through the use of the standard practice. However, these and later experiments at the New Jersey Experiment Station brought out the fact that one-half of one per cent cresylic acid "running approximately 95 per cent active agent" when added to an oil emulsion resulted in an appreciable killing of aphid eggs. Within the last two years an emulsified tar oil has been tried out rather extensively and trees sprayed with this compound seem to have been relatively free from aphis attack in early spring. While these products appear to be efficient the costs are rather high. The range of usefulness of ovicides seems, therefore, to depend to a large extent on their availability as substitutes for standard materials in the control of red spider or the San Jose scale when the buds are dormant. Further investigations of this phase of the problem are necessary before definite statements can be made with respect to the values of these newer materials or their combinations.

A goodly number of growers applied some type of an insecticide as an ovicide at the time of the delayed dormant period of bud development in 1931. Many of them expected by this practice to secure control of the rosy aphis, San Jose scale, red spider and the apple red bugs. On account of the outbreak of the rosy aphis the practical value of a number of these materials when used by orchardists was rather easily determined. Since the opportunity presented itself we collected a considerable amount of data on infestation conditions. These figures have been correlated and are presented in this paper in order to give apple growers a clearer view of the state wide conditions with respect to suppression valuations. No attempt is made to discuss the relative merits of the insecticides. Comparisons are used chiefly to point out some of the reasons for the failures in insect suppression. The figures are tabulated as averages per tree.

Approximately 100 orchards were examined in late June or early in July after the peak of rosy aphis development occurred on apples and before the injured foliage had dropped. When the records were analyzed it was found that the materials employed comprised four different kinds of insecticides. There were eight brands of spraying oils, two types of sulphur compounds, and three brands of nicotine sulphate (40 per cent nicotine). These preparations are commonly known to growers under several commercial brand names. The figures are arranged in Table 1.

TABLE 1.—COMPARISONS OF MATERIALS USED AS OVICIDES OR APHICIDES

Material	Time of Application	Average infestation per tree			
		Leaf Clusters	Fruit Clusters	Fruits Injured	Terminals
		No.	No.	No.	No.
L. S.—Nicotine	Del. Dor.	32.9	25.3	52.8	20.6
Oil	Del. Dor.	1628.4	1348.6	3487.5	400.4
Calcium Sulphide	Del. Dor.	3864	2493.7	7452.2	434.3
Sodium Sulphide	Del. Dor.	5909	1874.6	7082.7	373.7

Codling Moth Suppression.—The carry-over of codling moth larvae due to the tremendous outbreak during the summer of 1930 created infestations which many apple growers were unable to suppress. Fortunately the second brood apparently was of small importance although adults emerged in large numbers during the first week in August. Five poison sprays were suggested last year. The first was at the petal fall. The fifth was early in August. Fewer growers applied the full complement of sprays than at any time during the last four years. Consequently the losses in blemished fruits caused by these failures were considerable. Some growers left off essential sprays and these men experienced losses directly proportional to the degree of importance of the spray omitted. Other men apparently were able to omit the final cover spray if the earlier applications had been timely and were thoroughly applied.

Spraying Information.—In order to gauge the correctness of the spraying information annual counts are made in a number of orchards at harvest. These as a whole represent a fair cross-section of the insect conditions in the state. The orchards are selected at random and this year some 300 places were visited at harvest. These records were separated into three groupings and the figures computed on that basis indicate that the average loss was, in completely sprayed orchards, 4.5 per cent; in partly or poorly sprayed plantings 15.7 per cent; in unsprayed orchards 67.1 per cent.

THE RELATION OF OLD IDEAS TO NEWER METHODS OF INSECT CONTROL

In connecting the data for 1929 and 1930, we sensed that there was developing in the minds of a considerable number of apple growers a doubt as to the need for strict attention to the fundamental principles of insect control. Counts made during 1931 showed that this attitude had a practical bearing on failures to secure reasonable control of particular species such as codling

moth, the apple red bugs and the rosy aphis. The survey of orchard conditions was made at critical periods in the development of fruit injuries and on account of the superabundance of the codling moth and rosy aphis we have selected the figures related to these species as a basis for comparisons of insect suppression practices.

The Selection of Insecticides.—In a number of orchards direct comparisons were obtained of insecticides used for the rosy aphis. The owners are reputed to use great care with respect to timing, mixing and applying sprays. The demonstrations, therefore, are indicative of the maximum benefit which may be expected from the insecticides. The data has been arranged and charted for the convenience of this discussion. Table 2 includes comparisons of lime sulphur with or without nicotine in combination, and unsprayed trees.

TABLE 2.—COMPARISONS OF INSECTICIDES USED AS APHICIDES

Orch.	Material	Time of Application	Conditions with respect to rosy aphis			
			Leaf Clusters	Fruit Clusters	Fruits Injured	Terminals
No.			No.	No.	No.	No.
1	L. S.—Nicotine	Early Del. Dormant	20	104	269	68
	None	Unsprayed	224	434	504	203
2	L. S.—Nicotine	Del. Dor.	3	2	3	0
	L. S.		26	767	2599	160.5
3	L. S.—Nicotine	Late	539	269	269	447
	L. S.	Del. Dor.	1307	1185	2370	342.5

TABLE 3.—COMPARISONS OF INSECTICIDES AS APHICIDES

Orch.	Material	Time of Application	Conditions with respect to rosy aphis			
			Leaf Clusters	Fruit Clusters	Fruits Injured	Terminals
No.			No.	No.	No.	No.
4	Oil	Del. Dor.	8104	2700	8130	234
	None	Unsprayed	5723	1849	5547	131
5	Oil	Dormant	874.5	1966.5	2805	198
	Oil—L. S.	Del. Dor.	1229	2274.5	9588.5	558
5	Oil—L. S.	Del. Dor.	1229	2274.5	9588.5	558
	Oil—Nicotine	Del. Dor.	64	34.5	23	0
6	Oil	Del. Dor.	4616.2	2077.4	12641.2	985.6
	Oil	Del. Dor. and Pink	272.7	260.5	1180.5	243.6

Comparisons of spraying oil with and without either lime sulphur solution or nicotine, and unsprayed trees were made in other orchards. In order to avoid confusion in evaluating the treatments these figures have been arranged in a separate chart, Table 3.

The standard poison for codling moth is arsenate of lead. There are a number of commercial brands of this material which are being used by apple growers in Pennsylvania. Each kind is reputed to exhibit a greater effectiveness against codling moth than any of the other compounds. Recent investigations at the Washington Experiment Station indicate that there are differences in the condition of the deposits on fruits and that other factors such as coverage and weathering are important and require equal consideration. No essential differences in control were found between any of the brands tested.

Spreaders or modifiers are often used with arsenate of lead to reduce burning of the foliage and fruits in extremely hot weather. Such materials should not be applied in early summer unless growers are prepared to clean the fruit at harvest.

Timing of Applications.—The proper timing of sprays in relation to the efficiency of insecticides has received much attention in past seasons and since this factor entered into the analyses of the practices it has been considered a proper subject for your consideration. The most of the orchards visited were treated either with one material or with a combined spray. In many of them the times at which the insecticides were applied differed somewhat and the counts disclosed rather interesting differences in suppression. In Table 4 the lime sulphur was used in the proportions recommended for the respective periods and nicotine sulphate (40 per cent nicotine) was added at the rate of 1 pint in 100 gallons of the dilute lime sulphur.

TABLE 4.—COMPARISONS OF THE TIMING OF SPRAYS FOR THE ROSY APPLE APHIS

Treat.	Material	Time of Application	Conditions with respect to rosy aphis			
			Leaf Clusters	Fruit Clusters	Fruits Injured	Terminals
			No.	No.	No.	No.
No. 1	L. S.—Nicotine	Early Del. Dor.	302.5	1750	6212.5	187.5
2	L. S.—Nicotine	Del. Dor.	5	26	67.2	17
3	L. S.—Nicotine	Late Del. Dor.	447	418	2432	142.5
4	L. S.—Nicotine	Pink	1273.5	933	5598	381
5	L. S.—Nicotine	Calyx	2205.8	1901.8	7690.2	458

Table 5 is a comparison of spraying oils applied according to the recommendations of the compounder at different periods either with or without a fungicide. Nicotine was used as a follow-up spray with lime sulphur as the fungicide in most instances.

TABLE 5.—COMPARISONS OF THE TIMING OF SPRAYS FOR THE ROSY APPLE APHIS

Treat.	Material	Time of Application	Conditions with respect to rosy aphis			
			Leaf Clusters	Fruit Clusters	Fruits Injured	Terminals
No.			No.	No.	No.	No.
1	Oil	Late Del. Dor...	46	63.4	190.7	83.5
2	Oil Oil	Del. Dor. ..... Pink.....	3	1.7	3.7	1.2
3	Oil Nicotine	Del. Dor. ..... Pink.....	1.1	2.1	4.6	3.5
4	Oil Nicotine	Del. Dor. ..... Calyx.....	160	163.2	536.9	208.4
5	Oil Oil— Fungicide	Del. Dor. ..... Through Season.....	1.5	1.1	3.8	6.9

Some interesting conditions as regards the timing of the applications for codling moth were recorded at harvest in 91 orchards. In 55 orchards where the last spray was omitted the injured fruits averaged 7.2 per cent. The last two sprays were left off in 20 orchards with an average damage of 10 per cent. Omitting the last three applications in 16 orchards increased the average loss to 15.6 per cent of the apples harvested.

The Value of Proper Methods in Insect Control.—It is often stated that insecticides of determined merit do not give control of the rosy aphis even when applied at the correct time. It is recognized that such conditions do exist. Under-equipment, lack of thoroughness in application or improper machinery often enter into this situation. Comparisons were made of nicotine and spraying oils applied either according to standard recommendations or the recommendations of the compounders of the materials as to the timing and dilution of the insecticides. The manner of application is illustrated in Table 6.

TABLE 6.—COMPARISONS OF SPRAYING METHODS IN ROSY APHIS SUPPRESSION

Treatment	Time	Kind of job	Average infestation per tree			
			Leaf Clusters	Fruit Clusters	Fruits Injured	Terminals
Nicotine	Del. Dor. Del. Dor.	Good Poor	31 762	15 4783	39 8452	2 1057
Oil 4%	Del. Dor. Del. Dor.	Good Poor	35 6303	210 8575	1050 31500	35 3026

Codling moth injury in 96 orchards in which the full number of sprays was applied was 2.6 per cent. In 180 plantings where at least one of the applications was omitted or where the operation was poorly done the damage was 9.9 per cent. Thirteen of the places visited were unsprayed and in these the losses amounted to 36.2 per cent.

Importance of Efficient Machinery.—In collecting the data it was observed that different types of machines were being used and that these apparently factored in the variability of control. Where spraying oils were applied for aphis suppression by means of a stationary outfit, using a non-rigid distributor the number of injured apples averaged 149 to each tree. Portable outfits using a non-rigid distributor were somewhat less efficient and where these were used the dwarfed apples averaged 4086 per tree. Portable outfits, having semi-rigid distributors were operated in some plantings and in these the dwarfed apples averaged 13,620 to each tree.

Efficiency in operation was outstanding in some orchards and enabled some men to control codling moth with a minimum number of applications. Data taken in several orchards showed that losses due to codling moth entries where the stationary outfit, non-rigid distributor was used did not exceed 1.2 per cent; with portable outfits, non-rigid distributors, 3.5 per cent; with portable outfits, semi-rigid distributors 8.7 per cent.

Comparisons of Valuations in Insect Control.—This same system of evaluation was used to ascertain the comparative effectiveness of the recommended practices in the insect control program. The figures collected indicate the conditions found in the 300 orchards in which counts were made and these represent a fair cross-section of the state wide conditions with respect to the control of the more important species of insects which caused damages during 1931.

If the percentages of insect injury are applied to the estimated total apple production for 1931 of 14,000,000 bushels the monetary values of following a definite system of insect suppression are ascertained. These comparisons indicate that the potential insect losses amounted to $4,697,000. Insect losses due to a faulty program of spraying would have been as much as $1,099,000. If a complete program had been followed in all the orchards the insect losses would have been reduced to $315,000. The difference between complete and partial treatment was $784,000.

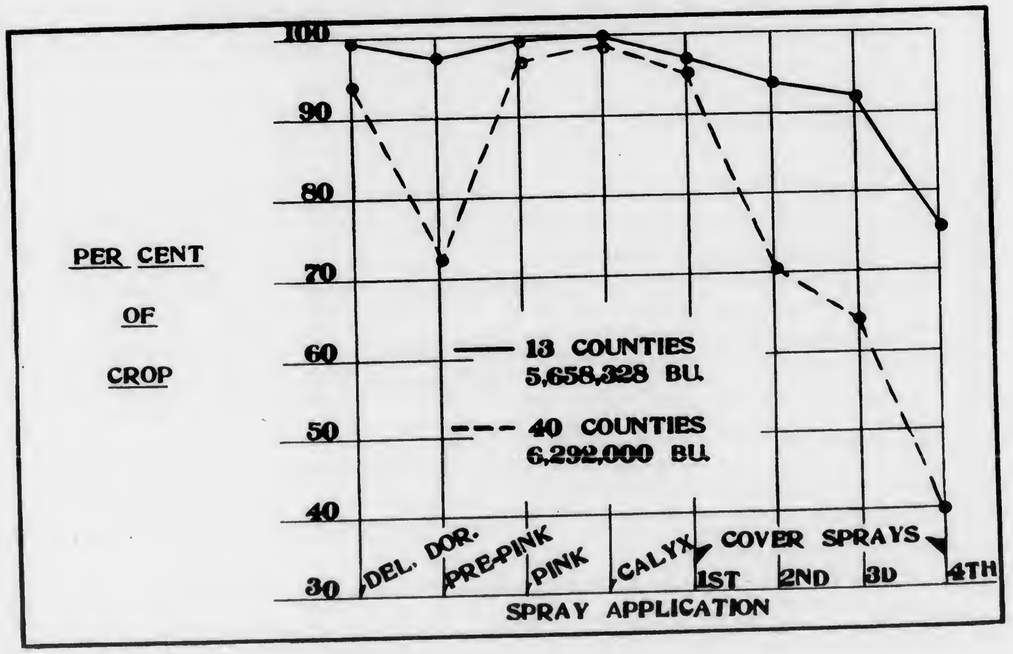
A Comparison of Programs for Insect Control.—The question often is raised as to how completely the control practices are followed by fruit growers. The industry is often sep-

arated into two groupings which for convenience in comparing the practices may be stated as (1) the commercial, and (2) the general. Both of these categories contain a number of orchardists who ought to be considered in the other grouping. However, if the distinction is made according to the numbers of men whose business is the production of fruit we arrive at a definite basis for making the choice. Approximately 92 per cent of the growers whose business is apple production applied seven foliage sprays and 75 per cent of them made eight applications as was suggested in the spraying information. The average of the insect control in this area amounted to 95.5 per cent.

The area in which orcharding is conducted chiefly by men whose principal interest is in other farm operations provides an outstanding comparison. The records indicate that about 95 per cent or more of these farmers applied four early sprays. After the first cover spray fewer men followed the plan and only about 70 per cent of them applied the second cover spray. Under these conditions the amount of insect control was 84.3 per cent. The chart Table 7 indicates the relative response to insect control practices in the state and is presented as being a basis for arriving at a conclusion as to the underlying causes of serious insect disturbances.

Apple growers often lose sight of the purpose of an insect control program. They most often are thinking in terms of the number of sprays applied and not of the number of insects damaging fruits during the growing season. The sprays are

TABLE 7.—A COMPARISON OF INSECT CONTROL PROGRAMS



timed and the insecticides are suggested for use during effective periods for the suppression of these pests. The omission of one or more treatments most often results in an incomplete degree of suppression and a corresponding loss in numbers of perfect apples. Such fruits may be marketable but the practice insures a gradually increasing carry-over of the insect infestation. This condition exists in restricted areas where the insect suppression practices are not uniform.

It has been pointed out that the selection of suitable insecticides, the proper timing of sprays, and the practicing of correct methods of making the applications factor not only in the control of the rosy aphis and the codling moth, but also enter into the suppression of all apple infesting insects. It is important to note that under our present methods of fruit growing efficiency in distributing the spray is of equal significance.

Our earlier ideas of insecticidal materials and their effectiveness for particular purposes have been revised and may yet be further improved. The underlying principles of the selection of suitable materials, the proper timing of sprays, thoroughness in making the applications, and the use of efficient machinery have not changed and can not be disregarded. The solution of our apple insect problems of past years was not obtained by new insecticides alone. Those of the present will be settled only when the great body of fruit growers accept the fundemental ideas of insect suppression and develop the practical application of them under the new situations.

Mr. J. R. Stear: I was very much interested in the differences of control that Professor Hodgkiss brought out from different times of applying the delayed dormant spray. I would like to ask Professor Hodgkiss this question: Can you tell me how many days there were between what you call an early delayed dormant, a delayed dormant, and a late dormant?

Professor Hodgkiss: This work not having been experimental, there is no record of the number of days difference in these. These figures which I have quoted are the results of check-ups in the various orchards, and are determined, largely by the interpretation, by the fruit-growers, of the different spraying periods as we recommended them. What I have been trying to do is to point out these conditions and indicate to growers the program that they ought to follow, to increase the amount of insect-free fruit.

"THE FUTURE OF SPRAY RESIDUE REMOVAL IN PENNSYLVANIA"

H. G. Ingerson, John Bean Manufacturing Co., Lansing, Mich.

A brief review of the status of residue removal in states with codling moth conditions and climatic conditions similar to Pennsylvania, may help you to understand better why I believe

you may have this problem some time. The residue situation is more acute in the latitudes similar to southern Pennsylvania and less so in other sections corresponding to northern Pennsylvania. A line can be drawn roughly from Pittsburgh through Harrisburg and straight east to the New Jersey line and in fact, across New Jersey to the Coast. North of this line the amount of spraying required for codling moth control is considerably less than in the sections south of this line. This is the factor that determines the amount of spray material on the fruit and in turn the severity of the residue problem. I do not mean that all of the fruit growers living north of this line can forget this matter,—rather I feel very sure that every commercial grower of apples in Pennsylvania should be as well informed on this subject as he is on the subject of spraying, fertilizers, harvesting methods, sorting, packing and marketing. In fact this is and will be in the future one of the most important items entering into the marketing problem in part of this country.

Consider briefly the status of residue removal in states closely adjacent to Pennsylvania: Most of you know that this matter first became acute in southern New Jersey. Ever since 1926 New Jersey growers have been confronted with the problem of heavy codling moth infestation requiring very thorough spray applications continuing well into the late summer. In 1927 the first fruit washers were put into service in southern Jersey. These have been added to each season until at the present time, a considerable proportion of the growers are equipped to remove residues. They have even found it necessary to wash the summer varieties such as Starr, Transparent Dutchess. Delaware has not had quite as serious a codling moth problem and in general avoided the necessity of residue removal until the 1931 season. The northern counties of Maryland adjacent to Pennsylvania have used fruit polishers for a number of years and in 1930 and 1931 installed several fruit washers. I am sure I am correct when I state that the codling moth is no respector of state lines and what I say here as applying particularly to central and southern Pennsylvania, applies with much more force to the entire Shenandoah-Cumberland section of Maryland, Virginia and West Virginia. Virginia has used fruit cleaning equipment for several seasons, perhaps leading in the percentage of fruit passing over cleaners of some type among the Eastern states. This is easily understood when we realize that as high as 60% of the crop during some seasons is exported and therefore must meet the world tolerance of .01. The same general condition applies to the section of West Virginia included in this same general fruit belt. Many of the dry types of cleaners have been in use for several years and in 1930 and 1931 considerable number of washers were put into service. Southern Ohio, where conditions are quite similar to conditions in southern Pennsylvania, avoided the residue problem until the past season, following severe losses from late broods of codling moth in 1930 and a heavy carry-over into 1931. Quite a goodly volume of

fruit cleaning equipment was put into service this past season. To go a little farther west, but where conditions were still somewhat similar to southern Pennsylvania the fruit sections of southern Indiana and Illinois have turned to fruit cleaning equipment as the surest way of producing fruit free from objectionable residues. I could continue and give you the status in all the other Eastern states but this will serve to show how fortunate you are in Pennsylvania to have avoided the necessity of this program up until this time. I think most of those present know the present situation in Pennsylvania*. There have been a few of the fruit dry cleaners or polishers in use in the southern parts of the State for several seasons, but they have been used not so much for residue removal as simply to improve the market appearance of the product.

FRUIT WASHING IN PENNSYLVANIA

In the summer of 1930 I was surprised to visit a fruit packing house near Easton and find a commercial fruit washer in service there. Inquiry brought out the fact that this washer was installed not to remove spray residue, but rather to remove coatings of cement dust from the harvested fruit, the orchard being located in a section of cement factories. With a few exceptions, this constitutes the fruit cleaning equipment now in use in Pennsylvania. Following this summary of conditions in the states adjacent to Pennsylvania, we will now consider the features that will influence future policies in this matter. Our old enemy, the codling moth, is at the bottom of this fruit cleaning program. Let's see what the present status, so far as codling moth infestation and control is concerned.

STATUS OF CODLING MOTH INFESTATION IN PENNSYLVANIA.

When I was in attendance at your meeting three years ago, one of the leading growers† in addressing the Association stated

*A check up on the arsenic residue analyses made on Pennsylvania apples in 1931 shows the following facts:

Apple orchards or lots of fruit analyzed	278
Samples analyzed which exceeded the domestic tolerance of .012	19
Shipments held up until arsenic was removed	14
Counties in which the bulk of the samples were collected	15
(These samples were collected from practically all of the large orchards in the state which export fruit or sell in carload lots into interstate shipments. The bulk of the samples were collected in Adams and Franklin counties with a good many from Cumberland, York, Erie, Lancaster, Lehigh, Berks, Centre, Wyoming, Perry, Bedford, Dauphin, Lycoming and Fulton counties.)	
Number of washers in the state	6
Approximate number of mechanical brushes or wipers	50—60

Collected by Federal-State inspectors, analyzed by the Bureau of Foods and Chemistry, Harrisburg. Data from D. M. James, Bureau of Markets.

†R. E. Atkinson, Bucks County, 1929 Proceedings, Page 88.

that failure to control codling moth was simply a matter of careless spraying. Continuing, he said, "I am sure that our losses from codling moths are less than one-tenth of one percent." This was at the end of the 1929 growing season. I venture that even with thorough spraying, he might possibly have a very different report for the seasons of 1930 and 1931. What are the factors that have caused codling moth to build up to such great proportions and do such unusual damage during 1930 and 1931? I think our entomologists all agree that a combination of mild winters and hot, dry summers, accounts for this condition. The mild winters allow thousands of codling moth to live over for the next season, that under more severe conditions, would die. The long, hot summers affect the codling moth population in several ways: More broods develop under these usual conditions but more especially a much greater number in each group. W. S. Hough, Virginia, has shown that when high temperatures exist during the egg-laying period, 20% more of the young worms make entrance to the fruit if the temperature is above 80 degrees, than occurs with temperatures below this point. Without attempting to predict what the balance of this winter may do to codling moth, we certainly know that up to this time, conditions have been unusually favorable to the big brood of worms which went into winter quarters at the end of the past season, to live over and be ready for business with the setting of the 1932 crop.

A SUGGESTED CODLING MOTH PROGRAM FOR 1932

I think we should face this matter squarely and recognize that we have an epidemic condition of codling moth population in at least a few of the Pennsylvania orchards as we go into the 1932 season. Some growers trust to the weather or Providence to give them a reasonably clean crop for 1932. No orchard program is stronger than the weakest link and if failure to control codling moth is the limiting factor in your profitable orchard operations, I am sure you are going to meet this epidemic with strong-arm methods. Some of you are using treated bands and in this way reduce the emergence of codling moth a certain amount.* Some of you will use bait pails or traps at the time of moth flight and in this way get rid of a certain percentage of moths. These measures are no doubt necessary and very much worth-while but in the light of the present knowledge, the chief dependence will be put upon arsenic sprays for codling moth control. Experience in heavy infestations has shown the absolute necessity of very thorough spraying against the first brood of worms, which begin to hatch from two to three weeks after petal fall and continue for several weeks. In certain parts of the State and in certain individual orchards, careful thorough spraying against this first brood combined with one application in early July for second brood, has, with

*See H. N. Worthley's "Treated Bands for Codling Moth Control," both in the 1931 Proceedings and in this issue.

normal weather conditions and normal codling moth population, kept your crops reasonably free from codling moth injury. What you will do in 1932 along these lines will be determined to a large extent I am sure, by what you have done and what results you have secured in the past two seasons. The apple industry in Eastern states as well as the West face this threat of heavy losses from codling moth in 1932. I shall not attempt to tell you how many spray applications you shall make or when you shall make them—Your spraying service will give you this information.

I know that many of the growers present will agree right now that they would be glad to take the necessary steps to meet any residue problem if they could be assured of controlling codling moth satisfactorily and then could remove any objectionable residue at nominal cost. Work along these lines has been carried on in the Winchester, Virginia Field Station, Branch of the Virginia Agricultural Experiment Station, under the direction of W. S. Hough. Hough reported at the Virginia Meeting that under 1931 conditions, he could apply three applications of arsenate of lead, adding one pint of fish oil soap for each three pounds of arsenate of lead, making the petal fall, three and five weeks applications without having excess of residue. He continued by saying that if codling moth population is high it will require one or two sprayings in July in which case, residue is likely to result. He further stated, "if a **thorough** application is made after July First the fruit will need to be washed, to meet the requirements." Professor Hodgkiss of Pennsylvania reported to your meeting last year in connection with his discussion of the Pennsylvania spray schedule and methods,—"The limiting factor in codling moth control was the last or July application. Orchardists who omitted this spray had losses which were as high as 35.2 percent of the matured fruit. Where the treatment was used in conjunction with the earlier applications, the amount of damage was small and did not exceed 3.8 percent. The average for the area was 1.6 percent." I am not sure what recommendations are being made by your spray service as to the use of stickers in the early season applications. I do know, however, that in the other sections with conditions somewhat similar to southern Pennsylvania, that an increasing number of the better growers are using fish oil with arsenate of lead as a sticker in their first brood applications with splendid success in the way of increased control of first brood worms.

The early part of the season the fruit is growing very rapidly and every young worm which enters the fruit at this early stage may mean two or three hundred descendants, for late season entrance after the time of effective spraying is over. Therefore, we should do everything possible in the way of improving our spray material combinations, our methods of application and timing of these early season sprays to reduce this first brood to the very minimum.

Now when we come to spraying for second brood, and at least in some years in the Southern counties of the state, a third brood, we need to consider carefully what our program shall be. Shall we put on one July application and hope for a clean crop? Or shall we make one or two additional applications and be sure of a clean crop so far as worms are concerned? Before making this decision we should consider the other angle of the spray residue problem, to which we shall now turn. For the purpose of the balance of this discussion I shall assume that you have made one or more second brood applications of arsenate of lead and that you have the residue problem to meet.

WHY SHOULD WE REMOVE RESIDUE?

Some of you may feel that the requirements of the Government on the amount of residue allowed on fruit are unreasonable. However, when we realize that this regulation is only one small part of the general program of the careful guarding of the public health and that many phases of this program effect the health of our own families, we will be more ready to comply with the requirements. Some of you are saying that you have eaten apples covered with spray material for twenty years and are still alive. True, arsenic poisoning from the amounts on sprayed fruits is not quick acting and we never hear of any deaths from this cause. The same thing is true of the slow progress tuberculosis but we all appreciate the need of ordinary precautionary measures and not a one of us present would knowingly drink milk from tubecular cattle. A number of years ago the ripe olive industry of California was careless in some of its packing methods and cases of poisoning occurred which were directly traceable to ripe olives. The publicity given this matter in the general press was a blow to this particular industry from which it has not even as yet recovered. We can all remember a similar happening in connection with the oyster industry. Some twenty or more years ago some injurious materials were used in the preservation of foods in canning and in other ways. The present pure food laws were set up to guard the health of the American public against these injurious materials. The application of these laws to fruits and vegetables is not new simply that conditions in our industry have in recent years brought the necessity for considering these requirements. The purpose of these laws is to make all food materials safe not only for strong healthy persons, but for invalids and children, I am confident that there is not a fruit grower at this meeting that would offer fruit for food purposes if he knew that it contained even a slightly injurious amount of any material. The governmental departments are authorized to determine the foods that are injurious and to see that practices are changed or steps taken to remove these objections. All parties in any way interested in the fruit industry have been very careful to keep this entire matter in its proper place.

The amount of residue you will have on your fruit following these summer applications will depend on a number of factors No doubt many of you think it will depend very directly on the amount of rainfall following the applications. True, this will have a slight bearing on the amount of residue but careful records kept for the past six or seven years in New Jersey, Virginia and other eastern states that have been studying this matter, show that this is one of the least important items entering into the residue situation. Ordinarily rain water does not remove appreciable amounts of arsenate of lead. If it would, we would be in a sorry plight, for as soon as a rain came following spray application our trees and fruit would be unprotected and we would need to go right back with another coating. These arsenate materials are not soluble in water, in fact, the government has set up just as rigid instructions on the percentage of arsenic that can be soluble in water in the manufactured spray materials, as they have on the amount of arsenic that could be present on apples for consumption, and the insecticide manufacturers have had to comply with these objections the same as we as growers must now comply with the requirements on market fruit. It is true that the atmospheric conditions together with rainwater have a slightly solvent effect but chemical analyses have shown this to be very slight. The effect of rain in adding size to each individual fruit no doubt accounts to a large degree for the apparent difference in amounts of residue following rainy periods and preceeding rains. In the season of 1931 the fruit sections of Southern Indiana after experiencing something of a drought in the early part of the growing season, in the latter part of August and the early part of September had a very great excess of rainfall coming in the form of violent downpours as well as all-night soaking rains. The men conducting work in that state saw the opportunity to collect some valuable data on this matter of the effect of rainfall on spray residue and made a very complete series of analyses of fruit picked before these heavy rains and directly after, and the differences in residue content were very slight indeed.

VARIETIES DIFFER IN RESIDUE CONTENT

Different varieties are constantly showing different amounts of residue, these differences being quite closely correlated with the texture of the skin of the fruit. Smooth skinned varieties such as Duchess, Wealthy, and Jonathan will retain less residue than rough skinned varieties such as Baldwin and Rhode Island Greening. Under Virginia conditions in 1931, Stayman and Ben Davis sprayed on the same dates as York and Winesap, showed less residue than these latter varieties even when they were harvested earlier. The shape of the variety no doubt has some bearing on the amount of residue. The area of the calyx basin and stem cavity compared to the balance of the surface is no doubt a determining factor. However, we have our varie-

ties and we are not going to change them because of the amount of arsenic that they will retain. The factors that are within our control are the spray materials that we use, the amounts we use and the time of application and removal. .

SPRAY MATERIAL COMBINATIONS USED EFFECT THE EASE OF THEIR REMOVAL

Whenever codling moth population builds up many growers demand of the experiment stations new and better spray materials. W. S. Hough presented a paper at the 1931 Virginia Meeting entitled, "Can Codling Moth be Controlled by Arsenical Sprays?" I shall quote here Hough's conclusion,—"In conclusion let me repeat that lead arsenate can be relied upon to control the codling moth. The number of applications, however, will have to be increased in some instances until the infestation is cleaned up. The adherence of lead arsenate may be increased by the addition of one pint of fish oil (eight ounces) for each 100 gallons of spray containing three pounds of lead arsenate*.

During the season of 1931 our experience with substitutes for lead arsenate in July sprays resulted in severe injury to the fruit where one and two gallons of summer oils were used per 100 gallons of water and severe injury to the foliage where four pounds of Barium fluosilicate per 100 gallons were used."

Arsenate of lead alone and in combination with sulphur mixture is not especially difficult to remove. Lime added to these mixtures aids the removal of residue and apparently also reduces the possibility of its killing effect on chewing insects. Arsenate of lead combined with casein spreaders is somewhat more difficuly to remove than with the spreader left out. Arsenate of lead combinations with oils or oil soaps are difficult to remove and require a fair knowledge of removal methods. These are the materials that spread the coating of arsenate of lead evenly over the fruit and foliage and are the ones that are apparently giving the best control of codling moth. I think, therefore, that our removal program should be based on the removal of these materials.

TIME OF REMOVAL

Little difficulty has been experienced in the East even with these lead and oil combinations where the cleaning was done at harvest time. A few weeks of storage however, makes the removal of these materials very difficult as apparently the coating of wax which the fruit lays down in storage covers the spray material and all and after this waxing occurs, strong washing solutions must be used and in some cases heated solutions must be resorted to. I would emphasize therefore, that there is great desirability in residue removal right at the harvest time.

*"They" say the combination of the common sort of fish oil with lime sulphur makes sensitive stomachs do nose dives and tail spins—even strong ones wabble a bit. (Secretary)

CHEMICALS FOR RESIDUE REMOVAL

A lot of work has been done by different Eastern experiment stations the past few seasons in trials of chemicals for fruit washing purposes. These materials range all the way from commonly used weak solutions of hydrochloric acid to rather complicated chemicals known in the industry as "de-gumming" materials. If the practice is followed of washing at harvest time, I think that weak solutions of hydrochloric acid will be most generally used for some time to come because of our quite complete knowledge of how to use this material successfully and its low cost. I would say that this material at the present time is as generally used for fruit washing when washing is necessary as arsenate of lead is used for control of chewing insects.

OTHER RESIDUES TO BE REMOVED

The past two seasons have been generally unfavorable to aphis outbreaks in the Eastern fruit sections. If in 1932 the spring is wet and cold, we will no doubt have our usual amounts of scab and aphis infestation. Following this aphis infestation we will have a certain percentage of our fruit covered with the black, sooty fungus that grows in the honeydew. While this fruit is oftentimes in the sections of the trees where it does not color sufficiently to meet the U. S. No. 1 grade, yet in many cases, it would meet the No. 3 requirements except for this coating of aphis residue. This material can be removed satisfactorily at the same time that spray residue are being removed. The same thing holds true for the specking following the leaf hopper infestation which is often serious in certain sections in dry summers and falls. This was so serious in certain orchards in the Shenandoah section in 1930 that some fruit washing equipment was installed to remove this leaf hopper residue even when the spray residue was not a serious factor.

There is one other phase of this residue removal or washing operation that I should mention. Along with the washing process goes the drying. While there is a difference of opinions as to the necessity of drying so far as storage quality of packed fruit is concerned, there is no difference of opinion as to the desirability of the fruit being dry for the packing operation both from the standpoint of appearance of the fruit and the efficient work of the packing house crew. With these dryers as regular part of the packing house equipment fruit can be picked in the early morning with the trees wet with dew or following rain, brought into the packing house wet, put through the dryer and be ready for immediate packing. You all know how rushed the late harvest season is and how many times you would liked to have put your packing crew to work on mornings following rains and heavy dew but you have had to hold off until it was ten or eleven o'clock and the fruit was dry. This one feature is going to be of great value especially to the larger

orchardists where the harvest period is all too short and every hour gained is a real help.

SUMMARY

I have tried to bring to you from the experiences of the past few seasons in all the Eastern fruit growing sections and my reasons for believing that the Pennsylvania growers if so directed by the spraying service may pursue a more aggressive program of spraying to reduce codling moth losses and that this possible increased spraying activity if carried out may require spray residue removal. I have tried to show the importance of early season spray applications and suggested the use of more effective stickers to be used in combination with arsenate of lead with these early season applications. I further state that with the epidemic of codling moth infestation it is my belief that one or more midsummer sprays may be applied at least in some areas of the Southern part of Pennsylvania and this will be done in a few cases with the knowledge that residue removal will be required. I have pointed out the main factors effecting the amounts of residue and have tried to assure you that even with the use of the most effective spray combinations, residue can be satisfactorily removed if done at harvest time and with materials and equipment now in general use.

Senator Pratt (Georgia): Will calcium arsenate adhere as well as lead arsenate?

Mr. Ingerson: I would rather pass this question on to someone else. Professor Worthley, the question is asked concerning the comparative adherence of calcium arsenate over arsenate of lead, so far as rain-removal is concerned.

Professor Worthley: We have made no analyses, but I would be inclined to suppose that it would be somewhat similar. Our best way of judging that would be the control figures in the final analysis. We do know that calcium arsenate will often defoliate apple trees; it is not safe to use on them.

John Runk: I have in mind scarcity of water. How much water does it take to remove this residue, and how much water does it require to operate this washer?

Mr. Ingerson: The water used in the washer is primarily used in the machines to rinse off the acid or the other materials that have been used to remove residues, and also to remove arsenic. The usual recommendation in that line—a safe recommendation—is two gallons of water for each bushel of apples washed. In some cases they have been safe with less than that, but two gallons of water per bushel of apples washed is a safe program to follow.

Professor Worthley: I should like to make a point concerning curculio. Probably most everybody realizes that insect conditions change from year to year in the same locality and that in different parts of the state, in the same year, insects will be different. Professor Hodgkiss will back me up in the

statement that the curculio situation is more injurious in some parts of the state than the codling situation is. And it's true the curculio spraying is largely an early seasonal problem. That is not to say that codling moth will not become serious in that section; it is not to say that some sections which are now quite bad with codling moth will not, in another five years, feel that they have it under control and not need to spray excessively for control. We have other pests coming in—there always will be. Take, for instance, the case bearer. We don't know what problem we may have to face within the next few years, because the case bearer is working north and is proving to be a tough customer wherever it is found in abundance.

I think we all realize that the amount of arsenic that is going to be necessary to apply to apples, on an average, is not going to be reduced in the next few years. And, under certain conditions of infestation, it is quite possible that there will be excessive arsenate which it will be necessary to remove. We have had the hope, here in Pennsylvania, that in general we could get away without washing because of the increased cost of washing. We feel, however, that the bug man should not be made the goat on the washing proposition, because in many cases it is not only arsenical residue that counts, but generally cleanliness of the fruit. As an investigator in insect control, I would be tickled to death to see the whole state covered with washing machines for this reason: It would mean that I could plan experimental work in insect control without worrying what shape the growers would be in, from the point of arsenical residues. As I mentioned yesterday, in one heavily infested orchard, codling moth population was high—in Adams County with four cover sprays following petal fall, all of our treatments showed excesses of arsenic that, under the law, would have to be removed before sale, with the exception of one plot where the spraying was confined to first brood and the application went on to the second of July. If washers were common, investigators wouldn't have to think of substitute materials for arsenate of lead that have not proved to be successful for supplementary measures for arsenate of lead. We could say—they have already said this at some stations—put on the arsenical sprays that are going to be necessary to control your particular pest, and, if that gives you excess residue, wash! So far we haven't been quite ready to say that in Pennsylvania, because it seems to us that the percentage of cases in which the spraying schedule has left dangerous residues has been too low to make a general recommendation of the adoption of washers a reasonable one. The problem is not going to be less in the coming years, however, than it is now.

Mr. Ingerson: I am glad Professor Worthley has given the feeling of the Pennsylvania Experiment Station and men. My purpose in explaining the situation in all the states around Pennsylvania was partly to point out how fortunate you have been up to this time in being able to avoid this thing. And I

know full well that you have been following your extension service, and that they have been striving to help you and advise the thing which was proper.

ROADSIDE MARKETING

C. J. TYSON, Gardners, Adams County

My experience with roadside marketing has not been very long, nor compared with that of other members, very extensive. It started in the fall of 1928 and never has run more than $200.00 per week. The best average was eight weeks in 1930 which totaled $1,200.00 and ten weeks in 1931 which totaled a little over $1,500.00. Needless to say it took three times as much produce to make the same average in 1931 as in 1930.

Getting into roadside marketing was accidental with me. I never thought I wanted to bother with it, especially over week-ends and at the end of the day when we feel that we have earned some rest. We are located on a fairly well traveled concrete road between Carlisle and Gettysburg, thirty miles from Harrisburg. Our orchard lies on both sides of the highway and does its own advertising so that we soon found ourselves bothered at all hours with people asking if we had apples for sale. It became a question of turning everyone down or concentrating our retail selling as to time and place.

In the fall of 1928 we set out some apples around the entrance to our lawn—no room for display—no safe parking space on either side of the road and a generally messy appearance. With cars parked on both sides of the road and only a single lane between it was a miracle that no bad accidents occurred. In that year we learned from experience some basic things which we had known more or less as theories and which those of you who have been selling at the roadside will recognize as fundamental.

Probably the first essential is plenty of room both for display of your produce and for parking of cars. You cannot make a lot of apples and miscellaneous produce look well in a crowded space nor can you create the impression of volume—a fundamental in good merchandising—if you have no room to display your wares.

Parking space for plenty of cars and trucks will always help. You can hardly have too much. Parking should, of course, leave the entire paved road-way clear for traffic. Parking on both sides of the road is very desirable and when this is not possible ample space for turning should be provided on one side. If possible, parking space should be provided on each side of the stand. Regular customers like to pull in and stop approaching the stand. Transients who are attracted by the stand itself, will often stop if there is room to park after passing the stand.

So much for the location. Now we feel that we have learned a few things about roadside marketing as it applies to our own

conditions, always subject to change, for after thirty years growing apples I am ready to admit that I know very little about it.

We do not like to sell on Sunday. We like our rest and anyhow we do not believe in it. Under our conditions our retail sales would not amount to much if we refused to sell on Sunday —too many of our regular customers work every day in stores, offices, etc.

We fill our fruit for display into one-half peck, peck, one-half bushel and bushel baskets. Our people buy the same apples better in baskets than in crates. We rarely give the basket with the purchase, filling everything into heavy paper bags. Most buyers prefer to carry bags rather than baskets in their cars. Occasionally packed-up bushels are sold in the baskets.

We mark each package on display with a plain price tag. We lose some customers who read the prices from their cars and drive on. Usually these are bargain hunters and would not become valued customers. We encourage all to get out of their cars and examine the fruit at close range. We are much more sure of making sales in this way than when we attempt to describe and price the goods through the car windows.

Our stand is located in the orchard. It is not pretentious. It looks like what it is—a farmer's outfit. We sell our own fruit primarily. If we are short any variety which is in demand we do not hesitate to buy it if we can and when asked do not hesitate to tell our customers. They seem to appreciate the service.

We have sold peaches, apples, quinces, pears, crab apples, and any surplus of flowers and vegetables which our garden produces. We have not grown vegetables especially for the stand. I doubt whether we have traffic to warrant it. I have not mentioned the by-products.

We sell sweet cider with fair success. We have no clarifying or sterilizing equipment. Our people do not like benzoated cider so we sell it while it is sweet and when it starts to turn we consign it to the vinegar barrel. I hope to be better equipped some day.

We make apple butter which our customers tell us is the best they ever ate and they come back repeatedly to buy it. This gives us an opportunity to sell more apples so we value the butter business for two reasons. We sell in quart and half gallon glass jars.

So far we have no permanent building adjacent to our stand. We have used tents for our surplus supplies. A roomy, correctly built, ventilated or refrigerated storage close to the roadside is a most important part of its equipment and we are living in hopes.

ROADSIDE MARKETING

F. G. REITER, Mars, Allegheny County

Roadside marketing presents its advantages and its problems and we have experienced both. If you are a small grower and

can be in direct contact with your customers, you can really get out of roadside marketing all the pleasure and profit there is in it. You may have the difficulty at times of not having sufficient quantities of certain products particularly in demand. If you are a large grower and have not had experience in roadside marketing, you will find there a project entirely different from wholesale selling. However, if you are in a location where you can develop roadside marketing, it should prove quite advantageous and profitable.

In selling wholesale to large stores, dealers, or produce yards, your fruit must be firm and not showing ripeness, while for roadside trade, fruit must be ripe; ready to eat from the hand or it is not in demand. You can often take soft peaches, ripe plums or apples that could not be sold wholesale and get much more than market value by direct selling. If your supply of this ripe fruit is large, make your price more attractive and you will wonder where all the customers came from.

I do not mean by ripe or soft fruit that you can sell fruit beginning to decay. If you consider quality important in the wholesale market you will find it much more important in direct selling. In roadside marketing you must set a high standard of quality and win the confidence of your customers by keeping up to that standard if you hope to develop a large trade.

The two principal complaints I hear in roadside marketing are lack of uniformity and quality in the products and price not in line with the market. The first one I feel is most important, We should be most particular about the quality of our products; have them as near uniform as possible. When the products are uniform and well packed we must display them to advantage in a building or surroundings that are neat and attractive. To get customers to stop, we should have things just a little different, just a little more attractive and after they have stopped you must be salesman enough to sell them.

Now as to price. I think the producer is entitled to all the price for his product the quality demands, but no more. If your price is high and your quality low your customers will not come back and your business will not flourish. You will always find a few customers holding out for price but the majority of people are willing to pay a good price for a good product and will come back if they get fair treatment.

The greatest problem we find in selling direct is to have a sufficient quantity of the product most in demand and not an over supply of the same product or other products at other times. Here the wholesale and roadside marketing go hand in hand, but the difficulty is that should you hold over too large an amount for retail trade and allow it to become too ripe, it cannot be sold on the wholesale market except at a sacrifice.

The principle of roadside marketing is ideal. To furnish direct to the customer, tree ripened fruit, fresh vegetables and other products in the best possible condition is really a step forward in marketing. However, we must always keep in mind

the viewpoint of the consumer and by working for his interest, protect our own. There has opened up in our district, several roadside markets where many of the products were purchased at the Pittsburgh wholesale terminal. While this is not fair competition, as whatever is done at roadside markets in the community reflects in a way on all in the business, yet we do not take this competition seriously. The old saying still holds good, "You can't fool all the people all of the time," and it is our job to win our customers with quality and service. Having had many years experience in roadside marketing, we believe it is a very practical and profitable outlet for our products.

SOME FRUIT GROWERS' PROBLEMS

H. M. ANDERSON, New Park, York County

Today almost everyone seems to be immersed in problems too hard for him to solve. I know of few sights that are more pathetic than that of a man with a dependent family who is out of funds and cannot find work; probably few situations are more heartrending.

Thousands of our fellow men are in that position and have been for some time. Beside their troubles ours seem slight, but the fruit grower has his problems, past, present and future.

Many of our worst problems of the past have been pretty definitely solved for us. For instance, yellows, borers, and brown rot in the peach orchard can be readily controlled if we follow instructions. My first commercial peach orchard was wiped out by yellows before it had paid its cost but last year less than one-quarter of one percent of my trees showed signs of infection.

Scab, codling moth and aphis in the apple orchard can be almost as effectively controlled if we everlastingly keep after them. In fact our production is pretty efficient; one of our biggest problems is now keeping production in line with consumption.

Many growers always have a "bigger acreage" problem; they seem to figure that if 20 or 30 acres will normally net $2,000.00 or $3,000.00, then 200 or 300 acres will net $20,000.00 or $30,000.00. I know of no more fallacious reasoning. In the first place very few of us are 200 or 300 acre men. Again, where large plantings are made it is usually necessary to plant upland and low land, and the grower finds himself saddled with acres of boarder trees; just as most dairymen find themselves with boarder cows.

All of the large peach orchards and some of the apple orchards with which I am familiar have considerable acreages that bear only when everybody has a crop, and the markets are glutted. Some very fine crops of fruit last year did not pay for marketing, let alone growing.

If all growers would cut out unprofitable orchards or parts of orchards, think how profitable the remaining acreage would become. Another solution of the glutted market problem would

be the keeping of second grade fruit at home, but I am too close a student of human nature to believe that we would ever agree to do that and do it.

Sometimes I think that if "varieties to plant" were discussed from a different viewpoint it would stop some unwise planting, and help the demand to catch up with the supply. For instance, Stayman somehow is especially subject to scab and it frequently loosens and falls before it is well colored or because it cracks so badly when dry spells are followed by rain and warm weather. There is a real problem that has, I fear, no satisfactory answer. I always lose some Stayman by cracking and some years I have lost thousands of bushels; many others have had similar losses, and if a satisfactory remedy can be drawn out here I am sure it will be a great benefit to many of us. I have heard recently that the use of a complete fertilizer instead of nitrate alone is very beneficial, and I mean to try it next spring.

The six weeks of warm weather preceeding Christmas created a real problem for those of us who had apples in common storage. The immediate solution was rapid marketing; the ultimate solution will probably be cold storage, but in the meantime I have bought a 24-inch fan and will probably buy another and drive them with electric motors at night and on frosty mornings. This equipment with careful control of ventilating outlets would have paid for itself last fall and left a nice profit.

Because of hot weather in peach harvest and over-production most peach orchards are now polluted with mummied peaches that are covered with millions of brown rot spores. Many of these peaches are still on the trees and there is going to be a real brown rot problem next spring if there ever was one. We are going to need more frequent and more thorough spray applications than for many years.

Another problem to be solved next spring by many of us is an infestation of red spider resulting from the past two dry summers. Red spider is epidemic only after dry seasons. In passing through the Yakima Valley last August I saw the worst and most extensive infestations of red spider that I ever hope to see, and they told me that it is always a menace there. I have never before found it necessary to use oil on peach trees to control it, but feel that I certainly must do so next spring.

And then the fruit grower has some important moral problems to face. I will mention that of Sunday sales at this time. I do not believe that the Lord ever intended us to work seven days in the week. History tells us that no nation that has ignored the Sabbath, or tried to eliminate it, has continued to prosper, and generally speaking, that is true of individuals as well. You are familiar with God's dealing with his chosen people; how he prospered them, and time after time in their pride and arrogance they forgot Him. To bring them back He visited adversity upon them and in their adversity they repented and were reinstated. Yes, prosperity and depression date back thousands of years—times must be hard occasionally to keep

humanity within bounds, and I suspect that we will continue to have adversity when we need it, and prosperity when we can stand it throughout the future. In the meantime I want to voice the conviction that if there are a lot less Sunday sales and other forms of Sabbath desecration, and more consideration for our fellow man, we will be more nearly ready for the prosperity to which we all look forward so hopefully and so confidently.

MY ORCHARD EXPERIENCE THIS YEAR

HARRISON S. NOLT, Columbia, Lancaster County

Any fruit grower who was able to make expenses, much less profit, is a real orchardist. One of the most important experiences we had this year was the old, old story of thinning. Our extension friends have been lecturing and preaching to us for years on how to thin fruit, but we are afraid yet we will thin too hard. I learned this year that Yellow Transparent should be thinned very early. Ordinarily we are taught to wait until the June drop to thin but as the fruit set was unusually heavy, it was necessary to thin much earlier, and the results were we had too many small apples and they could not develop size. In our county many were not even picked.

What did we learn about spraying? Any of us who failed to put on all the sprays were told we were the losers. Even a year such as this with low prices, a few bushels of fancy fruit which went to the cull pile, would help to pay that high spray material bill.

I had one row of Smokehouse which did not get the late summer spray and as a result we had quite a few which were not perfect. I know we lost a lot more first class fruit than that one spray would have cost. We know what the old standby materials, lime-sulphur, nicotine, and lead, will do; we growers can not afford to experiment with the newer materials which many clever salesmen are selling us. That is the job of State College.

I had some interesting experiences in pruning. We have a block of five year old apple trees making nice growth; many of them bore a lot of apples this past summer. When they were planted we tried to buy all large size one year trees, but with some of the varieties we had to take two year old trees instead. We tried the debudding method on the one-year trees leaving a few extra limb and during the first few years pruning them lightly, taking out only a few crossing limbs those causing the trees to be out of balance. This winter we are pruning them harder and shaping up the trees, selecting the best limbs and strongest crotches for the framework of our future trees. The two year trees which were headed in the nursery row did not make any more growth and are not as nicely shaped; the one year trees have now more fruit buds and are in better condition to bear heavy loads of fruit in the future while their yield this summer was heavier than we usually have on trees of that age.

Do we always know when is the best time to pick our fruit? We picked our Smokehouse four times this fall. Some of the first were put in cold storage and were a bit too green when picked. When they were taken out they scalded badly in a short time. The last picking hung too long, losing the real Smokehouse taste.

This season particularly the apples hung very well on our trees allowing them to ripen nicely. However, we allowed a second picking of Stayman to hang too long, resulting in a little water core; there was also a slight trace of it in our Delicious.

Then the next question came up. What shall we do with our fruit; shall we sell or store in cold storage, or at home? We did some of each. I had a few early apples ripening in the height of the peach season; as they were too small, they were given away. Up until this time our county consumed practically all the apples we grew, and we had a good local market. However, this year we found we had too many apples at home and had to look for markets in Philadelphia and elsewhere. This put us in competition with our neighboring states and the price was ruinous.

Just a few days ago, I head an experienced commission man say, "We have only two grades of apples this year—first and fourth. All the fruit that does not grade No. 1 will be placed in No. 4, and the price we get for anything but No. 1 fruit is anything but satisfactory."

Again, I know we were spoiled the past few seasons by having such a good export market. That market wanted a small apple, while our consuming public wants better apples. They have been educated to it by our western growers bringing in their fancy fruit.

I am sure if we had left half of our apples in the orchard this year, we would all be better off. We would not have the expense of harvesting which is a great deal more than pulling them off and leaving them drop.

We put too much of that before-mentioned fourth grade fruit on the market. What happens if a person buys fruit because it is cheap and the top of the package looks nice, and the fruit is not in its prime, some unripe and some overripe? That customer will become disgusted with apples and will turn to citrus fruits; then you and I must suffer, because we discouraged consumption.

Don't forget the honest pack. I have heard that discussed every year I have come to these meetings. A glimpse at the exhibit of commercial classes at the show building this year will tell you what I mean.

I learned considerable the past few days in the show room. The fruit on exhibition there is just as fine as any one could wish and less western fruit is offered for sale there than other years. Our people will eat Pennsylvania apples if we give them the quality.

Our experience with peaches was very similar to apples. Best size and quality will always sell even though we do not get much cash for it. But think of the fun one gets from selling nice clean fruit with no complaints from customers because of small, wormy or knotty peaches.

SOME ORCHARD OBSERVATIONS

GUY L. HAYMAN, Northbrook, Chester County

It is one thing to observe but we find it quite another thing to reduce those observations to intelligent writing. Your secretary told me to talk about anything, but to bear down on economics, or marketing, or some vital phases of our business. Presumably, these observations are to cover the crop year just passed. We shall try to cover the two phases of production and marketing.

We follow as closely as possible the college spray service, taking chances here and there, in making certain omissions. On the whole, however, I should say we are about 90 per cent regular. Our personal observations as to results obtained last summer may conflict somewhat with counts made by Messrs. Hodgkiss and Kirby, but I am probably looking at the job from another angle.

First, scab was more in evidence than anytime since 1925. It was far from serious but annoying just the same. Second, bitter rot, while not an economic factor, showed up more than ever before. Third, peaches showed entirely too much brown rot. Fourth, nicotine sprays seemed ineffective in controlling aphis and leaf hopper. Aphis were not very destructive, but the leaf hopper has us very much concerned. Fifth, a slight trace of scale now and then, with codling moth almost perfectly controlled and comparatively little curculio injury. Sixth, the brightest spot in the peach deal was the very slight damage from Oriental moth.

Observations during the past few weeks show more red mite than we care to see, probably due to omission of oil sprays last year. On December 6, while pruning Delicious, we found a water sprout with a few live leaves and a bunch of green aphis.

The wettest weather in two years caught us during the apple bloom, but Rome seemed to be the only variety seriously affected as to pollination. Under John Ruef's guidance, bouquets were placed in Stayman and Delicious. The set on both varieties while not heavy, was quite satisfactory. Weather conditions, considered, we were well pleased.

From a production standpoint, Stayman proved a great disappointment. Early russeting, growth cracks in perfectly clean apples, and dropping all summer, reduced the set from about 65% to 30%. Size and color were not up to par and splitting continued until harvest. Leaves were seriously injured by leaf hoppers, and in spite of a satisfactory twig growth and leaf

development, the late season found the leaves pale and lacking in vitality. Perfectly beautiful apples could not be packed because of cracked surfaces. It is suggested that this general unsatisfactory condition was a sort of drought hand-over,—I hope that is the correct diagnosis. As usual we were too stingy with our thinning, where real hard thinning should have been done.

The freeze of April 30 reduced our peach crop to almost 50% of normal and as things turned out, that proved to be a blessing. Following the practice of former years, we refrigerated our peaches picked at the week ends. The results were saddening and as we now feel, peaches will never again be stored. Our peaches have been marketed for years about as follows: One-third at home in a retail way; one-third wholesale more or less directly and the balance consigned to Philadelphia, Chester, or Wilmington. It has always been possible for us to fix and maintain our own retail prices but last summer we had nothing to say about it. Our philanthropic friends in Delaware caused us no end of trouble. Early in the season, truck peddlers with Delaware peaches had established a retail price of three baskets for $1.00, and later developments made even that price seem like robbing in the eyes of the buying public.

The retail trade which we have taken years to develop has been of little advantage to us this season, and in some respects has been a positive nuisance.

We entered the apple harvest expecting a poor market, and we have not been disappointed. It may be interesting to give our marketing experiences with our individual varieties. Wealthy was moved promptly and did fairly well. Smokehouse, usually a best seller, dragged along, with hot weather and disinterested buyers making the deal barely staisfactory. Jonathan went for export in mid-September, ten days too early for color. The price of $3.40 per barrel at our station made this probably the best deal of the season. The same buyer was willing to pay $3.10 for Grimes to be shipped September 10, but we preferred to mess around with our cold storage peaches and passed the deal by. That was the dumbest trick of the year. Delicious have moved well until two weeks ago. The market demand is now 100% Stayman and other varieties must be shipped in against the tide, whenever a break presents itself. Winter Banana, usually a fair seller, has been almost hopeless. Men who last year paid $2.00 for large Bananas, this year treated them as a joke. Almost half our Romes were carried in common storage at home. Usually we sell them from January to March with little difficulty. Our last load went out on January 8 and they were too ripe to be very attractive. The common storage has failed us this year and we are thankful our best fruit was not stored there.

Our Philadelphia market has indicated that it is done with common storage stock for this year. Two weeks ago, three inch Stayman from cold storage brought $1.50, while a comparable

pack from an excellent grower's common stock sold for 90 cents. These apples were sold at the same time by the same commission house. I am advised that on Monday the difference had stretched from $1.65 to 75 cents.

You may be interested to hear of a consignment of Summer Rambo, which a commission man received last week from the Cumberland Valley. I am told that they sold a day or two ago for 25 cents per bushel.

An innovation noted on the Philadelphia market this winter is the appearance of two boys with a Chevrolet truck hauling oranges in bulk from Florida, returning with apples. They make two round trips weekly, covering 5200 miles every seven days. We are informed that a similar service operates between Baltimore and some Florida point on a 35-hour basis. These are just some indications of the physical obliteration of distance.

My final observation is a hope that 1932 brings you all less worry and more profit than the year just passed.

OUR STATIONARY SPRAY PLANT

J. H. WEINBERGER
Zionsville, Lehigh County

At our 1928 meeting Dr. Fletcher gave us a paper on "Our Competitors in the Pacific North West" in which he concluded a brief history of their extensive and ever increasing use of stationary spray plants with this statement, "I am convinced that the stationary spray system will gradually supersede the portable outfit in the East as well as in the West." At that time three-fifths of the 2500 apple growers of the Wenatchee district were using stationary spray plants and out of 343 installations in 1927 only 18 were portable.

Since quite a few of us are still using the latter, a further discussion of the problem may be justified and of interest to some of you, notwithstanding the fact that this is the fifth consecutive year we have done so.

In reviewing these and other papers on the subject, I find our experience for the first year in close agrement with that of others. The plant our secretary asked me to describe is a combined stationary spray and irrigation system, intentionally designed for both purposes within the limits possible. Instead of designing for a minimum size of pipe consistent with reasonable friction losses, it was my object in designing this plant to determine upon the maximum size of pipe possible that would still afford sufficient velocity in the pipe to prevent settlement of spray material. In addition to this the pumps were duplicated, the power plant increased and a second pipe line laid from the plant to a point 2000 feet distant where it feeds into the spray system for distribution. The extra cost incurred in order to use the system for irrigation purposes was $1800.00. We find it convenient to use these pumps alternately in spraying and

there is a factor of insurance delay against due to pump trouble. Provision to drive the pump with a tractor has also been made, at slight extra cost, in order to guard against delay due to engine troubles.

The pump installed has sufficient capacity to provide for the spraying of 140 acres of fruit in a two or two and one-half day period. An irregular area of 80 acres was piped last spring, all of which is included in a rectangle approximately 1500 feet wide and 3500 feet long. The spray plant is located at a creek on one of the short sides of the rectangle. The tract is rolling with a general elevation of 125 to 200 feet above the creek level at the plant. The trees range from 17 to 32 years in age.

A two-inch main line, centrally located, extends from the plant through the tract for a distance of 2800 feet where it is divided into two one-and-a-quarter-inch branches both of which are later reduced to one inch and come to dead ends at the last laterals. At 200 foot intervals every fifth tree row, three-fourths inch laterals are run from the main line in both directions to the edges of the orchard. A shut-off valve has been placed on each lateral close to the main and several valves have been placed on the main line to limit the flow to certain areas. An outlet valve or hydrant with snap-ons for hose connections has been placed at alternate trees along the laterals. All pipes were laid to grade so as to drain to outlets. All of the laterals which were temporarily laid along tree rows on the surface.

The combined plant outfit consists of two 40 gallon "Friend" force pumps and a 100 gallon rotary tank filling pump mounted tandem on an eyebar frame with a 1000 gallon tank which is equally divided. Each pump is clutch connected to a drive shaft which also drives the agitator. The pump shaft is belt driven by a second-hand automobile engine.

This outfit is substantially housed in a one and a half story building, the upper story of which is constructed to carry a season's supply of lime sulphur if necessary. The building is located at a bank which makes it possible to roll the lime sulphur barrels into the attic over a short trestle. The operator while filling the tanks stands on a platform which is level with and an extension of the top of the tank. The lime sulphur is dumped into a trough in the floor above by rolling the barrel over it, from which it drains into a tank mounted several feet above the tank floor. From this it is tapped into vessels and measured for use. All the other material needed to make up the spray mixture is stored on the platform. When the full capacity of the pump is used up it requires a refill about every 12 minutes. This period varied from 15 to 22 minutes, depending upon the size of disks used and the general working conditions, with eight men spraying.

Method of Spraying.—We start spraying near the plant, one gun to a lateral and work away from it to the far end. Finally when the main contains enough spray material to complete the spraying, plain water is pumped into the main. This

avoids waste of spray material which may thus be limited to that held in the laterals to about two per cent of the total used. We spray with an approximate pressure of 400 pounds at the nozzle. This requires a pump pressure of 450 pounds when the sprayer is close to the plant, varying up to 550 pounds when farther away. Ten trees are sprayed from each hydrant with a 100 foot hose, using the long system. This system requires more hydrants than the square system but less dragging of hose and less hose length. By proper procedure the sprayers in our layout move only 50 feet of hose while spraying.

Kind of Pipe.—We used copper alloy pipe because of its probable long life. Our bids indicated only a slight advance for the copper alloy pipe over plain black pipe. Weathering tests on iron pipe and plates demonstrate that a small percentage of copper in iron tends to make it rust resistant and under any conditions extends its life.

Size and Length of Hose.—It is not economical to use a 3/8 inch hose. It consumes too much pressure. In the discussion on Mr. Farley's paper*, a member brought out the fact that in a test the pressure was reduced 50 pounds at the nozzle attached to a 200 foot hose when a 3/8 inch hose was substitted for a ½-inch hose. The tables indicate an even higher difference.

Another member in discussing the same paper asked the question, "What is the relative cost of putting in enough pipe lines so that one man spraying by himself carries only 100 feet of hose?" To anyone contemplating a stationary plant this question is most important. The papers of former years indicate hose lengths in use varying from 75 to 225 feet with one, two or three men to a single hose and gun. When cover crop growth rises with a rising thermometer a hose longer than 100 feet handled by one man is liable to slow him up due to fatigue.

We applied nine sprays this year with this plant; on the first, second, third, and fourth the average of all the sprayers for the job was 30 trees per hour. The cover crops were low and there was very little or no foliage. The trees have an average spread of about 30 feet and an average height of 20 feet. On the fifth (petal fall), sixth, and seventh sprays the same men averaged 24 trees per hour. Increased foliage and cover crop conditions slowed them up. On the eighth and ninth sprays with the foliage very heavy and the temperature high they averaged 21 trees to the hour. In the last two sprays three thirty-second-inch disks were used, on all other one-eighth.

If we had located our laterals 400 feet apart we could have saved $650.00 in the first cost of laterals and hydrants but in the nine sprays of the season we would have incurred an extra operating expense of $240.00 for labor to drag hose. This at six per cent represents an investment of $4000.00. In less than three years that saving in first cost would be dissipated in wasted labor.

*1929 Proceedings, Page 70.

Velocity, Friction and Pressure Losses.—It is generally considered good practice to design for a velocity of 2.5 feet a second. It is necessary to maintain this velocity at all times in actual practice. A continued low velocity of less than one and a half feet a second will settle heavy material such as arsenic while too high a velocity will cause undue pressure losses. It is of first importance to have a definite plan in mind, design for it and then chart it for a guide in operation.

Timeliness in Spraying.—Our technical advisors have impressed upon us the importance of shortening our accustomed period of spraying. In response some of us have sacrificed both quality and economy in our attempt to gain time, by using large disks or multiple brooms to pour on large quantities of material in a hasty, indifferent way. True economy is practiced by having sufficient equipment and employing enough labor to put on the least amount of spray material that will give you complete coverage in the desired time. We formerly used two 250 gallon tank portable sprayers, with 12 gallons per minute pumps driven by five horse power engines capable of maintaining 325 pound pressure on the pump gauge with two leads of hose operating. These sprayers were horse drawn by teams responding to verbal direction from one of the men spraying. With this equipment four men were able to spray the orchard now piped in a period ranging from 4.5 days (180 hours labor) for the early sprays to 6.5 days (260 hours labor) for the later sprays. The sprayers were refilled at tanks so located as not to require more than a one-fourth mile trip. Using the stationary spray plant with eight men spraying and one man operating the plant, the same orchard was sprayed in 10 hours (90 hours labor) for the early sprays, ranging to a period of 15 hours (135 hours labor) for the later sprays. Almost as much labor was required to lay and bury the pipes. The stationary plant consumed 40 per cent of the gasoline required by the portable spray outfits.

By this method of spraying each man is by himself on a lateral where he does not get the drift of another, nor does he skimp his work in order to catch up with a moving sprayer.

The additional pressure caused the spray to break into a finer mist for close work and it enabled the men to reach and hit what they aimed at in the tops. Occasionally we could not reach the tops of trees on windy days in other years, and found it necessary to return to finish a spray. That was not the case this year.

Cost of Plant.—The total cost of piping 80 acres, including a pump and engine to provide for 140 acres complete, excluding the building was $2,607.55. Pipes and fittings $19.00 per acre; laying and burying $4.37 per acre; engine, pump and accessories $5.25 per acre, making a total for the complete plant of $28.62 per acre not including the building.

Summary of Advantages.—Better protection against insects and diseases; better job of spraying; cheaper in operating although some material is wasted; saves cover crops from being destroyed; avoids bruising growing fruit; a reduced loss in depreciation of outfit; pleasanter spray conditions for those engaged at it.

CAREFUL HANDLING OF FRUIT IN PREPARATION FOR STORAGE OR MARKET

G. W. PECK, Cornell University, Ithaca, New York

I am going to present a few thoughts concerning the handling of apples which seem to me important if we here in the East are going to meet successfully increasing competition from apples from other sections, as well as from other fresh fruits and vegetables.

The careful handling of fruit throughout harvesting and packing operations and care in handling the barrel or box or basket after it is packed is equally as important as any one of the orchard practices which the most successful growers maintain in their orchard business. Certainly it is true that the most successful growers see to it that their fruit is carefully handled. None of you, I am sure, attempt to grow apples in a commercial way without giving particular care to the control of insect and fungous troubles. In the packing operations insect and fungous injured apples are graded out*. An apple with a few scab spots or one with curculio stings or with limb rub is fully as valuable as one showing bruises or stem punctures as the result of careless handling. At packing time these bruises and punctures may be hard to detect. Many of them occur in picking or in allowing the graded fruit to run into the barrel or basket. It takes some little time for these bruised spots to become discolored and give the apple a bad appearance, therefore the packer never sees them. The barrels are headed or the baskets covered and they go to storage or market, but when they are exposed for sale these bruises show up to disadvantage. Frequently decay will have set in where fruits were punctured or bruised. There is no other defect which will condemn a package in the eyes of a prospective buyer as quickly as the presence of fruit showing decay.

For a few years at our New York Horticultural Society meetings at Rochester and Poughkeepsie, barrels and bushels of packed apples have been taken at random from the packs of various growers, dealers, and associations, then placed on display. The packages are opened and each one graded by Federal inspectors. Some of you who have attended these meetings and have seen this exhibit will agree that the most serious defects,

*Even though fruit damaged in that way appears too often in the show. See the footnote under the Partial List of Fruit Prizes.

taking the exhibit as a whole, were bruises, stem punctures, press marks, and decay. A very high percentage of this damage, which seriously reduces the value of a package, could be eliminated with little or no additional cost to the owner if proper steps were taken to enforce careful handling of the fruit in every operation from the time it leaves the tree until the fruit is packed. In these exhibits at Rochester and Poughkeepsie I believe we can see a marked improvement in the past year or two in the matter of bruising. Each year more growers are coming to realize that careful handling and proper packing of their fruit are fully as essential as care in keeping defective apples from the package.

And your question is, how are you to get the average help to handle apples carefully? It is my belief that at the present time there is enough help available to come fairly close to doing as they are told; and by the way, the help are not always the ones to blame. There is many a grower who gives little consideration to the way his fruit is handled by his men or by the way he himself handles it.

It costs little, if any, more to handle an apple carefully in every step, from the time it leaves the tree until it is packed and placed in storage or on the car or truck than it does to handle it carelessly. And certainly fruit showing press marks, stem punctures, rim cuts and bruises will never sell for as much money as fruit of equal quality in other respects but with these defects not present. If any one doubts this statement all you have to do is to spend a little time at some market where produce is being sold from the car in small lots. Four years ago, I had an opportunity to watch this for a period of two months in Detroit. I was engaged at this time in inspection work with the Merchants' Dispatch, Incorporated. Each day from thirty to over a hundred cars of perishable fruits and vegetables were received. At that time quite a number of cars of apples in bushel baskets were coming in from Western New York and quite a good many from Michigan. From the very first day I was impressed with the fact that the buyers wanted quality, not only in apples but in every other line of produce. A very good car of apples carefully handled and packed and free from defects would frequently be sold out before we could get around to make an inspection of the load. Well, those were the cars that seldom a claim against them so it didn't make much difference whether we got a record of them or not. But the car showing bruises, stem punctures, press-marks or rim-cuts, scab, worms, decay or any other serious defect or a combination of them all, was always the one to sit around for three or four days or a week before all the load could be disposed of. It requires a lot more selling effort to dispose of such fruit and always prices on such a car would be below the market.

I expect that all of you have occasion to take your meals at various restaurants and hotels from time to time. Being on extension work in New York State I live on the road a good

share of the year. Isn't it a remarkable thing, how many of the restaurants and hotels take perfectly good food and spoil it in the process of getting it ready for the table? The same thing, exactly, applies to too many growers in the fruit business. Every effort is spent in pruning, fertilization and spraying in growing a crop with high quality and then through carelessness in the process of harvesting and preparing it for market this high quality is ruined. You will agree that the buyer and consumer are fully as able to find and appreciate high quality in a pack of apples as you or I are able to locate and appreciate a good meal. The buyer remembers the brand or the pack which stands for dependable quality, just as you or I don't forget the restaurant that served the good food.

Each crop of apples represents considerable of an investment not only in the orchard itself but in spraying equipment, orchard tools, spray materials, fertilizers, labor, packages, harvesting and packing equipment. As yet, however, comparatively few growers and handlers of apples in general have come to fully appreciate that this fruit must be carefully handled at every step from the time it leaves the tree until it is placed in storage or on the car truck if it is to present an attractive appearance on the market and successfully meet the increasing competition from other fruits and fresh vegetables. Careful handling is equally as important as careful grading out of other defects from the pack The grower who is eliminating both these troubles from his pack is the one whose crop is in demand. He has comparatively little competition. Such a grower has little to worry about so far as the future of the fruit industry is concerned. A year ago I had a number of our New York State growers tell me it was one of the best years they had ever had. Less than two months ago a man in the Hudson Valley told me that this was going to be his best year. In every instance these were our very best growers. They grow their crop well, harvest and handle them carefully, and put up an absolutely dependable pack.

The trade is quick to recognize dependable quality in a pack of fruit and a grower has nothing to lose while such a reputation is being made. I venture to say there are growers in this audience whose fruit going on consignment to the New York or other large market is frequently sold before it reaches destination, for 50 cents to a dollar or more per barrel, above the market. I know a number of instances where this has been the case with some of our New York growers. Certainly this reputation for a fine pack is a valuable asset. There is no good reason why a lot more growers might not enjoy this reputation and incidentally very materially increase the profits from their orchards.

I appreciate that careful handling is only one of the things that goes to make up a fine package of apples. Good color and size and freedom from blemishes all enter into it.

I would like to give you the results of some work which I did with McIntosh in 1927 and in 1928. Each year I harvested, for this purpose, around twenty-five bushels of fruit. Each year

all the fruit used in this work was harvested from the same tree. With one lot of McIntosh each apple was allowed to drop into the picking basket from six to ten inches. With another lot, each apple was dropped from twelve to fifteen inches, while with others they were very carefully handled and except for an occasional apple they were not allowed to drop or bruise in the operations of picking or packing. In the operation of grading the carelessly picked apples were emptied and packed without any particular care to prevent bruising. They were handled about as the average grower handles them. The carefully picked apples were carefully handled in every operation. One lot was run over a Rex sizing machine. The apples were graded and packed and placed in cold storage the same day they were harvested, and each year the middle of January they were taken out of storage and sent to the Horticultural Society meetings at Rochester where they were on display. The following table gives the average of the two years results in the different methods of handling. And, by the way, it is not patched up to prove my contention that apples should be carefully handled. The percentages give exactly the condition in which we found the fruit.

INFLUENCE OF CARE IN HANDLING McINTOSH APPLES
Harvested—Graded—Packed—Stored on Same Day
Withdrawn Middle of January

Method of Sizing	Method of Handling	each Apple Dropped inches	% of Fruits Showing		Degree
			Blue mold	Bruises	
machine	careless	12—15	35	27	Serious
machine	careless	6—10	28	17	Serious
machine	careful	—00	00	10	Slight
by hand	careful	—00	00	3	negligible

On both years when these experiments with McIntosh were conducted, there was at least a **dollar a bushel** difference January 15 in the market value of these carefully and carelessly handled apples.

This topic of "Careful Handling" would not be properly covered without having something to say with reference to press marks in barreled apples and rim cuts in baskets.

A very high percentage of the serious bruising and crushing of fruit at the tail end of the packed barrel could be avoided. A high percentage of the packed barrels of apples show unnecessary damaging press marks in varying degrees. It seems to be the common belief that if a barrel is filled to an inch or an inch and a half beyond the staves and the head pressed in a tight pack in insured. As a matter of fact, such barrels are almost sure to be slack—and show decay—after the fruit has remained in storage for a considerable time. If, in filling the barrel with fruit, it has been properly racked down three or

all the fruit used in this work was harvested from the same tree. With one lot of McIntosh each apple was allowed to drop into the picking basket from six to ten inches. With another lot, each apple was dropped from twelve to fifteen inches, while with others they were very carefully handled and except for an occasional apple they were not allowed to drop or bruise in the operations of picking or packing. In the operation of grading the carelessly picked apples were emptied and packed without any particular care to prevent bruising. They were handled about as the average grower handles them. The carefully picked apples were carefully handled in every operation. One lot was run over a Rex sizing machine. The apples were graded and packed and placed in cold storage the same day they were harvested, and each year the middle of January they were taken out of storage and sent to the Horticultural Society meetings at Rochester where they were on display. The following table gives the average of the two years results in the different methods of handling. And, by the way, it is not patched up to prove my contention that apples should be carefully handled. The percentages give exactly the condition in which we found the fruit.

INFLUENCE OF CARE IN HANDLING McINTOSH APPLES
Harvested—Graded—Packed—Stored on Same Day
Withdrawn Middle of January

Method of Sizing	Method of Handling	each Apple Dropped inches	% of Fruits Showing		Degree
			Blue mold	Bruises	
machine	careless	12—15	35	27	Serious
machine	careless	6—10	28	17	Serious
machine	careful	—00	00	10	Slight
by hand	careful	—00	00	3	negligible

On both years when these experiments with McIntosh were conducted, there was at least a **dollar a bushel** difference January 15 in the market value of these carefully and carelessly handled apples.

This topic of "Careful Handling" would not be properly covered without having something to say with reference to press marks in barreled apples and rim cuts in baskets.

A very high percentage of the serious bruising and crushing of fruit at the tail end of the packed barrel could be avoided. A high percentage of the packed barrels of apples show unnecessary damaging press marks in varying degrees. It seems to be the common belief that if a barrel is filled to an inch or an inch and a half beyond the staves and the head pressed in a tight pack in insured. As a matter of fact, such barrels are almost sure to be slack—and show decay—after the fruit has remained in storage for a considerable time. If, in filling the barrel with fruit, it has been properly racked down three or

four times, and has been properly tailed so that each fruit on the end takes a part of the pressure as the head is forced in, there is no reason why the apples should stand more than a quarter of an inch beyond the ends of the staves. Very little bruising will result of this is done, and the fruit will hold better and longer in storage, and fewer slack barrels will result. Much of the shrinkage in barreled apples going out of storage could be eliminated if they were properly packed when they went in, and promptly stored after picking.

It is not uncommon to find from a peck to even as much as a quarter of the contents of a barrel so badly bruised and crushed that this part of the package is practically worthless, due wholly to the fact that too much fruit was forced into the tail in heading. It should not be necessary to mention that the corrugated side of paper caps should be placed away from the fruit. In some packs a lot of them get in the barrels wrong side up, giving the fruit a washboard effect which detracts from its appearance. Any such condition is likely to impress a buyer that he may expect the same carelessness to prevail in the pack.

Rim cuts in baskets are largely taken care of by the use of oversize caps. If the baskets are filled too high, and the outside ring stands too high, rim cuts are likely to happen in the operation of putting on the covers or handling the basket in loading and unloading. Fastening the cover at four points not only helps very materially in preventing rim cuts but it holds the face intact. Baskets should be carefully racked down and should not be over full. If baskets are so full that the face takes all the pressure of the covers and the weight of packages above those in the lower layers of a loaded truck or car or in storage are likely to show more or less bruising and crushing. This is particularly true with tender varieties and fruit somewhat overripe. I would not want you to gain the impression that I am advocating less than a bushel of fruit in a bushel basket. A slack package will likely show every apple in the bushel or barrel with more or less serious bruising if it is shipped for any great distance and handled two or three times before it is opened. If the barrel and the basket are properly racked the contents will be held in place without over-filling and comparatively little bruising or press marks will result. Over-filling of a package certainly will not take the place of racking in the process of filling. Racking is an important operation, and one too frequently neglected or forgotten, or an operation considered not necessary. The package looks alright before the head is pressed in or the cover put on, but when it comes out of cold storage or is opened up on the market after having been handled a number of times is where neglect of this operation in packing shows to disadvantage.

There are just two or three other points in connection with the handling of apples which have a very distinct bearing on their keeping quality and market value. These do not have to do with particular care in handling, however, but are closely associated with it.

Good size and good color are important qualities which have a marked influence on salability and price. Some growers experience difficulty in attaining these trade demands and particularly in the matter of color. Where everything in the line of good cultural practices is properly carried out, and where color and size are not of the best, it would seem that, in some orchards at least, growers might well delay harvesting operations for a few days. Experiments with Baldwin and Delicious have shown that prior to full maturity these varieties increase in size at the rate of about a cubic centimeter a day. At this time, too, fruit takes on color rapidly and particularly so if weather conditions are favorable with cool nights and bright clear days. Except with a few varieties such as McIntosh and also except for severe wind storms the loss in the few apples which drop is more than made up in increased size in those remaining on the trees. Usually a high percentage of the drop apples at this time have ripened somewhat early due to some defect. I appreciate that in this connection a grower with an orchard in an exposed position may suffer serious loss from winds. In fact the loss from wind is occasionally severe in orchards with the most sheltered location. With McIntosh and to a lesser degree with some other varieties the loss from dropping may be severe with little or no wind. In general, however, the tendency with many growers seems to be to start harvesting operations before best size and color have been attained.

With varieties which tend to scald badly in storage it seems quite essential to allow them to attain full maturity and good color before harvesting in order to reduce this possible injury.

The stage of maturity on its keeping quality either in cold or common storage. Immature and overmature fruit will scald much more and show more decay in storage or when held for a few days after being withdrawn than will fruit harvested at a hard-ripe, properly matured stage. The following table gives the results of experiments with Rome Beauty carefully conducted by U. S. D. A. These percentages are the average of four years work. Similar results have been obtained by Carrick at Cornell with this and other varieties. For varieties which tend to scald badly in storage the use of shredded oil paper will be found of practical value in reducing this injury. Experiments indicate that about two pounds per barrel, distributed throughout the package is the proper amount to use. Shredded oil paper **will not** correct the results likely to follow from failure to store promptly, or from harvesting the fruit in an immature or overmature state, or from carelessness in any of the handling operations.

For long keeping apples should be placed in cold storage just as soon after they are harvested as possible. Lowering the temperature quickly not only very greatly increased the life of the fruit but holds in check such diseases as apple scab, Jonathan spot, Baldwin spot, blue mold and internal breakdown. Fruit

KEEPING QUALITY OF APPLES AS AFFECTED BY MATURITY

Date withdrawn	Condition at Harvest	Bad Scald Day withdrawn	Bad Scald 10 Days Later	Decay Day withdrawn	Decay in Ten Days
		Rome Beauty			
Jan. 10	Mature	0.0%	1.7%	0.0%	0.1%
Jan. 10	Immature	0.0%	49.9%	0.1%	0.6%
Feb. 17	Mature	0.0%	5.4%	0.0%	0.2%
Feb. 17	Immature	20.5%	70.5%	0.0%	0.0%
April 1	Mature	1.0%	10.4%	0.0%	1.6%
April 1	Immature	48.9%	81.5%	0.2%	9.8%
May 7	Mature	3.5%	17.8%	0.1%	2.7%
May 7	Immature	58.9%	81.6%	0.4%	18.0%

held in the orchard or packing shed at comparatively high temperatures for a few days after picking will not hold nearly as long in storage or present the bright appearance when taken out, as when stored promptly.

A very high percentage of the decay, blue mold fungus, which shows on apples coming out of storage is the result of stem punctures and bruises. Seldom will this fungus enter an uninjured apple.

In conclusion I would like to suggest that as an inexpensive means to make the apple business somewhat more profitable we give greater care in the various operations of handling.

SOME MOISTURE PROBLEMS IN THE ORCHARD

R. D. ANTHONY
State College, Centre County

Within recent years the results of studies conducted in a number of states have compelled us to revise some of our ideas about soil moisture relations. The abnormally dry conditions during the last three years have made it especially desirable that we become familiar with these newer ideas and their influence upon orchard practice.

The fact that some of our eastern fruit growers have attempted to irrigate some of their trees also seems to justify our considering the general problem of moisture relations at this time. We might add, in passing, that several of these temporarily irrigation outfits hastily rigged up when the drought of 1930 became so severe proved very profitable investments.

I think that most of us have been taught that a dust mulch was necessary to break capillary action and thus conserve soil moisture. Now, soil scientists tell us that the movement of soil moisture by capillary action is so slow that the effect of cultivation in stopping the capillary rise practically is negligible except when the soil is close to the water table, a condition which is seldom found in our Pennsylvania orchards.

To understand this principle and its effect upon orchard practices let us see what happens following a summer rain during which an inch has fallen. The upper part of the soil has become saturated. This excess rapidly drains downward due to the action of gravity but, if the soil was very dry before the rain, this downward movement stops at about 4 to 8 inches, depending on the condition of the surface of the soil at that time. When this gravity movement has ceased, the amount of water remaining in the soil is called its "field capacity", a term with which we shall need to become familiar. If the soil is somewhat damp when the rain begins, the downward movement of water by gravity may extend for several feet. Its lower extent marks the lower limit of the area that is holding moisture at its field capacity; a rain does not partially wet a soil. If the entire column of soil is at field capacity before the rain, all the water taken in by the soil moves downward until it reaches the water table.

As soon as the rain ceases, two other forces begin to remove water from the soil. Evaporation takes place from the surface and in a week may remove a considerable part of the moisture in the upper 4 or 5 inches. After that time surface evaporation is very much slower and is negligible below 6 or 8 inches.

Below the surface 8 inches the chief force which decreases the soil moisture below the field capacity is the action of plant roots. Again, at this point, we have had to remodel our ideas. We used to think that capillary action could bring sufficient moisture to the plant to supply its needs; now we have to think of the plant roots as growing out into new soil to get additional water when the moisture in the original root area is used up.

With this the case, we can see how important it is that a tree should have the ability to make a rapid root growth and also have available unoccupied soil holding a maximum supply of water into which its roots may extend.

A small amount of the water which the tree takes up from the soil is retained by the tree and used in growing new wood or fruit but most of it is lost through the leaves by transpiration. A tree transpires from 300 to 500 pounds of water for every pound of dry weight which it produces. The rate of loss by transpiration is influenced chiefly by the dryness of the air, the temperature, and the ability of the plant roots to secure water. Thus fruit trees growing in the dry air and high summer temperatures of southern California require much more water than in New York or Pennsylvania.

Different soils are able to hold different amounts of water at field capacity. In the spring at State College, after we have had favorable conditions of rain and snow fall, the Hagerstown silt loam in the Experiment Orchard will hold water equal to about 30 per cent of the dry weight of the soil.

Fruit trees can make little use of water in excess of the field capacity; in fact, their roots may be injured if the gravity water drives out the soil oxygen for too long a period. Not all of the

water that is in a soil at its field capacity can be used by the tree. As the moisture percent decreases, the soil resists further loss with greater and greater force until the tree roots are no longer able to overcome this force. If the roots then can not grow into new soil, the tree wilts; so the percentage of water present at this time is called the wilting coefficient of the soil. In the college orchard this runs between 8 and 10 per cent. This then leaves water available for plant growth at the field capacity equivalent to over 20 per cent of the dry weight of our soil. A soil moisture of 20 per cent is equivalent to about 3 inches of water per foot or over 80,000 gallons per acre one foot deep.

If we had a sandy soil which is less retentive of moisture, we would have a much lower field capacity and probably around 10 per cent available instead of 20 per cent. This may not mean only half as much moisture in a sandy soil. It is not the amount of rain which falls on the surface which is significant. With some of our heavier clays where the physical condition has become poor, the run-off may be so heavy that only a long continued rain penetrates deeply. With the lighter soils penetration is much more rapid, and consequently a much larger proportion of the rain becomes available to the plant roots. Cultivation which breaks up a surface crust usually increases the penetration.

It has been our experience at State College that if our soil moisture is about at field capacity when growth starts in the spring, apple trees have been able to make nearly a normal growth even through three months of practically no effective rainfall, **provided** the limestone rock has been far enough down to give the tree roots a volume of soil which could act as a reservoir. Closely planted trees, as where fillers are used, would have less water available to them.

A very large part of the root system of an apple tree may be in the upper two feet of soil, though some roots may go down 20 feet or more in a deep soil. During a serious drought the soil moisture in the upper area may be exhausted because of the presence of such a large amount of roots. These lower roots may then secure enough water to keep the tree alive but not enough to prevent wilting.

At times when the entire root area is in soil well supplied with moisture we may have temporary wilting. During hot weather when the air is very dry, leaf transpiration may be more rapid than is the water intake by the roots. At such times the leaves are able to draw water from nearby fruits. During the night or following a rain, when the rate of transpiration is lowered, these wilted fruits again become firm. It was probably these changes which caused so much fruit splitting with Stayman and drought spot in Baldwin these last two years.

We some times have drought conditions in the orchard when the Weather Bureau records of total rainfall would not indicate such to be the case. When the available moisture in the surface foot of soil at the college has been used up, it will take nearly three inches of rain to penetrate one foot. Under such a con-

dition a half inch of rain does not penetrate below the zone of surface evaporation and practically is all lost as far as tree roots are concerned. Any time when a considerable proportion of the rain during the growing season comes as light showers, the effective rainfall in the orchard is much below the total rainfall.

This throws some light on the problem we face when we start to irrigate an eastern apple orchard. An application of 1000 gallons per tree in an orchard planted 40 x 40 is equivalent only to one inch of rain. If the soil is so dry as to need irrigation 3000 gallons per tree would be nearer the right amount to use to maintain proper growth. The use of 50 gallons per tree may help a little in keeping a tree alive especially if the water is concentrated in a limited area but it should not be thought of as an irrigation.

Many of our cultural practices modify the soil moisture relations. It takes as much water to grow a heavy cover crop as to carry mature trees through the summer. Fortunately in the east we usually have abundant moisture for both. If, on June 1, we could foretell with certainty the advent of a serious drought, we would not seed a cover crop in the cultivated orchard. If we do seed the cover and the drought comes, our loss of soil water through the cover may not be important. A drought to be serious must begin by early July while the cover is still small. If the ground is in fine condition with the moisture close to field capacity, it can maintain both tree and cover; if the moisture and nutrition conditions are less favorable, the cover will be killed before its roots have penetrated deeply enough to have competed seriously with the apple roots.

In the sod orchard, conditions are somewhat different. Here we have a crop making a heavy demand on soil moisture early in the season, a demand which drops way down when the grass is cut and left as a mulch. If our droughts came in May and June when the sod growth is vigorous, sod might seriously deplete the soil moisture. Our experience has been that droughts during mid summer do not cause a greater water loss in sod plots than in cultivated plots growing a cover crop. This has been true both with blue grass and alfalfa.

If we must cease to consider cultivation as of value in breaking the capillary movement of water to the surface, has cutivation any other value in conserving soil moisture? We have seen how, under modern soil theories, the chief factor which removes available moisture from the lower soil is the action of plant roots. Cultivation is still of value in conserving moisture but it does so by destroying the weeds which otherwise would be using considerable quantities of water. That cultivation does not differ materially in its results from scraping which cuts the weeds without disturbing the soil has been verified recently at State College by Professor F. G. Merkle of the agronomy department

Many of you know that our horticultural department is recommending the use of short sod rotations as a desirable orchard practice. The ability of apple trees to grow normally

and fruit heavily under this sytem of management during the last two years in which the total rainfall deficiency has been over 19 inches, has been one of the factors leading us to this recommendation. We think two conditions are responsible for the ability of these trees to withstand dry weather. Turning heavy sods into the soil is proving the fruit grower's best methods of building up the organic content of orchard soils. Increasing the organic content of the soil increases the amount of water which the soil can hold at field capacity and so increase the amount available for plant growth. The presence of sods or sod residues decreases the run-off with heavy rains; consequently there is a much deeper penetration of gravity water and a greater volume of the soil has its moisture built up to field capacity—our reservoir is larger. The channels left by the decay of grass roots aid in this downward movement.

The experiences of the last few years hold two lessons for us, first, the prime importance of selecting a site which has a deep and retentive soil; and second, the necessity of maintaining that soil in such a condition that profitable tree production can be continued through the most serious droughts which we may expect under Pennsylvania conditions.

MR. MILLER: Did you say what causes the apple to split?

DR. ANTHONY: When it gets dry you sometimes get conditions where you see corn leaves rolling at noon. The next morning the leaves are all right, but there will be the same rolling the following noon; this is temporary wilting. There is a loss through the leaves too heavy and too rapid for the roots to bring water up fast enough. Under similar conditions in the apple trees, the leaves steal the water from the fruit. When night comes and transpiration slows down, then the fruit gets water back again—spongy at noon, firm at night. It is these conditions of rapid change of moisture in your fruit, that are probably the cause leading to so much splitting.

MR. MILLER: The fruit in some orchards will split and some wont. I often wondered why that was.

DR. ANTHONY: I think we can say, with quite a good deal of certainty that it is simply too irregular a moisture supply.

QUESTION: How would you handle alfalfa?

DR. ANTHONY: We have been running soil determinations in all of our plots for four or five years. It has been our experience that usually there is more moisture in our alfalfa plot than in any of our regularly cultivated plots that are growing a cover crop. With us, we cut alfalfa about in the blossom, and this cutting usually precedes the initiation of a drought with us by a week or two. It is very seldom, as I said before, that we have seriously dry weather during the early growing season—early May and June. So that we grow our first crop of alfalfa and get it cut before we have seriously dry weather. Under these conditions we have had no trouble at all with alfalfa using up moisture.

I might say that four or five years ago Lehigh County had a very dry spell; I think it was fully as dry as in 1930. Mr. Fenstermacher told me at that time their areas in alfalfa were in better condition than equal areas under cultivation, which, I think, did not have a cover crop. So I believe we can say, under Pennsylvania conditions, that it will be a very exceptional year when we have trouble from lack of moisture in the alfalfa block. If it does look as though it were too dry, I would advance the cutting of alfalfa.

QUESTION: Is alfalfa better than blue grass?

DR. ANTHONY: Well, I think we could answer that by saying that as many of our growers as think they can grow alfalfa successfully are trying it. Alfalfa gives you a nitrogen supply which you do not get from blue grass. Nitrogen is pretty cheap in the fertilizer bag now, so I would not go to too much trouble to grow alfalfa. But if I could grow the alfalfa as easily as the blue grass, I should use alfalfa.

QUESTION: How about sweet clover?

DR. ANTHONY: I think we should consider it more as a cover crop than as a sod. Ask Professor Fagan that question when he talks on cover crops.

While some of our growers are trying to use sweet clover more as a permanent cover, I am inclined to believe, for the time being at least, we had better consider it as an addition to our cover crops.

MR. MOORE: Will early cultivation encourage a deep rooted tree?

DR. ANTHONY: I am not so sure about that; I wish I did know. My own personal feeling is this: If you want deep roots, get a deep soil; your roots will go down if you have proper soil conditions. Those treatments, which in the first year or two lead to shallow rooting, such as mulching, are not desirable in the young orchard. After the first year or two I don't believe we need to worry much. Once your roots get started, if you have such a depth and richness of soil that your nitrogen conditions and your air conditions are right fairly deep, then you will have deep roots.

QUESTION: Professor, did you use any subsoiling in any of your experiments?

DR. ANTHONY: Not yet.

MEMBER: I tried that on a hillside orchard, and it seemed to me that, in the light rains, especially, and in the light snows, as they melted, there was much less run-off.

DR. ANTHONY: At the West Virginia Station's new research farm at Kearneysville not far from Martinsburg, they are using a deep sub-soiling to precede the planting of certain blocks of their trees. I think it will pay us to watch their experience.

Two years ago north central Ohio was harder hit by the drought than we were and most of the orchards in this section showed signs of suffering from lack of water. I was in one

orchard where a deep tillage tool, penetrating from 22 to 24 inches, had been run two or three times between young trees. When we studied the penetration of moderate rains in this soil, we found damp soil for about three inches from the surface, except where the subsoiler had run. Here moisture had penetrated to the bottom of the furrow and along the sides where the tight soil had been broken by the plow. This soil had a heavy hard-pan to a depth of 18 inches to two feet. Ripping through this hardpan was permitting deeper penetration of moisture and was probably a benefit in this orchard. The tool was not run close enough to the trees to cut many roots.

EXCERPTS FROM THE ANNUAL ADDRESS OF G. S. L. CARPENTER, PRESIDENT, MARYLAND STATE HORTICULTURAL SOCIETY, AT THEIR THIRTY-FOURTH ANNUAL MEETING

At the present time, our apple industry is meeting with the most difficult marketing conditions ever experienced. The industry was never in its entire history confronted with so many tariffs, embargoes, total or partial, or restrictions, as it is today; and they are steadily increasing instead of diminishing.*

Exports to England, Scotland, Wales, Irish Free State, Belgium, France, Holland, Denmark, Roumania, Poland and Germany must be free from spray residue and apple maggot. Vigilant policing on our part is required to avoid further action.

England, Scotland, Wales and the Irish Free State allow only fruit of No. 1 quality or better to be shipped between July 1st and November 15th each year.

The Argentine established by a Decree such drastic import sanitary restrictions that the movement of fruit from our section was seriously curtailed.

Poland, Roumania, Peru and Japan have a total embargo against us, and the Agrarians and Hitlerites in Germany head a strong movement to embargo us completely there.

Heavy duties and tariffs have been recently set up against us in many countries.

The Belgian duty on apples in baskets was raised on December 10th from 5 to 25 francs per 100 kilos. A kilo equals 2.2 pounds.

France has a duty of 7½ francs per 100 kilos, but a bill is now pending to quadruple this.

Holland has a duty of 8 per cent based on valuation. However, Holland advises, because of our tariff and bulb quarantines, we can expect a duty raise.

Sweden has a duty against us of $1.98 per barrel.

Norway, from August to January, has a duty of $4.94 per 100 pounds plus surtax of $2.47 per pounds; balance of year $2.47 plus $1.23 surtax.

Denmark has a duty of 60 cents per barrel.

*SECRETARY'S NOTE—This is only too true.

Finland has a prohibitive duty of $10.00 per barrel.

Poland has a duty of $1.52 per barrel.

Canada has a sliding scale tariff based on valuation fixed by Order in Council amounting to approximately 30 cents per bushel and 90 cents per barrel.

The Argentine, a duty raised from 7 to 32 per cent.

Most serious of all to us would be a tariff against apples from the United States, which is contemplated by the British Government in which preferential treatment for the British commonwealth of nations is provided. [Now 10% -- Begun March 1.]

I believe that these tariffs, embargoes and restrictions which have been placed against our apples, are a direct result of the tariffs, embargoes and quarantines used by our Government to protect certain of our industries. Yet, we cannot blame any of these Governments, who have used our procedure as a basis for their own. Certainly it is retaliation, but can we blame the Argentine, when her grapes, cattle, turkeys and corn by embargoes or quarantines are totally or partially restricted in their movement to our country for issuing similar decrees against us?

Added to these trade barriers, we have a decreased buying power abroad and a depreciated exchange. Many countries have gone off the gold standard. On January 2nd, the pound was worth $3.40 instead of $4.86. In Denmark, Norway and Sweden, the value of the kroner averaged 18.7 cents instead of 26.8 cents and in the Argentine, the peso is worth 23.75 cents instead of 42.44 cents.

Our apple industry has been developed to supply the World's markets and is seriously in need of all outlets. 1926 was a disastrous year, yet we exported more than 7,000,000 barrels of apples. This year to December 19th, we have exported only 1,573,904 barrels, 735,704 less than 1930, a year of low production.

Of course, it follows that the fruit which we cannot export will be offered on our domestic markets for sale, though much of it is not suited for this trade. At the present time, wholesale prices on apples, according to Government reports, are the lowest that they have been since the records were first kept in 1910.

For many years, we have been improving our laws for the standardizing of our pack of apples. This year, our movement of graded fruit has been curtailed by the heavy volume of Unclassified fruit distributed in bulk and in packages by trucks and rail to all areas. We face the loss of much of the benefit derived from our standardization unless this movement out of our state of inferior fruit is curtailed or regulated.

In the past, our industry has worked along lines of improvement most necessary for a particular section. I believe the time has come when we should act not as individuals, states or sections, but as an industry, and that all sections growing apples in our country should work together in solving and progressing their common interests.

I feel that the horticultural societies of Virginia, West Virginia, Pennsylvania and Maryland should work as one in the handling of problems and situations which affect this area.

Our industry does not dare depend on the hope for better times as a solution for their problems. The situation is so serious that concerted efforts must be made, if our industry is to prosper. I believe we can do much.

READ THIS IF YOU HAVE MARKETED OR HOPE TO MARKET APPLES IN NEW YORK STATE

STATE OF NEW YORK
DEPARTMENTS OF AGRICULTURE AND MARKETS
ALBANY

January 18, 1932

Mr. George A. Stuart, *Director*
Bureau of Markets
Harrisburg, Pennsylvania

Dear Sir:

On January 12th our apple inspectors located in New York City report the inspection of several closed packages of apples which were branded "Utility, 2¼ up, York Imperial, United States of America, Joe Zilch, Ciderville, Pa." Our inspectors called our attention to the fact that *this shipment of apples was overfaced in that the specimens of apples on the face end of these packages were of a larger size than the remainder of the apples throughout the basket*[1]. They state that they were faced with apples 2½" in diameter or larger.

On this same date, and at the same pier, our inspectors report the inspection of another lot of apples which were marked, "Delicious, Summit Farm, 2½ in. Min., James Dandy, Appletown, Pa." Our inspectors note that *the packer neglected to stencil the grade on these packages* and on January 15th our inspectors report the inspection of another lot of apples at Pier 29 which were marked "Ben Davis, 2¼" and up, William Hill, Harbor St., Seaport, Pa.

Our inspectors note that the packer neglected to stencil the grades on any of these baskets[2]. While our inspectors did not examine these shipments of apples to ascertain the grade, they did open several packages to ascertain if the face represented an average of the contents. Our statute relative to packing and grading of apples, requires that all lots of apples exposed for sale in either open or closed packages must not be overfaced. The apples on the face end must represent an average of the apples throughout the packages. This law applies to apples grown and shipped in this State.

As I have the reports relative to these apples on my desk, I thought you might be interested in the information and I am very glad to call it to your attention.

Very truly yours,

P. M. Eastman,
Assistant Director.

[1]You may overface 15% in Pennsylvania but **not** in New York.

[2]In New York, the U. S. Grade must go on the package.

Secretary's Note: Ficticious names and addresses, of course, but you'd be surprised!

MODERN DEVELOPMENTS IN SPRAYING PRACTICE

H. G. INGERSON, John Bean Mfg. Co., Lansing, Mich.

Since my last attendance at your meeting in January, 1929, many developments of great importance to the country at large and to our fruit industry, have taken place. In considering the material for this discussion, I have referred back to the reports of your Pennsylvania meetings held during the past three years, and find very little discussion of the mechanics of spraying. In view of the unusual destructiveness of codling moth the past two seasons, I believe a discussion on spraying methods is timely.

I need not go into detail as to the importance of spraying. It is generally conceded that spraying is one of the most important orchard operations, but I doubt if many of us have given thought or careful consideration to just how expensive an operation spraying is. I have been keeping reports of spraying costs from different sections of the East for several years and in compiling these, I have been surprised at the uniformity and the high per acre cost shown by these actual records kept over a period of years by experienced orchardists in your neighboring states of Ohio and New York. In your Pennsylvania reports for 1929, you will find detailed cost figures on spraying, presented by a leading orchardist in Ohio*. Under his conditions he operated three large power sprayers, supplying spray materials to them from a supply tank mounted on a motor truck. His averages are for three years with man labor figures at 40 cents per hour. It has cost him from 1½ cents to 2½ cents per gallon for the spray material applied to the tree. Figuring an average application on mature bearing trees at 10 gallons and taking an average of his cost of 2 cents per gallon, we have 20 cents per tree per application. I take it that you average at least five applications per season here in Pennsylvania, or spend $1.00 on each tree each year for the privilege of spraying it. Figure the number of trees per acre in your orchard and you are spending from $30 to $50 per year for your spraying operations.

Another large Ohio grower who keeps careful cost records, summarizes his cost figures by stating "The average cost of spraying is a little over $25.00 per acre annually." A recent survey of orchard costs in the Western New York fruit sections, quite similar to Pennsylvania conditions in many ways, shows the following:

*Frank Farnsworth, 1927 Proceedings, Page 144.

60 ORCHARDS SURVEYED, EACH OVER 30 YEARS OF AGE

No. of Sprays	No. of Farms	Average No. of Sprays	Spraying per acre		Barrels Packed Per acre	Growing cost per Barrel to picking time
			Man Hours	Total Cost		
1 or 2	5	1.4	3.3	$9.36	26	$2.32
3 or 4	21	3.4	8.1	20.65	33	1.69
5	22	5.0	11.4	30.78	44	1.52
6 or 7	12	6.1	15.1	31.82	50	1.32

Cost of $9.36 to $31.82 per acre for spraying, averaging 8 gallons per tree per application.

Note the increased yield and decreased production cost per barrel as the number of spray applications increases.

The relation of acreage to spraying cost is clearly shown in the following table:

(Orchards more than 30 years old, Dunkirk Soils)
NEWFANE, NIAGARA COUNTY, 1928

Acres of bearing orchard	Number of orchards	Average acres of bearing orchard	Number of Sprays	Spraying	
				Man hours per acre	Cost per acre
0—14	23	9.6	4.4	14.2	$35.45
15—29	24	22.4	4.3	10.5	24.07
30 and over	13	50.2	4.4	7.5	20.95

I simply bring these figures to your attention to emphasize the importance of the spraying program in your cost of production. *I am sure that you are all agreed that the only hope for profitable orchard management during the next few years is in lowered production costs.* It is to this program that I hope to bring some suggestions during the remainder of this period. Before discussing the newest things in spraying equipment, however, I think we will do well to look over the surprisingly rapid improvements in sprayer construction beginning with the first use of spray pumps back in 1885 and noting the results by definite periods up to the present time.

You will note that I have divided the different factors on which sprayers are rated into pump capacity, pressure and power. Before considering the newer developments further, consider for a minute just what these things mean in terms of actual spraying service. The pump capacity means the actual gallons per minute pumped by the outfit being used. This capacity may not all be used through the nozzle; in fact, a return to the sprayer tank of from 20 to 30% of the actual discharge of the pump is a desirable condition and the best quality of spray will be delivered through the nozzles only when this condition exists. The matter of pressure has been discussed frequently but I am sure there is much misunderstanding of just what the pressure actually does

EVOLUTION OF SPRAYING EQUIPMENT

Period	Pump capacity gallons per minute	Pressure pounds per sq. inch	Engine power used H. P.	Tank size gallons	Average gallons per day per spray man
1885–1895	Hand—1 to 2 gal.....	60–75	none	50	200–300
1895–1905	Home made and first commercial 2-5 gal...	75–150	1–1½	50–100	400–600
1905–1910	Small factory machines 4-6 gal.....	150–200	2–3	50–200	500–800
1910–1915	Medium factory machines 6-10 gal.....	200–250	3–4	100–200	600–1000
In 1916	Spray gun invented.				
1915–1920	Factory 10-20.....	250–275	4–10	200–300	800–1200
1920–1930	Factory 10–35.....	300–500	4–15	200–500	1000–1500
Stationary	Factory 10-40.....	300–600	4–20	500–1000	1500–2500
Portable is Stabilizing at	Factory 12-20.....	300–350	6–12	200–300	1000–1200
Stationary according to acreage covered.					

for us in the spraying operation. The more recent research work along these lines has proven conclusively that the principal benefit of high pressure is in breaking the particles of spray solution into the finest parts, or into the so-called mist. It can be demonstrated that a stream of water can be thrown to just as great a height operating at 100 pounds pressure as at 500 pounds pressure. This may come as a surprise to many of you but the present large capacity fire-fighting apparatus does not, for the most part, operate at high pressure. Instead of this, it depends on large volume to raise the stream to the desired height. Many fruit growers have felt that the height to which they could throw a stream depended entirely upon the pressure at the spray pump. This opinion is erroneous to the extent that you must have volume with this pressure to attain distance. Since the average fruit tree does not grow, or at least should not grow, to a height much exceeding 30 feet, it is readily seen that pressure alone for throwing spray material to great elevation is not of the greatest concern to the fruit grower. I think we will have to agree, then, that pressure is mainly for the purpose of breaking the spray material up into its fine particles.

Another important item that has not been given enough consideration by the fruit grower, is the loss of pressure between the pump and the spray nozzle. I have seen many outfits in use

with the pressure gauge reading 300 pounds,—when I was satisfied that the pressure at the nozzle did not exceed 200. This loss is occasioned by restrictions in the hose, in the couplings and fittings, and at other places along the line. The expense of having good sized pumps and engines to properly power them is, in this way, partly lost so far as any good to the user is concerned.

Now to discuss the most recent developments in spraying equipment and practice, I would say that a very sure trend at the present time as shown in the last table, is a change from sprayers having pump capacity of 6 to 10 gallons per minute to units running in capacity from 12 to 20 gallons. These slightly larger pump capacities have been shown to be more suitable for operating two lines of hose and two spray guns as regularly used by the average grower. Along with this change in pump capacity has come a change in spraying pressures from 250 and 300 pounds up to pressures all the way between 300 and 400 pounds, probably averaging about 350. Another important change from the economic standpoint is the tank sizes of from 150 and 200 gallons up to 250 and 300 gallons quite generally used by the larger commercial orchardists at the present time.

While horse-drawn sprayers are by far the most generally used, the newer development in portable sprayers are in the tractor and motor truck models.

Tractor hauled sprayers have been in quite general use now for ten years. More and better tractors on fruit farms have served to bring tractor sprayers into increasing favor and more general use. No doubt the most important of these developments are the improvements in tractors and their ability to haul sprayers under orchard conditions. This has come about both by the use of larger and heavier units and improved principles for giving better traction. Another factor that has contributed to the adoption of this type of equipment has been the replacement of horses in many of the other orchard operations,such as hauling fruit out of the orchard. Fruit growers have realized that if they could haul their sprayers under all conditions with a tractor, they could, to a large extent, be relieved of the expense of carrying a team through the year, principally for the spraying operation.

A more recent development in the tractor hauled outfits is in the use of the tractor engine as the power unit for the spray pump. This practice has some advantages, in that it saves a part of the first cost of a separate engine. It also saves part of the operating cost of this separate sprayer engine. No doubt another large factor is that by figuring on the use of the tractor for powering the sprayer, the grower can justify the purchase of a tractor such as he needs for his other orchard work, that would not be justified if he were not to use it for his spraying purposes. No doubt the greatest saving affected in tractor-sprayer use is in the keeping cost of a team.

This tractor powering of sprayers has its disadvantages, and any grower considering this type of equipment should consider

carefully whether he can pull a sprayer through his orchard with a tractor under the severe hauling conditions which sometimes exist. If he cannot do this, of course he should not put his main dependence on this type of equipment. Other conditions where the tractor models do not fit in so well are steep hillsides, as prevail in some of your Pennsylvania districts. The advantages of these tractor outfits generally far outweigh the disadvatnages, and I predict that a considerable part of the larger models of orchard sprayers will be tractor hauled and tractor powered in the next few years.

Another and still more recent development in portable orchard sprayers is motor truck mounting. With the small motor truck in general use on the farm, standing idle during the spraying season, many growers have seen in this a chance to get rid of their team, and perhaps even get along without a tractor, and haul their sprayers on their motor truck.

The advantages of this type of spraying equipment are, of course, quick returning from spraying operations to the filling station, and in this way often saving the cost of an extra supply wagon to the sprayer. Other advantages are the easy portability of the motor truck mounted outfit from one location to another, where orchards are at some distance apart. These truck mounted outfits are, for the most part, being furnished complete with their own engines. The smaller makes of trucks in general use for orchard purposes do not have surplus motor power to operate a pump at the same time they are propelling the sprayer through the orchard. The disadvantages include possible damage to trees and fruit, from the higher mountings of the truck outfit, and of course a motor truck, after being used for spraying, is not in every way presentable for road work. In a few cases the motor trucks are being used with power takeoff attachment and we look for this to increase with the new development of suitable sprayer transmission to adapt the speed of the pump to the different speeds of the motor truck. Such devices are now available and we now look for an increased use of both the tractor and truck type of equipment.

Along with these new developments in portable sprayers has come real progress in discharge equipment. Many of you can remember when standard equipment on orchard sprayers were two long bamboo-covered rods with a Y at the end, each carrying two small capacity nozzles. These were replaced to a very large extent in 1916 with the advent of the spray gun. I need not go into detail as to the advantages and disadvantages of this device. Regardless of the disadvantages, we all know that the spray gun came into very nearly universal use and is still in favor by a large percentage of our fruit growers. The difficulties of the gun were principally that, in the hands of careless operators, foliage and fruit injury resulted. This became so serious in some sections, particularly where summer heat aggravated the mechanical injury, that much time and effort was put forth by different experiment station workers along with the manufacturers, in

developing suitable types of nozzles and rods to properly distribute the spray material, even under hot weather conditions, without foliage or fruit injury. This equipment has been quite well standardized and improved until now there are available units carrying from three up to as many as eight nozzles in one cluster, and arranged with such exactness so as to deliver the spray material as one unit of wide penetrating mist. These are replacing spray guns in the hands of many growers, applying all the spray in the form of a fine fog and doing it without the danger of spray injury that exists with the use of the spray gun.

You may wonder that I have omitted any mention of stationary spray equipment. You have had this subject discussed on your program for at least the past three years, and it is to be discussed during this session. I have purposely omitted this, feeling that the interest of this type of equipment is not as great as a few years ago because of the present economic conditions and also the development of these other, more rapid methods of spraying with portable sprayers. This does not mean that the stationary outfit does not have a place in Pennsylvania; I am sure that it does. This place is where one stationary outfit will replace several portable units and in the case of the steep hill orchards where the hauling of portable rigs is either done with too much difficulty or at too great an expense. Under these conditions the stationary sprayer will come into its own and allow operators under these conditions to do a real job of spraying at nominal cost.

PENNSYLVANIA APPLE DISEASE CONDITIONS 1929-1930-1931

R. S. KIRBY, State College, Centre County

At all times, and to even a greater extent at a time like the present, the biggest question in apple disease control is, "How can I most economically produce commercially clean fruit?" The answer to this question can only be given after one has a knowledge of the diseases present and has an understanding of when, including how and with what procedure to control each disease.

In order to get accurate information on the occurrence and development of apple diseases in Pennsylvania during the past three years, the extension pathologists have made nearly 3000 visits to orchards, examined 20,000 scab perithecia to determine the stage of spore development, examined over 1,000,000 apple leaves and 1,000,000 apples to determine the presence and severity of the different diseases.

During the past three years a special effort has been made to get information on the occurrence of the different diseases on the fruit at harvest time. A total of 935 orchards, including unsprayed, partly sprayed and completely sprayed have been

visited and 485,097 apples examined and records made of the occurrence of diseases on each apple, and of the spraying program followed.

A knowledge of the diseases present in unsprayed orchards is of prime importance since such information is the only way to know what diseases we are combating when spraying. Table 1 shows the percentage of the six most common diseases present in unsprayed orchards in Pennsylvania in 1929, 1930, and 1931.

TABLE 1.—PERCENTAGE OF DISEASE PRESENT IN UNSPRAYED ORCHARDS AND RAINFALL 1929, 1930, AND 1931

Percentage Diseased Apples							
Year	Scab	Sooty Blotch	Brooks Spot	Blotch	Black Rot	Rust	Total
1929	87.2	9.2	4.4	1.0	.6	.01	100.0
1930	73.9	8.7	7.5	2.2	.2	.01	92.5
1931	80.5	46.0	8.0	3.9	1.5	.20	100.0
Average	80.2	24.4	6.8	2.6	.8	.07	97.5

Rainfall in Inches						
	April	May	June	July	August	Total
1929	6.12	4.81	3.56	2.81	2.52	19.82
1930	2.71	3.03	4.20	2.23	1.47	13.64
1931	3.33	5.28	3.71	5.28	4.01	21.81

Note: Figures based on counts of 7368 apples in 52 orchards in 1931, of 5282 apples in 39 orchards in 1930, and of 4976 apples in 19 orchards in 1929.

The figures in Table 1 show conclusively that very few apples free of disease can be produced without spraying in Pennsylvania; that scab is the most important single disease of apples within the state; that sooty blotch is of second rank followed by Brooks spot, blotch, black rot, and rust.

The effect of rainfall on the occurrence of the different diseases is worthy of note. The year 1929 represented one of the worst scab years of recent times, yet the total rainfall was not as great as in 1931. This condition was apparently due to the excessive rainfall during April, 1929, which enabled scab to bring about severe early infestions while in 1931 there was very little rain until after blooming or the middle of May. In 1930 there was an average of 73.9 per cent scabby apples which was 6.3 per cent below the three-year average but when it is remembered that during the dry season of 1930 there was a deficiency of 7.02 inches of rainfall below normal between April and September, it appears that scab even under adverse weather conditions is a menace that can only be held down by proper control measures. The figures in Table 1 show also that such diseases as sooty blotch, Brooks spot, blotch, and black rot are not affected

materially by the early season or pre-blossom rains but are proportional to the amount of summer of after-blooming rains.

Since climatic conditions vary markedly over a state like Pennsylvania it is expected that the occurrence of certain diseases might vary. Table 2 shows these variations.

TABLE 2.—PERCENTAGE OF APPLES IN UNSPRAYED ORCHARDS AFFECTED WITH DISEASES IN DIFFERENT DISTRICTS OF PENNSYLVANIA 1931

Percentage Diseased Apples						
District	Scab	Sooty Blotch	Brooks Spot	Blotch	Black Rot	Rust
Southeast	80.2	80.7	15.4	6.5	1.8	.3
Juniata Valley	92.6	55.9	2.6	1.2	1.4	.5
Central	79.0	27.4	5.4	4.4	1.9	.1
Western	74.0	0.1	0.0	0.1	.1	.0

Note: The Southeast District includes Adams, Schuylkill, Carbon counties and all counties to the south. The Juniata Valley District includes Perry, Juniata, Mifflin, Huntingdon, Blair and Bedford counties. The Central District includes Franklin, Cumberland, and all counties to the north of the Southeast and Juniata Valley Districts. The Western District includes Somerset, Cambria, Clearfield, McKean counties and all other counties to the west.

The figures in Table 2 show that scab is severe in all parts of the state but that the other diseases are the most severe in the Southeastern district and that they become less common the further one goes to the north or west in the state.

The study of the occurrence of apple diseases in unsprayed orchards in the four districts of the state shows that the relative importance of the individual diseases varies so much that spraying programs should be modified to meet district or local conditions. Table 3 shows the relative occurrence of different diseases in the four districts of Pennsylvania.

TABLE 3.—APPLE DISEASES IN VARIOUS DISTRICTS EXPRESSED IN PERCENTAGES OF TOTAL DISEASES IN UNSPRAYED ORCHARDS PENNSYLVANIA 1929, 1930, 1931

Percentage of total disease				
Disease	Southeastern District	Juniata Valley	Central District	Western District
Scab	44.4	69.5	87.8	99.9
Sooty blotch	37.3	26.6	8.4	.01
Brooks spot	12.4	.80	1.8	0.0
Blotch	4.12	.36	1.44	.01
Black rot	1.08	.42	.6	.01
Rust	.13	.17	.02	0.0
Bitter rot	.02	0.0	.01	0.0

The figures in Table 3 indicate that apple growers in the Western district should almost entirely concentrate their apple disease control program on scab control, but that the growers

in the Southeastern district must follow a program to control at least four or five diseases remembering that 55.6 per cent of different diseases present on unsprayed apples at harvest time were other than scab. In the Juniata Valley district growers should plan their program to guard against sooty blotch as well as scab since it is nearly 40 per cent as prevalent as scab. In the Central district scab represents 87.8 per cent of the problem but growers in Franklin, Cumberland, Dauphin and Northumberland counties must keep sooty blotch and blotch in mind when working out their spraying program.

Value of the Different Sprays in Controlling the Various Apple Diseases

A special effort has been made during the past three years to determine which of the disease sprays are the most important in the control of each apple disease and how many sprays are needed to grow apples commercially free of disease. Disease counts were made of 79,655 apples in 168 orchards where growers had applied all but one of the disease sprays. Included in this were six demonstrations where growers had each time they sprayed omitted that spray from a different block of two to four trees.

Table 4 shows how scab increased when each of the sprays were omitted.

TABLE 4.—INCREASE IN PERCENTAGE OF SCABBY APPLES OVER COMPLETELY SPRAYED BY OMITTING DIFFERENT SPRAYS, PENNSYLVANIA, 1929, 1930, 1931

Spray Omitted	Percentage of scabby apples			
	1929	1930	1931	Average
Delayed Dormant	2.7	7.6	.1	3.5
Pre-pink	26.2	20.6	5.2	17.3
Pink	1.7	1.6	3.5	2.3
Petal Fall	5.2	2.3	14.2	7.6
10 Day	4.4	2.3	6.0	4.2
20 Day		11.9	.5	6.2
3rd Summer			4.5	4.5
4th Summer	.0	.0	.3	.1
None	1.8	1.0	1.3	1.3

Note: The figures for spray omitted "none" or complete spraying are based on counts of 283,659 apples in 430 orchards.

The bottom line designated as 'spray omitted none' gives the percentage of scabby apples under complete spraying. For each spray omitted the figures show the increase in percentage of scabby apples over that in the completely sprayed. The two blank spaces under 20-day and third summer in 1929 and the one under third summer in 1930 appear because sprays were not recommended for disease control at that time. The third and fourth summer sprays in 1931 usually represent a spray

recommended for disease control about July 1 to 10 and recorded as the third summer or recommended the last of July and recorded as the fourth summer spray. Disease conditions within each county determined when the sprays were recommended. The figures in Table 4 show that in two of the three years the pre-pink was the most important spray for scab control, and that the petal fall was the most important in 1931 when the first prolonged rains occurred immediately after petal fall. The omitting of the delayed dormant spray was of importance only in 1930 when scab spores matured exceptionally early. The effect of the dry weather during the delayed dormant period in 1931 is strikingly shown with only a .1 per cent increase from the omission of this spray.

The pink spray apparently was of only minor importance. However, scab counts made early in each summer showed that its omission resulted in considerable apple stem infection and that two-thirds of the apples infected during the period of protection from the pink spray dropped before harvest. Further, during at least two of the three years there occurred exceptionally dry weather during the blooming period.

The fourth summer spray applied the last of July seems in general to have little effect on scab control. The third summer spray applied about July 10th can under most cases take the place of the fourth summer spray and be of greater value in scab control.

The figures in Table 5 show how sooty blotch increased when different sprays were omitted.

TABLE 5.—INCREASE IN PERCENTAGE OF APPLES AFFECTED WITH SOOTY BLOTCH OVER COMPLETELY SPRAYED BY OMITTING DIFFERENT SPRAYS PENNSYLVANIA, 1929, 1930, 1931

Spray Omitted	Percentage of Apples with Sooty Blotch			
	1929	1930	1931	Average
Delayed Dormant	.05	.2	.0	.07
Pre-pink	.0	.4	.1	.17
Pink	.0	.1	.0	.03
Petal Fall	.0	.2	3.2	1.13
10 Day	.0	.7	3.9	1.53
20 Day		23.1	.3	11.69
3rd Summer			18.4	18.40
4th Summer	4.3	.1	3.6	2.97
None	.1	.01	.4	.16

The pre-blossom sprays have very little effect on the amount of sooty blotch, while the twenty-day and third summer sprays, which give protection to the fruit from June to August, are very important in sooty blotch control. Therefore, growers in districts where the disease is severe should take special care to see that their apples are thoroughly protected with spray from June to July.

In the case of Brooks spot the figures in Table 6 show that this disease, like sooty blotch, is affected very little by pre-blossom sprays. Most of the infection occurs after petal fall with the heaviest infection occurring 20 to 60 days after petal fall.

TABLE 6.—INCREASE IN PERCENTAGE OF APPLES WITH BROOK'S SPOT OVER COMPLETELY SPRAYED BY OMITTING DIFFERENT SPRAYS
PENNSYLVANIA, 1929, 1930, 1931

Spray Omitted	Percentage of Apples with Brook's Spot			
	1929	1930	1931	Average
Delayed Dormant	.0	.6	.2	.3
Pre-pink	.0	1.2	.9	.7
Pink	.0	.0	2.3	.8
Petal Fall	.0	1.2	8.0	3.1
10 Day	2.5	2.6	6.5	3.9
20 Day		43.9	.5	22.2
3rd Summer			5.6	5.6
4th Summer	10.4	.1	.0	3.5
None	1.9	.1	.2	.7

During the past three years Brooks spot has in all but the most severe cases been held in check by liquid lime sulphur sprays. The splitting of the old 14-day spray in two parts at 10 and 20 days after petal fall has helped to reduce the amount of Brooks spot. In severe cases one or two applications of Bordeaux has almost completely controlled the disease.

The figures in Table 7 show that bitter rot is a disease which may not be present every year. There was more bitter rot in the state in 1931 than for the past six or seven years. The severity of bitter rot is apparently influenced very little by the application of lime sulphur sprays.

TABLE 7.—PERCENTAGE OF APPLES AFFECTED WITH BITTER ROT
EASTERN AND CENTRAL PENNSYLVANIA 1929, 1930, 1931

Sprays Omitted	Percentage of Apples with Bitter Rot		
	1929	1930	1931
All (Unsprayed)	.25		.0
Delayed Dormant			
Pre-pink			
Pink			
Petal Pink			
10 Day			.26
20 Day			
3rd Summer			.36
4th Summer			.80
None (All Applied)	.001		.18

The abnormally high temperature occurring from July to September in 1931 combined with the slightly above normal rainfall accounted for the increased amount of the disease in the Southeastern part of the state.

The control program for orchards where bitter rot is severe should include plans to remove the bitter rot mummied apples from the trees and to make one or two applications of Bordeaux if weather favorable to the disease occurs during July and August.

Such diseases as blotch and black rot are present in very small amounts in completely sprayed orchards. Lime sulphur almost completely checks these diseases. However, where twig and limb cankers of blotch are common, Bordeaux is needed as a clean up measure.

The figures in Table 8 show the percentage of apples affected with all diseases increased when the different sprays were omitted.

TABLE 8.—INCREASE IN PERCENTAGE OF DISEASED APPLES OVER COMPLETELY SPRAYED BY OMITTING DIFFERENT SPRAYS
PENNSYLVANIA, 1929, 1920, 1931

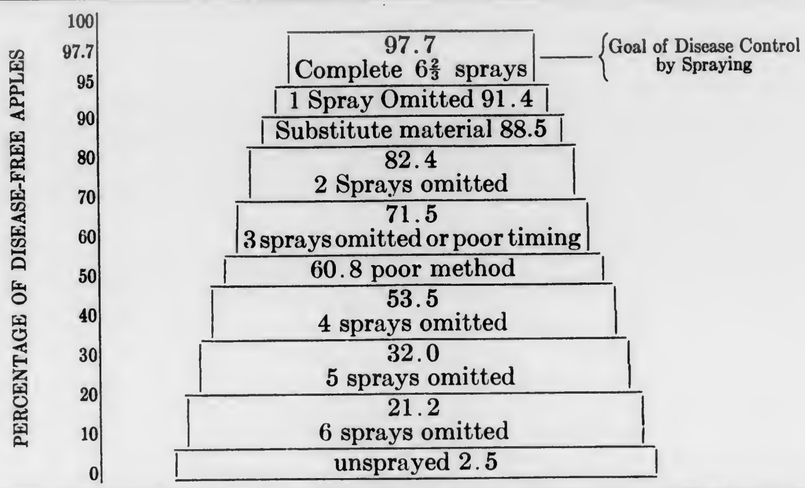
Spray Oitted	Percentage of Diseased Apples			
	1929	1930	1931	Average
Delayed Dormant	1.4	8.5	.1	3.3
Pre-pink	24.2	22.2	7.0	17.7
Pink	.0	2.1	5.8	2.6
Petal Fall	3.2	3.7	24.8	10.6
10 Day	7.8	5.7	19.4	10.9
20 Day		78.1	1.1	39.6
3rd Summer			28.1	28.1
4th Summer	14.5	.0	4.7	6.4
None	3.8	1.1	2.2	2.4

The figures show that in five out of the seven disease control sprays the omission of one spray caused an increase of over ten percent of diseased apples. In the case of the pink sprays, counts made before harvest showed at least ten percent disease. The fourth summer spray is not considered as one spray since its place has been taken by the earlier or third summer spray. *The delayed dormant spray is therefore the only spray that may be of doubtful value in disease control.* However, the delayed dormant spray is likely to be important whenever scab spores are mature at that period.

Table 9 tells the complete story of what happened when sprays were omitted. all applied either as recommended or not as recommended.

In unsprayed orchards there was an average of only 2.5 per cent disease-free apples. With six sprays omitted, or one spray applied, there was 21.2 per cent disease-free apples. When five sprays were omitted, all applied either as recommended or not as disease-free apples. With four sprays omitted there was 53.5 per cent disease-free apples.

TABLE 9.—RELATION OF SPRAYING PRACTICES TO APPLE DISEASE CONTROL PENNSYLVANIA, 1929, 1930, 1931



When outstandingly poor methods of spraying were used, such as missing parts of trees, using worn-out spray guns or half strength material, there was 60.8 per cent disease-free apples. Omission of three sprays or poor timing in the most important sprays gave 71.5 per cent disease-free apples. Omitting two sprays resulted in 82.4 per cent disease-free apples. Use of substitute material resulted in 88.5 per cent disease-free fruit. With one spray omitted, there was 91.4 per cent disease-free apples. Application of a complete spraying program which varied slightly in different counties but averaged 6 2/3 sprays for the state gave 97.7 per cent fruit free of disease at harvest time.

REPORT OF THE COMMITTEE ON NURSERY STOCK CERTIFICATION

Your committee held its annual school for nurserymen during the past summer. The main course study was with cherries and peaches. At their own expense the nurserymen made it possible for the committee to have Professor W. H. Upshall of the Ontario Experiment Station, Vineland, Ontario, as instructor in identification of peach and cherry varieties. Professor Upshall has devoted considerable time to making a study of leaf characters; his help at the school was very beneficial. Twelve different nurserymen gathered at the George W. Stein & Son Nursery, Wrightsville, York County, where cherry varieties were studied.

In the afternoon the group was entertained at the Root Nursery at Manheim, Lancaster County, where considerable work with the peach varieties was carried on.

One of the outstanding features of the school is the high degree of cooperation the fruit tree nurserymen of Pennsylvania

are showing. They are doing their best to keep each other's blocks free from mixtures of varieties. They are working together, helping to supply each other with absolutely true-to-name buds. As an example, I cite the case of one nurseryman who gave his services to another nurseryman, assisting in the culling of a large peach block.

I regret very much to report the illness of one of your committee, Mr. H. G. Baugher of Aspers, Adams County. The past summer was the first time for years that Mr. Baugher has not taken an active part in the nursery school.

Your committee feels that Pennsylvania nurserymen are making a sincere effort to keep all their fruit tree stocks true to name.

F. N. Fagan,
F. M. Trimble,
H. G. Baugher.

STRAWBERRY PRODUCTION AND MARKETING

GILBERT S. WATTS, Bellwood, Blair County

I am not an authority on strawberries, nor am I a strawberry specialist. We are truck farmers and market gardners, and, along with that enterprise, we grow about five acres of strawberries each year.

In the first place, we lay great emphasis on very early planting. And from our experience, it seems to be a very important factor in getting a good stand. If we set very early, we have low temperatures, evaporation is not so rapid, soil moisture is more abundant. It seems we are pretty sure of a fine stand if we set extremely early. Incidentally, we fall plow our strawberry plantation, and then we don't dig up the soil too deeply, we harrow; we like it firm. Early in spring the plants are dormant, or quite likely to be very nearly so. In our own case, as I said, we are market gardners, and very early planting of strawberries is a good aid to intercropping. In intercropping we must be careful that we don't overreach and injure the strawberries. By planting very early we have found some intercrops that are of considerable help to us. We'll come to that in just a minute. Incidentally, we do use a transplanting machine. I have heard some of you say you do. And our feeling is that straight through we get better, thicker roots by machine planting than we have ever been able to get by hand planting. It is my absolute judgment that if we don't get good stands, it is because we are at fault, not the machine. In the last six years we have done all our planting by machine.

We use our own plants of recent years; it saves us much money. But, more than anything else, because if we get disease—or insect-infested plants, we would stand to lose heavily. A few years ago, we brought in red spider in this way,—it just knocked out a few acres for us to the point of no crop at all. Since that

time we have been introducing new varieties of plants. We have, over in an extreme corner of the farm, an experimental plot. We put the new ones there for a year until we see what we have on them. If they are clean, we put them in with the rest of the stock.

We grow, mostly, Howard 17 (Premier), and sometimes people say, "Why don't you grow Chesapeake?" Briefly, it is this: The Howard 17, under our conditions, makes us the most money: that is all there is to it.

Aberdeen looks pretty interesting. We have had some for two years—an acre of it—this year it certainly looked very good.

Briefly, our fertilization is to broadcast and harrow in plenty of 1-2-1 fertilizers before planting. In recent years it has been concentrated fertilizers. We set the drills at 15 to 20 inches, using four to five hundred pounds on the acre. That is a narrow width for strawberries, perhaps, but we intercrop. A few weeks later we intercrop with such things as beets or lettuce. We may give an early top dressing of nitrogen, and then in August apply a top dressing of sulphate of ammonia; the nicest way to put that on is a little wheelbarrow type of fertilizer distributor.

Spring applications of nitrate of soda or sulphate of ammonia in the bearing year used to be quite a regular thing with us, but since we have gone to the August applications, we haven't done much spring top dressing, except where we plant on a poor knoll of ground, where the plants are not going to make sufficiently vigorous growth.

Some of you may be interested in intercropping. I don't know how intensively you may operate. Briefly, this is our schedule: We intercrop our whole strawberry plantations in the first year. Perhaps the thing that works best is beets and lettuce plants. We set out around about 50,000 beet plants to market very early—bunch beets—and these are put right in the middle between the strawberry rows. We plant strawberries usually from two to three and a half feet apart, running a row of beets right down the middle, and the land that isn't sown to beets takes lettuce for an intercrop, and the rest of the area is set with radish seed, three rows only about four inches apart, right down the middles. Onion sets are planted between the strawberries for green onions. In that way we get a greater return from our land the first year, and by intercropping we are justified in a liberal fertilizer program.

We fruit the plantations but once, with a few exceptions, because we feel that we get finer berries. I believe most of you will agree with me in that the expense of establishing a new plantation is not likely to be greater than that of renewing and carrying on an old one. The second year we almost invariably plow the berries, and as soon as the last picking is made, harrow it down thoroughly and prepared a solid bed, and plant bunch beets,—that crop has worked better to follow with strawberries

than anything else we have handled. When the beets are pulled, we often follow them with a rye cover crop.

We have always removed the blossoms the first year to induce better formation of runners, and the way of doing that may vary. We have found a gang of small boys with old razor blades with only one cutting edge, will snip them off in good shape; we think that method faster than scissors. At the first weeding, which comes soon after pulling out of these onion plants, we do place runners. We don't spend a lot of time; we simply turn each runner into place and use a stone or clod to hold it in place; I believe that helps a lot in getting good thick roots early enough in the summer so that the plants have heavy crowns before winter.

Of course we all know what it is to bend and hoe—the weeds love the strawberry patch. If some of you haven't tried it, I believe you might be interested to work with some of the small hoes that are on the market, little half-moon-shaped hoes; or there is another hoe that is seven inches broad, but only one inch high, sharpened on the broad side and on both ends. And with that little hoe we can reach in and pich out a weed and do practically all the work standing up and, I think, with a little more speed than we have before, when we didn't have those special hoes.

I warn you to be careful about the kind of mulch you get into your strawberries. That seems to be a trying problem. We buy our mulch because we don't grow grain crops, and we do try to be careful to get wheat straw, if we can, that is reasonably free of wheat seed and wheat.

There is one point on which we lay the strongest kind of emphasis, and that is the establishing of individual responsibility on the part of every picker. We find it takes, usually, twelve or fifteen pickers per acre to keep our berries picked up as they should be. That means that we have anywhere from sixty to eighty pickers on the job. We used to have quite a time getting the sort of work done that we wanted done. The last few years we used two bosses in the picking job. We have a row boss, as we call him, who stays in the patch and sees that the pickers stay to the rows to which they are assigned to work and don't drift off to another row; he also sees that the berries are not tramped on, and that the picking is done in a clean and orderly manner. Then, at the point where we pack—at the edge of the field—is the packing boss. He has an assistant to place the berries in the crates. And here is the crux of the whole matter; the packing boss keeps all empty baskets under control, so that empty baskets can be obtained only through him or his assistant. And, as the baskets are filled, it's only a matter of a moment to indicate, by a common lead pencil, a picker's number on the rim of the basket, "No. 6," or "No. 3," as the case may be; each basket is marked with the picker's number. Therefore individual responsibility is established one hundred per cent right then and there. If the packing boss or row boss

finds bad work, that's all right. But may be some of its gets through, or there's a case of carelessness, or neglect, or dishonesty in pack; it is discovered up at the market or by a wholesaler up in Altoona or Pittsburgh, or even the retailers that these berries reach; they can tell from the number on the basket who was at fault, for every one is signed by the picker. The result is that we have discharged only one picker in the last year. That particular picker was one of those people who, unfortunately, seem not to have the capacity for doing honest work. We feel that it is a great step forward to have an organization of pickers. The individual's signature goes on everything we pack for market, whether it is in the field or in the packing house. The signature of the person that packs goes on the rim of the basket—not too conspicuously—you could cover it with a nickel. Nevertheless every fellow feels his responsibility, and it relieves the management of a great deal of worry and unpleasantness.

Last year we took on some new pickers, and we began to watch these new pickers closely. We found a few deficient; they were topping their berries more than was right; with a little instruction we soon had those people in line.

So I feel that, if we are going to make a success with strawberry picking and marketing we have to put this responsibility right back on each picker where it belongs. We have a responsibility to ourselves and to our buyers, and the picker has a responsibility to us. And there is no reason why they shouldn't put it where it belongs.

We try to pick daily, and we usually get pretty well over the patch every day, unless the weather turns cool. It is not always necessary to go over the place every day.

Some of you may be interested in our experience with irrigation of strawberries—I know some of you irrigate strawberries. We use all of our lines, sprinkler type, portably. In other words at the end of the strawberry field, which is 436 feet long, we have hydrants, one and a half inch, built at fifty-foot intervals. That field is 500 feet wide, and two sprinkling lines seem to give us plenty of capacity to water the five and a half acres; that is, there are 500 feet to the line, ten sets of these pipes. In other words by moving two pipes five times, we can water the whole thing, with the result we can put an inch of water on our five acres of berries every five days. That seems absolutely sufficient, and I know that we have increased our yield by several hundred crates on a number of occasions by having water. Do we water at time of picking? Yes, as soon as the pickers are out of each 50-foot section, the water follows behind. We try to be a little careful about the water, of course, for we don't want moldy or rotten, soft berries. We had two or three unexpected pickings the first year through irrigating.

On the subject of marketing I have nothing unique to offer. I think it gives a great deal of satisfaction when I go to sell to wholesalers by telephone, as most of it is done,—to know that

this individual responsibility is back of every quart of berries in every crate. Most of you do your own selling, and if you ever had the experience of recommending a pack very highly and then had some fellow get hold of a faulty box, you know that doesn't back you up very well. And we find that at the roadside markets, since we have put this individual responsibility on the picker, our salesgirls delight in talking up those berries. They have confidence in the product, and that confidence emanates from the salesperson to the buyer. So I feel that that is the starting point of our whole market—that confidence in every buyer that every package is right.

Roadside marketing has been talked of a lot; some of us may be tired of hearing about roadside marketing. Yet I wonder whether the possibilities in roadside marketing have been touched; that may seem radical, but I wonder. Strawberries may lose quality even more rapidly than sweet corn—I believe they do. But if we give the people the thing that they have in mind in the roadside market idea—fresh farm products at the point of origin, and then giving it to them so good that they can find no fault in it, I believe we have a great future.

We lay great stress on display and keeping a display filled up. If it is late in the evening, and the berries are almost gone—we have a table which accommodates eighty boxes of berries spread out for easy inspection, and eventually they are pretty well sold—and there are holes in the display, probably only twenty boxes left, we push them up into a compact group, four by five; for no one likes to think he is getting the last pick of anything. We keep the display filled up, and to attract attention we use price tags. I think that is an important thing in our roadside marketing. There may be some reason for not putting a price tag on a beautiful fur coat in an exclusive shop; but those reasons, whatever they are, don't apply to strawberries or anything else on the market. I feel that the price is a piece of information to which I, as a buyer, am entitled, without having to ask it. We reason it out this way: Many customers are extremely reticent in buying; they are bashful. If they must ask the price, in a certain sense they are compelled either to buy or to refuse to buy, with resultant embarrassment or resentment; whereas, if the price is in plain view, the customer can make up his own mind in the freest manner, and, incidentally, save some of your time by selling himself.

Our wholesale movement has gone, in the last year, mostly to the chain stores, and of course, to some of the local wholesale houses. We "sign" every crate of berries with our distinctive tag, just as each individual box is signed by the picker, which helps us to find and hold our market.

Finally, I want to raise one little question: We have advertised our strawberries in the newspapers in a limited way, not to exceed two or three per cent of our gross sales, and we have had a great response. It is almost like stepping on the gas in a high-powered car. And the more advertising we do, it seems, the

more response we get, because the people look for it and respond to it. Last spring or early summer, we had a very hot week and local ice cream manufacturer in our city of 75,000 carried a full page ad every day, featuring an enticing dish of ice cream. While he was running this, there was quite a crop of raspberries picked in our community, many of which didn't find any too good a market. In another week people were around looking for raspberries and couldn't find them. I know, because they came to market and wanted raspberries after the crop was gone. You would be surprised how much profit there would come to you growers by using advertising to the extent of two or three cents per crate.

QUESTION: How did you handle that bed after it was renewed?

MR. WATTS: We don't renew our beds. To make a story out of it, at sometime between the first to the fifteenth of April, we will go into the plants that were set out last spring and dig as many as we need—virgin plants that have never borne fruit—and those will be put on a new plantation. Then a year from next spring, we again take no fruit, and set them out to make a new plantation. In other words, we use young plants all the time.

QUESTION: Does the picker put his name on each box of berries he picks?

MR. WATTS: The man who fills the baskets puts the number on. It may seem like a great deal of pettiness to do it that way. But it is done just with a lead pencil.

APPLE POLLINATION

H. F. HERSHEY, Hamburg, Berks County

This question of apple pollination is a pretty big and wide one. A lot has been published about it, but I am going to give my own experience.

When we bought our orchard ten years ago, we acquired a block of Delicious apples of about 40 acres, and they were planted 18 by 18, with a fourth of them Stayman apples in between. We had a pretty bad combination, which we didn't know at the time, but which we found out afterwards. Our Stayman wouldn't pollinate the Delicious, but the Delicious would pollinate the Stayman. Why they were planted so closely I don't know, but we had to take one full row of the trees out; and, as we had quite a large planting of Stayman, we decided to remove the Stayman and half of the Delicious. So we have a block of about eight hundred trees, practically solid Delicious, with a few odd variety trees scattered throughout. These Delicious have not done very much towards earning their keep in the last few years.

We became more and more interested in pollination work. We observed, around the edge of the orchard where we had

some Smokehouse* and close to some Grimes, that we had pretty nearly every year quite a few apples, and the further we got away, we had fewer and fewer apples, and when we got into the center of the block, fifty-five trees wide, we had no Delicious at all. Before proceeding with more details I might further mention here that this block is now seventeen years of age—up until the last few years we have not had any appreciable returns at all—probably an average of a bushel per tree, a bushel and a half sometimes, but not anything to approach the earning of their keep.

We decided to use bouquets, to pollinate these Delicious. We had further observed a few varieties, possibly fifty trees out of 1,800 scattered through, that close to these trees we had fairly good yields. Possibly a dozen Snow trees were in this block. The Delicious trees immediately surrounding these Snow apple trees had a good crop. Also we had some Ganos mixed in there, and we found out that the Gano was a good pollinizer for the Delicious. We have had good sets of Delicious around the Gano. Peewaukie is not much of an apple, but if you want it for a pollinizer, it is a wonderfully fine pollinizer for Delicious. We have just three or four Peewaukie trees in this block, but wherever these Peewaukie trees are, the Delicious trees are practically all loaded.

In 1930, Ruef, together with C. S. Adams, County Agent, and ourselves, worked out a plan of putting bouquets into this block of Delicious. We bought many ten-quart buckets, and from a nearby institution we got a lot of gallon cans; we strung these all through the orchard—every other tree in every other row had two cans on it. We took our sprayers and had the boys climb up into the trees and fill these buckets with water. Then we put blossoms through this entire block of forty acres. The first year we used Grimes, Gano, Rome, Wealthy, Transparent, and one or two others—all varieties whose bloom had been shown as good for Delicious pollination.

We found out something that first year. Ruef's suggestion was that we should cut out big branches and place them up on top of the trees, and we did that in some cases. But found that this was a difficult job; we learned one more thing by doing that—when we cut the great big branches we could hardly keep our buckets full of water. I know we put them up on a Friday or Saturday, and we had extremely hot weather. We didn't work on Sunday. Sunday afternoon, when I came to examine the buckets, they were all practically empty, and a lot of the bloom had withered and dried up. We also had another experience that year with the extremely hot weather: We didn't take the best of care of the bloom in transporting it from one part of the orchard to the other, and it wilted, and some of it never recovered. But with all the varieties we used that year, where the bloom was put up in good shape, we had fairly good

*Smokehouse is regarded as of doubtful value as a pollinizer. See McDaniels, 1931 Proceedings, Page 91—*Secretary's Note.*

results. Where the bloom withered—you could almost tell it, row for row—we didn't have results. That year we used some sixty hives of bees scattered through the orchard; they weren't very strong hives or colonies, but they apparently did the work.

QUESTION: How many acres did you say you had?

MR. HERSHEY: Forty acres, 1800 trees.

QUESTION: Do you think that is enough bees?

MR. HERSHEY: I don't believe it was quite enough for the condition of those hives. They weren't strong enough.

MR. HERSHEY (continuing): We used only Transparent bloom in 1931. We had a block of Transparent trees which we hadn't pruned, but were profuse with bloom. We got our buckets up again and got them filled with water, and we had very reasonable sets. It wasn't so hard to transport the bloom as it had been the year before, and we filled all our buckets with bloom, putting them up just about as high in the tree as we could—two buckets to a tree, every other tree in every other row—and the response was wonderful. I might say, in that connection, this year we changed our plan on the bees, and we bought twenty-five packages of five pounds each and scattered them in four or five places in different parts of the orchard. Now, I am inclined to believe, from our experience this past year, that the purchase of package bees is probably the proper thing to do, because you have a much stronger colony of bees. I am not a bee man, don't know much about them,—don't like them. It seems we have to have them although I got rid of these bees as soon as possible.

The 1931 results were very marked. We have no check on this block of Delicious; it is rather hard to get, but you could tell even at harvesting time every tree which had a bucket hanging up in it.

QUESTION: Do you think that the trees that didn't have the buckets weren't as good?

MR. HERSHEY: It wasn't quite as good, but good enough. This year we had an average on our Delicious of about eight bushels per tree—not a great average.

Now I believe—it is my candid opinion—that this year the Stayman Winesap is a fairly good pollinator, because this block of Delicious butts into some Stayman Winesap trees, and we could see no marked difference at all for pollination purposes. I believe that, while we say that Stayman Winesap pollen s non-fertile, that statement has to be qualified, because I can remember in 1926—an apple year when we had lots of Stayman—we had a solid block of Stayman that had a wonderful set on it, and they couldn't possibly have gotten pollen throughout the entire block if the Stayman had not been fertile*.

QUESTION: Have you ever found anything to pollinate York Imperial?

*The great mass of experimental evidence shows that Stayman is usually a poor pollinator. Hershey's case is the exception, rather than the rule.—*Secretary's Note.*

MR. HERSHEY: I don't think they need it. We grow very few Yorks.

QUESTION: Do you think it would be advisable to place grafts on the top of every third tree in every third row to your Delicious block and graft the Jonathan or Gano?

MR. HERSHEY: We are doing more than that ourselves. We are top working these trees, and I aim to have a graft on every tree. And we are using yellow apples. We are using Transparent, and we are using Grimes, and we are using Golden Delicious. I don't know if we will ever pick those apples or market them or not—may be we will, and may be we won't. If it's too much trouble, we are going to let them drop, because we have the rest of our Delicious trees, and what we want is the Delicious apple.

QUESTION: Do you keep account of the labor expense for this pollination on the forty acres?

MR. HERSHEY: It takes us two days and eight or ten men at a cost of forty or fifty dollars, because we use low-cost labor.

QUESTION: Do you really think that Delicious will pollinize Stayman?

MR. HERSHEY: I think it will. Work that has been done by Professor Auchter, now in the U. S. Department of Agriculture, shows that Golden Delicious is a very good pollen source and it is good for Red Delicious. I believe that we all have got to, in a way, work this thing out for ourselves. Another plan is to use different varieties in grafting. For instance, if you use all Grimes—and Grimes is pretty often barren only every other year—and you take Transparent, one year it is full of bloom, another year it has practically nothing, unless you go through and pull all your bloom off earlier, or the apples off early. But I believe if you use three varieties—and I am using yellow varieties so that there is no chance of getting them mixed with the Delicious—that that's going to rid you of a lot of your trouble.

QUESTION: Have you tried any pollinizer on Black Twig?

MR. HERSHEY: We have some Black Twig. I presume that most any of the recommendations that are given out by the experiment station for Stayman will hold for the Black Twig.

QUESTION: Doesn't your set get too heavy?

MR. HERSHEY: They didn't this year, although we had a few such trees. They are pruned pretty hard; they will stand a heavy set.

MR. HERSHEY (continuing): I don't know if cross-pollination had any effect on the quality of the Delicious or not, but we have had better apples, snappier apples this year than we have ever had before, even when the trees had only a few apples, half a bushel or a bushel on them.

QUESTION: What objection would you have to placing the bouquets on the ground?

MR. HERSHEY: I don't think the bees will work through them as well as they should. We have had lots of limbs, quite

close to the buckets, that you could see right in around the bucket that the pollination was much better than farther away from the buckets. There may be other methods. I know some people use barrels, put a lot of bloom in them; but it's not a great deal of work to put the bloom up there if you have got good, active fellows. They will soon take it off.

QUESTION: Did the bees prefer Grimes Golden?

MR. HERSHEY: I don't know that they do. They certainly worked in the Transparent block; it was full of bees. I don't believe that they are very partial to any one kind of bloom.

QUESTION: Did you have to cut up many trees to get blossoms?

MR. HERSHEY: We cut up the Transparent, and we are sorry we didn't cut them up more.

STORING PEACHES AND APPLES AT THE ORCHARD

SHELDON FUNK, Boyertown, Berks County

We put in the cold storage plant back in 1925. We have operated it ever since, and I have learned a few things about the operation of cold and common storage. But before I take up that subject, I would like to say just a few words along another line; that is that I believe I express the sentiment of the fruit growers of Pennsylvania when I say that I believe that at the present time State College should pay particular attention to anything that means the cutting of costs in the production of apples and peaches. I believe we have got to cut corners wherever we possibly can. I, personally, no longer try to compete with the western fellow who is putting up the boxed apple. *I firmly believe that we in Pennsylvania are commercial growers, that we are not supplying fruit to that extra high-class consuming market, but that we are producing fruit for this great army of middle class people who want good fruit, but don't particularly care whether it is U. S. No. 1 or Extra Fancy.* I believe it's up to us to cut costs, to cut corners wherever we possibly can. And I am sure that sometimes the men at the College run across something, some ways by which, possibly, the results will not be quite as good, but we can get sufficiently good results with just a little less cost. And it is right along that line that I would like to present this subject of storing peaches and apples at the farm, or at the orchard.

Different conditions in the country, in the growing sections, naturally make more difficult storage, handling, and marketing conditions. We have such districts as Adams and Franklin Counties, where there are large quantities of apples and peaches grown; and the same thing is true in New York State where the natural thing has been the development of commercial cold storage plants, and, undoubtedly, that is the best proposition there. But then, again, there are a great many districts in Pennsylvania,—this is true in Berks County and in many other counties—where such a great quantity of fruit is not produced,

in which the erection of a commercial cold storage plant would not be a commercially profitable proposition. It is under those conditions that we find a particularly fine place for this home storage of peaches and apples. And by "home storage" I mean not only common storage, but also cold storage, so that I would like to treat it from that standpoint.

While a great many of you men have your own common storage plants, which is very good, I'm sure that if you ever put in a cold storage plant, you would find that it was one of the best investments you have ever made, because it works right along with that common storage plant so very nicely. Some of you may say that this is not a good time to bring up a cold storage proposition, because it is a rather expensive venture; I know that cost has been the factor which has prevented a great many men from going into the cold storage proposition. The cost will, naturally, vary greatly, depending upon what type of storage you construct, and whether or not you have a suitable building to begin with. If you are going to construct a new building, naturally your costs are going to be considerably higher. But I believe you can figure on a cost of somewhere between one and two dollars per bushel; that is, an initial construction cost of between one and two dollars per bushel capacity for a cold storage.

There are quite a number of refrigerating systems; I shall say only a word about them, because I don't know enough about them to say more. I have an ammonia direct expansion; some men use the Bryant system; I don't doubt that it is a very satisfactory one. Just within the last few years, there has been a new system introduced which looks very good to me. I know of several growers in Pennsylvania who have installed them, and I believe it is the coming system, for under that plan we do away with all the coils which are on the roof of the room or on the sides of the room in the older system. The cold air is taken over the coils placed in one corner of the building in the Bryant, and there is a very much better circulation of air in that way, and much better ventilation than under the old types of refrigeration. Anybody interested in refrigeration would naturally look into that, and I am not going to spend any more time on that subject.

Now, when it comes to operation of the storage you are going to have a great variation, the cost depending upon how much overhead you have. In my own case the monthly cost of operation per bushel runs between one-third of a cent and one cent. That is the actual cost of current consumed. My man who takes charge of all the sales and does the work lives right there. He attends to the cold storage; and it requires very little attention, with practically no overhead cost to me. Now I don't figure interest on investment, but the cost will range between one-third of a cent and one cent per month. During the peach season it was jammed to the doors—everything it would hold, and we were running as hard as we could run, and then the current bill averaged about one cent per bushel on peaches during the hot months, at the present time it isn't running over two-thirds of a cent per month.

QUESTION: What capacity have you?

MR. FUNK: I have 15,000 bushels capacity. I have two units, a 2-ton automatic unit and a 4-ton hand control; the idea being that when we are bringing stuff into storage we run the two units as hard as we can. After we have it cooled down to the proper temperature, we throw off the 4-ton machine and let the 2-ton run ahead as long as it is necessary. I was rather interested in what Mr. Hayman said this morning relative to the storage of peaches, and I was wondering what the trouble was that he had with his peach storage this past year. We have been storing peaches for quite a number of years, all grades, all sizes,—and our results have been uniformly successful. I have been more than pleased with our results on the storage of peaches.

QUESTION: How long do you storage peaches?

MR. FUNK: Ordinarily we don't figure on holding peaches more than four weeks. We put peaches in just as we need a place for them. Elbertas will start a little before Labor Day; I find the market is usually glutted Tuesday following Labor Day. The result is that we put such stuff in the storage house in order to relieve the market on Tuesday following Labor Day. We usually store pretty heavily then. The peaches may be coming along pretty fast, and if the picking gangs happen to run ahead of the packing gangs, and I find that we are going to get an accumulation of stuff in the packing house, instead of slowing down the picking I merely send trucks into the orchard and let them haul the field-run stuff directly into the storage house just as it comes out of the orchard.

This past season, they filled up the rooms so rapidly we couldn't get the temperature down fast enough, and in such a case stuff will go bad every time. Put it in as fast as you can, but pull your temperature down; don't let that temperature get up to 40 degrees or 45 degrees and stay there for two or three days. It may run up to 45 when you are putting in the stuff, and I have had it run up to 50, but get it down to 35 inside of a couple of days, or you will lose the peaches.

QUESTION: Wasn't it rather mean packing or sorting after you took them out of storage?

MR. FUNK: We had to be careful not to bring them out too fast. It was necessary to take out not more than twenty-five bushels at a time and run those over the grader, because if you let them lie around in hot weather, they will sweat very fast, making a bad looking pack. The best type of peach to store is the good, hard first-pick peaches. But it may be that you have a market for them; if you have, sell! Put something in for which you don't have a present market.

Another nice thing about a cold storage plant on your own place is that it works so nicely for anything else that you may

be growing. In my case we grow several hundred bushels of pears. And we have, perhaps, a hundred or two hundred bushels of plums and the like. Now you know it is the finest thing in the world to be able to take this stuff into the cold storage house, if you don't happen to have the time or a market to sell it today, Let the plums and pears stay there until you are ready to sell them,—until the other people have sold and you find a good market.

Now there is one thing I want to say about that peach situation this afternoon before I leave it, and that is we were just a little bit lucky this fall with our weather conditions,—that is one gamble that you are taking to storage peaches. A peach is a hot weather fruit; your market is gone just as soon as the weather turns cold. We had a very warm fall, and it certainly helped move peaches this year,—some of them were held for as long as five and six weeks.

QUESTION: Do the peaches lose flavor in two weeks?

MR. FUNK: They begin to lose flavor not in two weeks, but in four weeks—just as soon as they begin to turn brown at the stone, they begin to dry; when they begin to turn dry they need to be moved. You must get them out. They will not turn dry in three weeks.

QUESTION: Do you drive trucks right into the cold storage plant?

MR. FUNK: We go in with hand trucks. The time you run up your temperature is when you try to put two cars, for instance, in a room of 5,000 bushels capacity. If you take a room of that size and put two cars of hot peaches in it in one afternoon, you are liable to find that is too much unless you have a very large equipment so that you can pull down the temperature quickly.

QUESTION: Is there any taste or smell from the storage given to the fruit?

MR. FUNK: Absolutely none, unless the ammonia gets out; that will affect the flavor.

QUESTION: Do you have humidity to maintain.

MR. FUNK: My humidity works out well, just by chance. We have coils running overhead. When you are holding a 35 degree temperature and stop refrigerating, a drip will result. The ice will melt off the coils and there will be plenty of moisture —the humidity is very good. That's one thing that I think was partly due to the fact that we had better results this year in our own storage—because of the humidity. I find, where a cement floor is used, the air feels a little too dry. In other words, with dry air there may be a temperature of 32 or 33, but it doesn't seem as cold as when there is a higher humidity. Then it may be actually two or three degrees higher by the thermometer, yet you think it is very cold. It is because of that high humidity, which is very essential. If I had a cement floor in a storage room, I think I would cover it over with something else. I would use sodium silicate, which would close up those pores, or put on something like Amiesite.

QUESTION: I understand commercial houses have circulating air?

MR. FUNK: They have humidity controlled circulating air. Along that line I want to add a word about apple storage. We work apples in very much the same way. We put in early apples, and cold storage is a splendid thing to have when early apples come along. If the market is a bit slow, you can put them in and by holding them a little while you can often get better prices. Two years ago I had about half my Duchess, all of my Wealthy, and all of the later stuff that followed, until the following April but that was not a good proposition. Nevertheless, it usually works out very nicely in the keeping of all those early and summer apples. We feel that we must have storage for everything that we want to hold for any length of time, up to Stayman. Beginning with Stayman we use the common storage, but everything up to and including some of the Stayman we try to put in cold storage.

The condition of apples when picked has considerable to do with the keeping qualities. A green Smokehouse will not hold up, but let a Smokehouse first get good color and it will keep a long time—we just cleaned up the last Smokehouse a week to ten days ago; they came out in splendid shape. I had those apples in a room that was running somewhere between 35 and 40, but they came out in good condition; whereas, if they had been green they would not have been in good condition. So I think it is always going to pay us, on most varieties, to pick anywhere from two to three times. We usually pick about three times, and I feel that is a very profitable operation.

QUESTION: Did you say you had trouble with Smokehouse and Summer Rambo last year?

MR. FUNK: I had very little trouble with Smokehouse this year. But last season we had a lot of trouble with breakdown; I learned a lesson on Summer Rambo, and we watched them and got them out before they started. But why it is that Summer Rambo acts that way I don't know; it is more than I can understand. We have had a lot of trouble with it.

QUESTION: Speaking of picking them three times; do you pick by the hour?

MR. FUNK: Yes, everything is done by the hour. We store everything orchard run,—that is another nice thing about having our own plant right at our own place. You bring them out of the orchard and put them right in; you pay no attention to packing or grading until you have them all in. It helps to utilize your labor; it distributes that labor cost very much more than if you have got to run them through the packing house and pack them out regardless of packing conditions or regardless of money. That is another place we can cut costs by having a storage house right on the place.

QUESTION: How far is it from the orchard to your storage house?

Mr. Funk: The storage house is probably a mile or a mile and a half away—two miles, possibly, from the farthest part of the orchard. We now store almost entirely in baskets. I like the stave baskets—sometimes called an "export tub." That is a ventilated stave basket, the finest thing I know of for storage. Now I know a lot of men use crates, and possibly they will keep just a little better in crates than they will in baskets; but my objection to the crate is that you have an added overhead, you don't sell them in crates; whereas, in baskets, you can get rid of baskets and don't lose that package, even if it is getting poor. And then, again, the crates take up so much room. When your place is limited you are still two-thirds filled up.

Question: How do you arrange your baskets?

Mr. Funk: Just the same as you load in a car.

Question: Do you put a lid on?

Mr. Funk: We put a lid on and pack them down the same as you would in a car. I put everything in this year without caps, thinking that we would get better results, but it was a failure. Hereafter I am going to use caps, they cut off a certain amount of ventilation, but I find that the drivers invariably make the baskets a little too full, and then, in handling them, cut a few apples; and you usually have two or three rotten apples right on top. Put on a cap, and you overcome that.

Question: How cheap would commercial storage have to be to compete with a home storage plant?

Mr. Funk: I could not give you definite figures on that, but it would have to be considerably less than now. Of course, you can't blame these cold storage men; they have a tremendous overhead that I don't have. They have an office force, and they have a day and a night man—may be more than one day and one night man. You see, they have a big overhead that I don't have.

Question: What kind of floor have you?

Mr. Funk: I have concrete, cork, and wood in two rooms, and concrete, cork, and Amiesite in another room. I said I put that Amiesite on the concrete,but I put the cork on top of the concrete and then Amiesite on top of that.

Mr. Tyson: I might make a brief report of the Legislative and Agricultural Council Committee. We haven't had any definite work referred to us in legislative lines, and, so far as I recall, nothing of direct interest to this Association has come up in legislative lines in the last years. We all certainly are—and in this respect I lap over into the organization of the Agricultural Council—much interested in keeping in touch with other farmers of the state—other rural people—in matters which do touch legislation. And, while previous legislatures have not progressed as far as we should have liked to see them, we still have hopes. One of those questions—the outstanding one, possibly, in the minds of people today—is the question of taxation; and the Agricultural Council, composed of three

representatives from each of the agricultural interests of the state, particularly those meeting here during this week, has had it particularly in mind. Another of their activities has been the development of the rural electrification—the spreading of, the extending of electric lines into the country—and trying to see to it that those lines are made to reach farmers on as reasonable a basis as possible. Apparently a good deal has been accomplished in that direction, even though many of us still feel that it costs too much to get electric current in outlying places—certainly, we still feel that some of the rates are too high. But this organization, with the committee, has spent a great deal of time on the subject and have handled the specific claims of a great many of our country people; it certainly has been responsible for many of the improvements that we have seen taking place over the last few years.

In the matter of taxation, the Agricultural Council has a committee that has been working for several years, and during that time has conferred with a large number of local and statewide associations organized for the study of the tax situation. And I feel sure that it is only a matter of time, and that the studies made by these committees are going to result in a plan whereby most of us, at least, can get power lines, and when that time comes it certainly will be reflected in legislative action.

HOW THE STATE DEPARTMENT OF AGRICULTURE CHECKS UP ON ARSENICAL RESIDUES

D. M. JAMES, Bureau of Markets, Harrisburg, Dauphin County

I desire to mention for your information the way that the State Department of Agriculture has been assisting in the spray residue check-up work, that is, to assist growers to know where they stand on arsenate spray residue. Through the cooperation of the Bureau of Foods and Chemistry and the Bureau of Markets, we worked out a system in these last two years, which has done very nicely, and we have not had any serious difficulties. As far as I know, there have been no Pennsylvania apples in difficulty because of excessive spray arsenate.

Probably some of the growers, particularly those outside the commercial districts, who are not familiar with this method we have worked out, may wish in the next year, if we go about the same way of handling it, to make use of this service. The way we have handled it is like this: We send out our shipping point inspectors between the peach and apple seasons, about ten days to two weeks, when there is little inspection work to do. Last year we had about twenty-five men who covered practically the entire commercial district, mostly through Adams, Franklin, and York counties, including the larger growers in other districts. Now they collected orchard samples of the apples, and these were sent in here to Harrisburg and were analyzed within a few days—last year there was so much rush

that it took a week to ten days to catch up one time. But, as the shipments had not started, this was no serious handicap, because an orchard inspection was made before the shipment started.

The growers who ran high on arsenic were notified, and if later on we took a single sample and it was found to be too high, they were cautioned about exporting those apples without washing or brushing. There were only six washers in the state that we know of; there are a good many brushes which may take off some arsenic, although they are not effective if there is much. Now in the past season, we analyzed 278 samples, and of these 19 were found to exceed the domestic tolerance, which is slightly higher than the export tolerance*. There were 14 shipments held up until the arsenate was removed, and I might say I don't think any of these were held long enough so they couldn't be shipped later.

We are trying to cooperate with the fruit growers, to help them eliminate this arsenate residue, and to advise them if their stock will pass the export and domestic tolerance. There has been no expense charge; the regular force of the Department of Agriculture has been able to put on this service, without creating any excitement or doing any advertising. It has been carried on quietly, but it has been rather thorough, and we have found it to be effective.

QUESTION: Do you make the examination in Harrisburg?

MR. JAMES: We will examine the samples that are sent in, but we can't consider that an official test for an export certificate. One of our inspectors will be glad to examine any apples that are sent in any time; but, in order to give you an export form certificate, we can't do that. We have to collect the samples and know the conditions of the apples in the orchards.

MR. RUNK: I spoke to our President yesterday and asked his permission to present a little matter that, perhaps, I am very much worried over—the problem of the itinerant peddler. I don't know what he has done in your community, but in our community he has torn things to pieces. We had trucks coming from New York, we had trucks from Virginia, we had trucks coming in from New Jersey, we had trucks coming in from Delaware and all over the East, hawking and selling stuff anywhere from fifteen to twenty-five cents a bushel. I thought so much about it, and it became such a factor in our marketing problem that I tried to get some information together; I have here some clippings from THE PACKER and in order to make this very brief I am just going to point out what has been done in some of the states. (Mr. Runk then read a clipping concerning action in Missouri, another clipping concerning Tennessee and fines levied on persons selling without various licenses and permits.) The Farm Bureau of Ohio on December 6, 7, and 8, 1931, took this matter up and passed a resolution, which I am not going to take time to read to you, dealing with the problem,

*See the complete table on page 39 in this Proceedings.

asking for legislation or the study of conditions which would warrant legislation in the future. In the state legislature of Utah a few weeks ago they went after it from the standpoint of carrying diseased and infected fruits in without inspection. I believe our Bureau of Markets here in this state, with which Mr. James is connected, has authority to inspect and control the correct labeling of fruit, but has nothing to do with the control of the sale. The National League of Merchants, which met in Miami, Florida, just a few days ago, went into this problem very thoroughly. We have reports from a number of different districts in Kansas, especially Troy, Kansas, going into the details of how these trucks are just wrecking the established business interests of the community. This is what is happening in our local, our established channels of trade—we have no movement for lower grades of apples, whereas a few years ago we had demand for truckloads of second grade, or the equivalent of utility grade of fruit.

In the National League of Merchants, which met in Florida last week, as I said, they appointed a committee, a standing committee to study and investigate this proposition and take up proposed legislation. The horticultural associations of both West Virginia and Virginia have taken action on this problem within the last few weeks, have established committees to make a study of the situation and to propose legislation in the future. Our legislature will not be in session until a year from now; but if this problem is as serious everywhere in the state—and I have talked with a number of men since I came to the meeting, and they say "We are facing the same thing". I do think we ought to study this problem, not doing anything which will drive the legitimate trucking business to the wall, but instead trying to do something that will drive these itinerant peddlers out of our markets—if necessary, tax them to death.

I present this simply as a matter for thought; I have no recommendations whatever to make, other than to stir you up and get you to thinking about it, and to hope that something can be done in the future to take care of our established markets.

RESOLUTION

WHEREAS the accommodation rendered by the Department of Agriculture, in connection with the use of the meeting room and also the services of Mr. D. M. James and Mr. T. L. Guyton, are very much appreciated.

THEREFORE BE IT RESOLVED that this Association wishes to thank the Department of Agriculture and these gentlemen for their services.

H. S. Nolt, Chairman,
F. S. Dickenshied,
C. H. Bruce.

January 21, 1932.

ORCHARD COVER CROPS

F. N. FAGAN, State College, Centre County

During the past 23 years your Experiment Station has conducted in the orchard at State College, cover crop, culture, and fertilizer work. Like much similar work little valuable information developed in the early periods of the tests. The work at the college has resulted in one general problem; namely, orchard soil fertility. For fifty years your Experiment Station has conducted field fertility tests of farm crops. Much valuable information for the orchardist has incidentally developed from this work.

The cover crop system followed at the Pennsylvania State College from 1908 to 1929 was clean culture throughout the summer, seeding the cover crop in late summer. Often the seed was not sown until after August 15 and many times in the case of rye not until September. The covers used in this early period were rye, oats, rape, and millet in the non-legumes, and soy beans, cow peas, various clovers, and winter vetch in the legumes. From 1924 to 1928 the seeding dates of covers were advanced from late August to July 1 in 1928. During this change of seeding dates we noted an increase of cover grown resulting from the longer period of time the covers were able to grow. In the non-legume covers, rye and oats had to be discontinued since they are not suited for hot, dry weather which we generally have in July and August. Very often the other covers such as the clovers, rape, and millets had very little chance to make much growth due to the hot, dry summer weather, when they were not seeded until July.

However, whenever we did get a good growth of cover, we noted that tree growth did not seem to be hurt in any way by the fact that growing cover crops were in the orchard during the summer. In fact why did we not ask ourselves the question years ago, "Why should covers growing in a cultivated orchard hurt tree growth if sod growing in the orchard apparently did not injure tree growth?" To be sure, we would naturally have answered this question by saying we keep the grass cut once or twice in the sod orchard. We could also cut cover crops if they grew too vigorously.

In 1929 we advanced the seeding dates of covers to June 1 and this practice has been followed each year since that date. What were the results? First, we grew the best and largest covers the orchards have ever had even though 1929 and 1930 were the dryest years the orchards had had since planting in 1908. The covers got the benefit of the soil moisture resulting from the winter snows and the spring rains. Because of this moisture still in the soil, the covers could get enough start to weather the dry period of July and August. This was especially true of the clovers, for in the springs of 1930 and 1931 we had fine clover to turn into the soil. Second, we saved the cost of cultivation for the months of June, July and August. That alone

is worth thinking about during the present period of economic depression with the accompanying low prices for the harvested fruit. Third, the competition of the cover for soil moisture with the trees, of course, is present when we seed June 1 but we could detect no bad results to tree growth in 1929, 1930 or 1391, nor to the size of harvested fruit. Peaches, apples, cherries, plums and grapes showed no bad results developing from the lack of cultivation in June, July, and August. In fact in the poorer soil blocks of the college orchard we noted that the lack of moisture in 1929 and 1930 killed the cover crops while the trees continued to grow, for in many blocks the covers growing under the branch spread, died while in the middle of the rows the cover continued to grow. This indicates that the tree will care for itself in competition with the cover crops. Fourth, with only this short period of cultivation, that is late April and early May, we reduce the destruction of what organic material we turned into the soil from the year before. Soil Science in the last thirty years has taught us that continued cultivation of the soil tends to hasten the decay of soil organic matter.

With the old practice of June, July, and August cultivation, we were destroying what little organic material we had grown in the cover of the preceeding year. Early seeding of covers will continue in the Experiment Station orchards until harmful effects show up, if they ever do; your Station workers do not believe injurious results will follow from such a practice.

Early seeding opens up the subject of the best covers to use, The non-legume covers suited for this work are the millets. Sudan grass, sorghum and even corn broadcast. Likely others will develop as time goes on. The legume covers fit well into this system. There is no question at all in the minds of state agricultural experiment station workers and farmers that the growing of clovers on land ever hurt the soil. When we seed clovers early they get enough growth to carry over their life during dry periods of summer and are well rooted to withstand the following winter. Mixtures or one alone of the cheap clovers such as crimson and biennial sweet clover seeded in late May make a good growth and usually winter well. Even during the dry summer of 1930 the sweet clover seeded in late May and early June pulled through and produced a heavy stand in 1931. Soy beans seeded in late May made good covers in 1930. It is needless to say that the lime requirements must be satisfied if one expects to grow clovers and it is also needless to say that a soil where clovers can be grown annually will not become poor from such a practice, where a good standing results.

The work at the Experiment Station indicates that it is just as important to fertilize the soil for the benefit of the cover as it is to fertilize the soil for the direct benefit of the trees. There are very few soils in the orchard districts of Pennsylvania where grain or grass will not respond to applications of phosphate fertilizers.

There are strong indications in the work at State College pointing to the practice of early seeding of covers in young orchards. The more covers grown and incorporated into the soil during the early years of the orchard will tend to offset the smaller amounts one may grow after the trees occupy more of the soil with their roots, and shade the soil with their leaves. In older orchards, covers may make rather a small growth due to low soil fertility, competition with the tree roots for moisture, and shading. Mixed sweet and crimson clovers have made good growth in 22- and 23-year-old apple orchards where the trees fully occupy the soil, when seeded before June 1. Even early spring seeding would be satisfactory in establishing clovers for the first time. It is possible to grow alfalfa in older orchards. Millets and Sudan grass seem to make good growth even in older orchards where shading is rather heavy. One must remember, however, that cover crop growth depends, even with early seeding, on soil fertility and water holding capacity of the soil. But with early seeding the cover will get the benefit of the higher moisture content resulting from spring rains and winter snows.

Heavy covers resulting from early seeding may have to be mowed down during midsummer to lessen the harvesting difficulties. Sudan grass, millet, and the clovers mowed in midsummer with the cutting bar set high, will produce second growth from the stools but still not enough growth to interfere with fruit harvest, except on very stony soils.

Any cover that lives over the winter months as alfalfa, clovers, or grasses, may rob the nitrate from the soil in early spring just at the time the trees most need this element, during the period from when the trees are breaking bud through blooming. Heavy stands of covers under the trees can easily be checked but not killed by discing or by the use of a heavy spring tooth harrow. This will prevent the cover from taking as much nitrate from the soil. Where clovers or alfalfa are being used for covers, annual seeding may or may not be necessary following the spring discing or harrowing, depending upon the severity of cultivation. If the operation cuts up the growth to such an extent as to uproot or kill part of the cover, then it would be advisable to broadcast four to six quarts more of seed to the acre. It is well to remember that native grasses will gradually run out legumes if some means of destroying the grasses, such as discing or harrowing, are not resorted to. By annual harrowing it may be possible to put off for many years the much more expensive job of plowing.

From this discussion it will be seen that the purpose of cultivation in the orchard may be reduced to two main points: First, the checking of any rank growth of cover living over the winter so that the cover will not take nitrates from the soil at the time the fruit tree needs them; second, the preparation of a suitable seed bed to receive the new seed.

The main object of a cover crop is to supply organic material to the soil. If it cannot be grown in the orchard, then it may

be grown elsewhere and hauled in the same as manure. By proper handling and fertilization beginning when the orchard is young, there is no reason why enough cover cannot be grown each year to hold a satisfactory organic supply in the soil. This cannot be done by trying to grow non-legume or even legume covers without satisfying such crop's soil and fertility requirements. This cannot be done by following clean cultivation from early spring through June, July, and half of August.

Experience with general agricultural crops shows that the need of crop rotation is an established fact. The orchardist may find it desirable to follow a rotation of different cover crops over a period of years. In other words, the continuation year after year of a millet or Sudan grass cover may result in an unfavorable soil condition resulting in a poorer growth of cover which would lessen the annual amount of organic material returned to the soil. What rotation will be needed is a question for the future. I doubt whether with the legume covers this rotation will be necessary but legume insects or diseases may develop to the extent that we will find it necessary to practice rotation systems of covers, taking into the rotation one year of millet, or one of Sudan grass, or one or two years of our native grasses, and back to beans, winter vetch, sweet clover, crimson clover, or mixtures of legumes.

QUESTION: Did you use rye as a cover crop?

MR. FAGAN: We had to cut out rye and oats for early seeding; they are cool weather plants. When we sow rye and oats early there is rust in both of them, with the result that they do not amount to anything. Therefore, rye and oats have to be discarded for seeding around the first of June.

QUESTION: Was the soil acidity high?

MR. FAGAN: We checked the acidity. The soil has been limed. We are trying to keep the soil reaction at the point where the acidity can not enter as a factor. We have to lime it again this year.

QUESTION: If, after meeting the lime requirement and having a good stand, what fertilizer would you be inclined to use with sweet clover seeding, with that history?

MR. FAGAN: If you want to use sweet clover under such conditions there is little chance of your having any trouble getting a stand. You will probably have to continue using some nitrate for the benefit of your trees, even though you grow sweet clover.

QUESTION: How do you sow cover crops?

MR. FAGAN: We generally drill. In the older part, where we can't do that, we broadcast and then harrow it in with a spike-tooth harrow, with the teeth sloped back. A cultipacker is an ideal tool for this and you can get a seeder fitting. They make one with a box seeder—even with the fertilizer attachment—that will fit right back of the cultipacker with the seeding tubes running in front of the rear discs.

QUESTION: What is the difference in using sulphate of ammonia and nitrate of soda?

MR. FAGAN: You must keep your ammonium sulphate applications offset with lime as you need them. If the soil becomes so acid that you can't grow a cover, you will then have to offset the acidity with lime or pulverized limestone.

QUESTION: How about fertilizing cover crops?

MR. FAGAN: From past experience we can say that without any fertilizer for the benefit of your cover, a non-leguminous cover is not going to give you enough growth by seeding it in late or mid-summer to keep your soil in good condition. we know we must fertilize if we are going to use non-leguminous cover crops. We know that soil is not going to become poorer as long as we can grow heavy stands of clover.

QUESTION: When should rye be turned in to get the greatest amount of green manure?

MR. FAGAN: The soils men say before it begins to get stemmy and too tough to rot up.

QUESTION: How long do you let Sudan grass stand before you mow?

MR. FAGAN: If you get stands of Sudan such as I have seen in places, you will have to mow it because if you don't you couldn't get your pickers to go through.

QUESTION: How many years can you keep sweet clover?

MR. FAGAN: It is a biennial plant. It will grow a large root this year; next year that same individual plant will grow, bloom, and seed. Then that stalk is done for. But, if it makes seed, that seed will come up the following spring to go through the same cycle. Of course very few men let it grow up in a bearing orchard on account of the harvest problem. Understand, here's another point that we may run into. By growing such heavy covers through the orchard we may be getting so much stuff in there that we may increase our insect and disease problems. We had it in a part of the college orchard in 1931, where the grasshoppers cleaned off the lower leaves on the apple trees in a tall millet cover crop.

QUESTION: With the sweet clover in peach orchards, do you still recommend nitrate for the trees?

MR. FAGAN: I would, if the trees were not growing vigorously enough.

QUESTION: Do you think you would increase the amount of brown rot with such a heavy cover crop in peach orchards if there happened to be a wet July and August?

MR. FAGAN: We have controlled brown rot by spraying and if we had a wet season and the chances of an epidemic of brown rot in the orchard continued to be good, we would probably run the risk of mowing and controlling the brown rot by spraying. That brings up other orchard economic questions. I wouldn't be surprised that, through the drought-affected sections of Pennsylvania,

in the next two or three years, our experiment station workers are going to be asked the question: "What's the matter with these trees? They are dying off." And if you come up to State College a year from now, maybe two years, you will see parts of the orchard standing there, dead. While in general they pull through year after year there are parts of them with poor cover crops or where no covers have been put in, and where we have added nothing from the outside. Probably we can't grow much cover crop in a bearing orchard. If so, we should take a piece of land outside and and grow a lot of cover crop, mow it and haul it in. Manure is out of the question, but you can grow some other stuff and haul it in there at low cost, then plow it in next spring.

QUESTION: Do you consider soy beans a satisfactory and economical cover crop?

MR. FAGAN: We have some prices on seed. I received them in December, and they are expensive,—a little more expensive than some of our clovers. They will not winter and furnish something green in the spring. Our soils men say that the green crops plowed down act better in the soil than a dry crop, for the simple reason that your soil bacteria must take nitrate out of the soil to give them energy to break down any dry, strawy material. The bacteria break down the green cover crops more easily. Crimson clover and sweet clover can be purchased this spring at about five dollars a bushel; six to eight quarts to the acre is not a prohibitive seeding.

QUESTION: What would happen by discing the soy beans in the fall before they die?

MR. FAGAN: They probably would decay a little faster. There would be nothing wrong with it, as far as I can see.

QUESTION: Is there any chance of self-reseeding by not discing until spring?

MR. FAGAN: They will reseed themselves if seed matures provide they do not germinate the same as some of our other seeds—a little early and then freeze.

QUESTION: Which variety of millet will give the rankest growth?

MR. FAGAN: We have had pretty rank growth with Japanese, German, and Hungarian millet. I would say most of the millets that we have been growing for hay will succeed in the north.

QUESTION: Do you delay the plowing in the spring in order to get some green material to turn under?

MR. FAGAN: Until late April or the middle of May.

QUESTION: Does a partial discing in the spring prevent the clovers from competing with the trees at blossom time?

MR. FAGAN: That is about what it amounts to. If your clovers are heavy, you may want to check them. The difficulty is to keep them from taking the food that you are putting on for the trees.

REPORT OF INSPECTION RATE COMMITTEE

PAUL THAYER, Chairman
Carlisle, Cumberland County

This Inspection Committee was appointed to see what could be done regarding the lowering of the cost of the fruit inspection. We met with the Secretary of Agriculture, who expressed a willingness to cooperate with us as far as he could. His point of view might be of interest to you: He feels that the fruit inspection is a service to the grower and in only a small way is a public benefit, and in that regard it is different from some of the other inspection work, such as, for instance, the T. B. work and other work of that nature, whereby the public is protected. In this he simply feels it enhances the value of our fruit to put on "U. S. No. 1," and for that reason he felt that the service should bear the expense. However, he said that by an arrangement within the Department, they found that they probably could save a little money by a rearrangement of the work by the use of state-owned cars instead of using private cars, and that he felt they could afford to reduce the expense somewhat. We put it up to him that we wanted to benefit the large growers by cutting down the price per day, and the smaller grower by cutting down the price per car. The best that he could gives us was to cut off the travel cost—and those of you who had fruit inspected this year know that you are charged a flat rate of five dollars per car without any additional travel cost. We report that we got that concession from the Secretary, and that he was very glad to give it.

SHELDON FUNK: Mr. Thayer and I don't want to take much of your time, but I do believe that the Pennsylvania peach growers in particular should take some action at this time in endeavoring to have the freight rate reduced—and possibly have refrigeration charges reduced also. Virginia growers have just received quite a considerable reduction in freight; I believe that, instead of peaches being considered first-class, they are now shipped out as sixty percent of first-class in Virginia. This makes a considerable reduction. In studying the case of some points in Virginia, the rate to New York City is not very much greater than it is from points in Pennsylvania—that is, in southeastern Pennsylvania. Railroads, naturally, do not want to reduce freight rates more than they must, but, on the other hand, I am sure that the railroads are beginning to realize that unless they do something and do it pretty quickly, they are going to lose practically all of their peach traffic close to the larger cities. Last year we had men who were willing to truck in refrigerator trucks into Boston at the same rate that the railroad companies were charging. And it looks to me as though this would be a very opportune time to take up this matter. Since the Virginia people have gotten it, I see no reason why

SECRETARY'S NOTE—This committee has been continued. Another reduction may be effected this year.

we should not get the same classification. It's entirely possible that the railroad people would be willing to go along with us in an endeavor to hold some of this traffic that they see they are losing. And I believe that the Pennsylvania growers at this time should take some step in that direction—a reduction in the freight rate and also a reduction in the refrigerating cost. The cost of refrigeration runs from forty-five to sixty dollars—that is, in any case, and I think that is general—and that I feel is really an exorbitant charge. It isn't a great deal more from very much more distant. I should like you to consider that matter.

PRESIDENT CRISWELL: You have heard Mr. Funk's remarks. I think the main thing here is to get a committee authorized to inquire into and take such action as they see fit—even going to the extent of—if necessary—soliciting and raising, by private subscription, among us funds to handle the matter. Will any one make such a motion?

Upon the motion of Mr. Greist, which was properly seconded, it was unanimously decided to appoint a committee to inquire into the peach rates and take such action as its members find advisable.

Secretary's Note: The peach rate reduction benefits Pennsylvania; it is in effect March 1. Refrigerating rates are still the same,—Funk says we may get action on them.

A FEW FRUIT PRIZES AT HARRISBURG

What the Customer Receives

CLASS 73 COMMERCIAL BARREL FIRST PLACES ONLY

Paragon	Guy L. Hayman	Northbrook	Chester
Rome	Geo. A. Goodling	Loganville	York
Stayman	Dan Sherly	Cashtown	Adams
York	C. J. Tyson	Gardners	Adams
Baldwin	Guy L. Hayman	Northbrook	Chester
Stark	H. R. Worthington	West Chester	Chester
Ben Davis	W. E. Grove	York Springs	Adams

CLASS 74 COMMERCIAL BUSHEL

Baldwin—Ben Davis—(Gano and McIntosh no Firsts)—

Rome	Geo. Oyler	McKnightstown	Adams
Stayman	Arthur Rice	Biglerville	Adams
N. Spy	Mt. Valley Fruit Farm	Mifflinburg	Union
York	W. E. Grove	York Springs	Adams
Stark	N. E. Mowery	Mechanicsburg	Cumberland
Smokehouse	Karns & Davidson	Chambersburg	Franklin

OTHER PRIZES

CLASS 75 COUNTY EXHIBITS 1st—Delaware; 2nd—Franklin; 3rd—Lancaster; 4th—Chester, and 5th—Snyder.

Gabriel Hiester Cup Awarded to Franklin Co.—Most members placing.

State Horticultural Association Cup awarded to Harrison Nolt, Columbia, Lancaster County,—Best bushel in the show.

Important! The judge observed privately that while bruises and stem punctures may not be the growers' fault, apples do not become sadly polluted with scale or scab except in the orchard. Also, picking off the tiny scale insect itself still leaves the red ring and it is still considered insect injury.

If you looked over the exhibits, you will know what the judge meant.

MARKETING THROUGH CHAIN STORES

E. DANA SUTLIFF
Shickshinny, Luzerne County

I note that the principal part of your program this afternoon pertains to marketing. and there is another word that I would like you to take into consideration with that word "marketing." And that other word is "salesmanship." Now, through the agency of State College and the county agents, we are able to produce good fruit but if we can't get the price for that fruit, the work has been in vain. All the work from State College is on the producing end, and the big part of the business is selling, and unless you can sell that fruit profitably, you will have to use red ink in your bookkeeping. Now, what is it that constitutes salesmanship? Before I go on with this matter of salesmanship, I want to say that my problem will fit the growers of two to five thousand bushels of apples.

I am going to relate a little incident of just a week or two ago, I saw a man in the market and I looked his fruit over; I looked the man over. I thought, "That man won't sell that load of fruit." I saw him two days later, and I asked him, "How did you find the market?" He replied, "I took twenty bushels of apples to market; I worked hard all day, and I sold four bushels; the rest I brought home." What was the matter? Was it that man's fruit? I looked carefully at his fruit; it wasn't graded as it should have been; possibly twenty per cent of his apples should have been taken out, and then he would have had a nice product*. But here! I am going to describe that man to you. To start with, that man's hair had grown down to his coat collar. I dare say that his face had not felt a razor for two weeks—possibly longer. The edges of his collar were all frayed

*SECRETARY'S NOTE—Looks like State College still had some opportunity for missionary work in the production end.

out; he was wearing a pair of overalls that the ladies wouldn't have wanted with them at the table. He had on an old pair of arctics that were well-stained with barnyard juice. His apples were in old black crates. Could you expect that man to sell apples? If he had come to your door and tried to sell your wife apples, would she have bought? No!

I was in a store the other day, when a bright, energetic-looking man selling a specialty came in. In these times you might think that was a hard thing to put across, but I want to tell you how that fellow went at it. We are all susceptible to flattery, and flattery is a valuable asset in salesmanship, if you don't carry it too far. Use such flattery that may be understood as a compliment. The first thing that young man did was this: He stood looking at the shelves in that store, and he said to the merchant, "What a neat arrangement you have for your goods!" And he began to talk trade with the merchant,—that is, in regard to different brands of goods. He didn't tell the store man at first what he was representing. But finally he broke the news to him and told him what he was selling. The merchant said to the young salesman, "I don't want to handle that; money is scarce, and I couldn't sell that." However, the salesman, with ingenuity, persuaded the merchant that it was a good proposition, and he placed that goods in the man's store.

In contrast with that, on the same day I saw a salesman in another store. He came in with a long face, and he told how hard the times were—they were getting worse and worse. That man was selling staple groceries, and the merchant was actually low on some of the items that that fellow sold. And you could see a different expression on the countenance of that merchant while this salesman was talking to him. Did the salesman get an order? No, he did not get an order! Do not have a good product alone, but first let your appearance be neat and clean! A smile is one of the most valuable assets that there are in salesmanship. And the successful salesman is the one who takes advantage of every opportunity. Another valuable asset to anyone who has anything to sell is the ability to tell a story. Get them from your papers, magazines, and make use of them when you go to make a sale, for they are a big help.

Now I am going to get down to the meat of my address—"Marketing Apples Through Chain Stores." We are told today that the chain stores handle forty per cent* of the groceries that are sold at retail. The growth and volume of their business is tremendous. But what about the fruit? Are they selling forty per cent of the fruit? They are not! At least not in the country where I come from. The independent merchant has it all over the chain store in selling fruit. I sell to both, and the independent has a decided advantage. Now there is a reason for that.

*SECRETARY'S NOTE—Chair stores today are handling east of the Mississippi River about 50 per cent of the perishables, according to B. A. Leeper, general manager, National Fruit and Vegetable Exchange.

To start with, you should know how the chain stores are managed; they have their central office, then they have a traveling man that has some fifteen stores that he visits each day. And then they have the store managers. Now invariably,—I am safe in saying,—seventy-five per cent of those store managers are young men and young women from the towns in which those stores are located. They get their training in the store, but they do not know anything about fruit. I know a lot of them to whom an apple is an apple; I know that to the traveling manager an apple is an apple; and I know that to some of the produce buyers for these big chain stores an apple is an apple,—they do not know apples and they have a lot of undesirable fruit unloaded on them. For two years in succession one of the chain stores in our section has had two carloads of Stark apples in October. You all know what a Stark apple is. It is all right now, but would you want to eat one in October? No! And neither do the people in town! They take those apples and distribute them around to their stores, and they sit there, and they sit, and they can't sell them. I have seen York Imperial by the carloads in our market as early as October 5; they would be put out and sold by the chain stores. It is any wonder to you that they are not selling apples?

Now I am going to tell you what I did with one of the chains. Three years ago my son, who does considerable trucking, had about three acres of cauliflower; went to market one day, but came back rather discouraged. He had thirty dozen cauliflower.. and he said, "Dad, I didn't break even on that cauliflower. I want you to help me." I said, "All right." I thought of the chain stores. I went to the Wilkes-Barre manager, and I said, "Now, look here. We have some fine cauliflower; it's high quality, and we will stand right back of our product. What I want to do is to take your Nanticoke stores, furnish them cauliflower every other day. I will guarantee the freshness of it. If there is any carried over two days that shows any signs of deterioration, I will simply take it out and replace it."

"Well," he replied, "that's something new. We have never done anything like that before; but you can try it."

So I did. They took every bit of cauliflower that we had. I took out from their stores possibly three dozen cauliflower until the season was over. That was something that made them place confidence in me, because they knew that I did just exactly as I had agreed to do. They sold more cauliflower in those few stores in Nanticoke than they did in any of the forty other stores, the manager told me that he had under that branch, and they made some money from it. I am still doing business with that same store. They had confidence in me, and I have tried not to betray that confidence; I have kept that up.

So finally I made up my mind it would be the easiest way to market my apples. I went to the same general manager. I said, "Now I have another proposition to put up to you. You're not getting the fruit trade in Nanticoke; I would like to build

up that trade and make you some money,—take a car of our fruit, too." "Well," he asked, "what is your proposition?" I replied, "My proposition is this: I will pack my apples in bushel baskets for you, and I will leave those at the stores. As fast as I learn the requirements in each neighborhood, I will guarantee the sale of the apples. If any apples deteriorate, I will give allowance for them, you to furnish me with empty packages." "Well," he said, "go to it."

Here is something that I found. In a local market such as we have, we need a great many varieties. It took me some time to find this out, but I found that some few stores could sell Greenings; I found about eight out of ten that couldn't sell Greenings—there wasn't any use in putting them off there. I had stores that would take the old Gilliflower as high as ten bushels a week; I had three stores that I left Gilliflower in, and they couldn't sell an apple. So there it was. But, by having a great many varieties of apples, and learning the neighborhood, I have marketed practically my entire crop to that chain store ever since.

Now, in regard to price, you may think that a chain store is a price-wrecker. They try to handle everything just as reasonably as they can; but they don't want to handle anything unless they make money on it. Last Fall, as soon as my apples started, I went to them and I said, "Now my apples are started. How about price?" "Wait a minute," the manager said, then got me an invoice of a carload of U. S. No. 1 apples at sixty-nine cents a bushel laid in Wilkes-Barre. I saw the apples; they were all right, too. I replied, "I can't do it. I can't bring you any apples for less than eighty-five cents." He declared, "It's too much money. We get eight cents for that package; that cuts the price of those apples to sixty-one cents. You are asking us twenty-four cents more, and we are going to give you an empty package. We can't do it this year." It ran along for ten days, then I had a telephone call, and the manager said, "Start to deliver apples." One of those cars was a car of Stark apples. They took them out to their trade and they couldn't sell them. Now, with the apples,—as you heard one of the speakers remark here this afternoon,—for this wholesale shipping trade, they must be hard; whereas, if you have a local market, you can market your apples in season. You can build up a reputation on your fruit. One of the stores on Main Street in Nanticoke got a box of western apples before Christmas; on last Tuesday (Jan. 12) that store still had half a box left.

They were fancier than mine, I will admit, but the salesgirl said, "As long as your apples are in here, the trade will take your apples in preference to paying the price at which those western apples are selling." So that, if you want to sell apples to the chain stores, or to any other store, you have got to gain the confidence of the person who is going to buy your apples. Don't betray that confidence. Another thing: If you are doing wholesale business, don't do a retail business. When anyone

stops me on the street and asks me for a bushel of apples, I simply refer him to the nearest store handling my apples.

ILLINOIS GROWERS GAIN BY REDUCTIONS IN FREIGHT RATES*

Freight rate reductions on Illinois peaches will open a new outlet for the 1932 crop into interior cities of Pennsylvania, New York, and other eastern states, according to the Illinois Agricultural Association. This action, sought by organized peach growers of southern Illinois since early last summer, will mean a reduction of from $23 to $99 a car on freight, opening a market for an estimated 1,000 cars of peaches annually in a territory not reached heretofore. The decision cuts approximately one-third from the former rates on peaches and is effective anywhere on Central Freight Association lines, which extend as far east as Buffalo and Pittsburgh. It has the effect of placing Illinois rates into this territory from 6 to 8 cents below the rates from the southeastern peach belt. Similar adjustments are being sought on lines reaching into the New England states to open additional territory.

THE FUTURE OF THE APPLE INDUSTRY

HON. HARRY FLOOD BYRD
Winchester, Virginia

When history records the happenings of the year 1931, it will probably be said that it was the worst apple year that we have ever known, but, of course, we apple growers are not in a class by ourselves in that respect. Not only did we have the world-wide depression to contend with, when by the government's estimates we were supposed to have had the second largest crop in our history, but also during the harvesting period we had the collapse of the English pound, which, insofar as my particular district is concerned, created a very difficult situation for us to meet. And even the weather has been against us, because we had those hot spells during the harvesting season. Then, during December, the warm weather made it possible to market cull apples—apples which otherwise would not have been placed in competition. Notwithstanding these conditions, we in Virginia feel optimistic about the future of the apple industry, because we believe that it is on a sound foundation, insofar as the fundamentals are concerned. Consider that in 1900 there were 203,000,000 apples trees of all kinds and descriptions in this country, while in the census of 1925 this number has been reduced to 100,000,000—less than half in a period of twenty-five years. So far as commercial trees are concerned, they have

*From "State and Federal Marketing Activities", Bureau of Agricultural Economics, U. S. D. A.

been declining at the rate of about one million trees per year. When you recall the fact that it takes from ten to twelve years for apple trees to bear heavily, I believe that the time is soon coming in this country, when we will have little fear of an over-production of apples, except in a very occasional year, such as, the year that we have just gone through. So we feel that there is a great deal in the future to look forward to, especially by reason of the fact that our crop is cleaned up every year, while producers of corn, cotton, wheat, and some other things, have surpluses carried over from year to year. But notwithstanding this favorable outlook for the future, there are very grave problems that we must meet for the immediate future of our industry. I came here this morning, in the hope that some practical method could be found whereby we could cooperate together in this great Shenandoah-Cumberland region, because I want to say to you fruit-growers that there is no other part of America that has the advantage that we have in the production of apples. We can produce as high a grade apple as any other part, and we have the tremendous advantage of the accessibility to eastern markets and a low freight on seaboard export. When you consider that it costs the far-western apple-growers seventy-five to eighty-five cents a box to deliver their apples in New York City, while it costs us only fifteen cents a box, it gives us an enormous advantage.

I think the time has come when we must put up a better grade of apples so as to compete with the apples from the Northwest. My brother and I had an experience this year; we were able to sell some fancy Stayman, delivered in New York—15,000 bushels—at a price equal to that paid for extra-fancy Stayman from the Northwest, we paying fifteen cents freight rate, the Northwest paying seventy-five to eighty-five cents, depending upon whether or not there was refrigeration.

The chief problem is in our hands to solve, and if we don't solve it, then we deserve to be forced out of the apple business. I mean that we must grow better apples; that is solely and entirely within our own hands. I have been in the apple business for 28 years, and in that long period I have never made any money on Unclassified or even No. 2 apples. They may pay the carrying charges; they may pay the cost of harvesting and the cost of growing and spraying, but there's no profit in any apples except No. 1 apples. And, as I view the situation today, from a growing standpoint, the problem that all of us have is to increase very greatly the percentage of No. 1 apples that we produce from our respective orchards; and our profits will be determined by the percentage of No. 1 apples as compared with apples of off-grades. I want, out of my experience of 28 years, to give just a few of the principal ways, in my judgment, of increasing the percentage of No. 1 apples.

Now, the difficulty that we all have today in getting No. 1 apples is mainly in color. That is the most difficult problem that we have to solve in our section, especially with the York

Imperial. And I want to say this to the Pennsylvania apple growers, that while we have specialized in the York Imperial, we are willing to admit that the Pennsylvania York is the finest finished York that is placed on the market; that has been shown time and time again by the fact that you obtain higher prices for Pennsylvania Yorks than we do for Virginia Yorks. Having in mind the object of increasing the color on red varieties, because that is what it is coming to in every market in the world, the most important thing to do first is a thorough pruning; it is to prune more than we have pruned in the past. I don't mean an excessive pruning, to the extent of stripping the trees of the fruit spurs, but I mean that there must be sufficient sunlight let into the inside of the trees, so as to increase the color, because we must bear in mind that the only two things that will bring color to apples are first, maturity, and second, sunlight. And the apples are not going to color where you do not have the proper pruning. So the first thing we should do is to give our trees a thorough pruning.

With respect to spraying, that is so thoroughly understood that I will not refer to it, except to say this: That the greatest mistake that I have always made in spraying is to omit any spray that is recommended by the agricultural extension service. When in doubt, spray! That is my advice. Don't omit, by reason of the cost or anything else, a single spray that is urged upon us by those who know better than we do as to when and how to spray for the different pests that we must control.

The next great problem confronting us, as I see it, is the treatment of the soil, and, as to that, there is very little information available. By that I mean soil treatment so that we can obtain the maximum of production and maximum of quality at the same time. It's a very difficult thing to do, because we know that when we stimulate the trees and bring about increased bearing, we may reduce the color. I am convinced, over long experience with nitrogenous fertilizers, that while they are necessary to maintain production, yet the use of nitrate of soda and other fertilizers of this kind reduces the color because it extends the growing season of the apple, increases the leaf surface, and to that extent shades the apple and reduces the color. I do not mean that we should not use nitrate of soda. I have used it extensively all through these years. But this year I have determined to reduce the nitrate of soda in the hope that I can obtain a larger percentage of No. 1 apples, insofar as color is concerned, than I have in the past. Then, I believe, we must come to thinning as a regular orchard practice, that we must thin to obtain color and to obtain a uniformity of size.

Last year, for the first time, my brother and I attempted to prop all of our trees in our 21 orchards, which I think had a great advantage, lifting up the apples that hung over each other, and bringing color to those that were underneath. In other words, I think that we must put every thought and attention that we have to the idea of, first, growing apples free of insect

and disease injury, and, secondly, of growing well-colored apples of the red varieties. I think the time has come, by reason of the reduced export demand, that we must expect that we can obtain a fair price only for red apples that are supposed to be red and which present a good appearance when they are offered on the markets on the other side.

Now, as I say, the first great problem confronting us is to grow better apples. The next problem is to pack the apples better. I think probably we are among the worst offenders this year in the condition that existed. There is no doubt about it that the apple-growers of the East—I do not say they deliberately did it, nevertheless they accomplished it—virtually destroyed the European markets for, possibly, a period of thirty to sixty days by dumping on these markets the most inferior apples that could be imagined. In other words, grades of apples that were not marketable in this country were sent to the European markets and England, and those markets were virtually destroyed, insofar as any profit was realized by the growers, for the space of sixty to ninety days.

Now I think there ought to be some cooperation between us; I believe that all the growers can cooperate together. And I come to you, not for the purpose of criticizing Pennsylvania, because as far as I know Pennsylvania is not especially to be criticized; but I come to apologize for my own state of Virginia, because I think she was more responsible than any other for the situation that occurred this year.

There is a great deal to know in regard to packing apples. As for us, we have packed for export for years, and we know that we must pack our apples tightly. No matter how fine the package is, if they arrive slack on the markets abroad, they will not obtain a good price. I have been using shredded oil paper. Even if you do not export the apples, it is a very advantageous thing to do, because it gives a much better appearance to the apples, a refinement, which I think you are compensated for by the increased price. I think it is absolutely essential where you store your apples, because it is the cheapest insurance you can possibly obtain against scald. And today there are scalded apples not in shredded paper, but I have not as yet, seen scalded apples in shredded paper properly used. So far as my brother and I are concerned, we expect to use shredded paper on all of our apples, whether they are shipped immediately to the market or stored for later shipment.

Now, of course, the facing is very important, and it is not necessary for me to tell you that. I have always tried to get the best apples of that particular grade for the face, and I do not see any reason to change that practice, although, of course, the apples should not be too much overfaced*.

I believe, too, the time has come when we must size our apples in quarter-inch sizes. In the first place, as a selfish

*See the letter on page 79 from the New York State Bureau of Markets.

proposition, if we have the grading machinery to do it, it would be a wise thing to do, because there are less apples in a barrel that are uniformly graded than where the sizes vary, so that the holes in between them can be filled up by the smaller sized apples. Mr. Ralston, who represents the Virginia State Horticultural Society, has written us, advising that all of our export shipments be put up in quarter-inch sizes in the future. Now there is nothing else that I can say about the packing of apples.

Now, those two problems I have mentioned that lie within our own capacity to solve are, first, to grow good apples, and, second, to pack them better.

There is another great problem confronting us, and that is, we must advertise apples to the world and to the American people. Consider that in the past ten or fifteen years, many new fruits have been thrown on the market in competition with apples. Take the tremendously increased consumption of grapefruit, oranges, plums, and peaches. Some of the oldest of you growers will remember that years ago the apple-growers had virtually a monopoly of the fruit trade, but now we must compete not only with other apple-growers, but with these new fruits of very attractive appearance and flavor that are being constantly placed on the market. And I hope that some plan can be worked out, whereby the apple-growers, if we do nothing more, can advertise the apples from the Shenandoah-Cumberland region—this production of the millions of barrels—that we can work out some plan to do that to advantage.

I want to tell you of an experience we had in Virginia last year. We got through a plan to assess each apple grower two cents a barrel. We collected, by reason of it, between fifteen and twenty thousand dollars; not all of the money has been collected yet. We used that money to send a representative abroad—Mr. Ralston—who is one of the most capable men we could secure to represent us in Continental Europe. He has done a great deal to smooth over the great difficulties that confronted us this year. We used the balance of it to advertise Virginia apples in the South by means of full-page advertisements, and by radio and other means. Of course, Virginia can do very little alone in this matter, and we can accomplish very much only if all the apple-growers join, but at least the apple-growers of the East and, more especially of this particular section. And I hope that you in Pennsylvania will very carefully give thought to some plan whereby we can cooperate in this and other matters. We passed a resolution at our horticultural meeting held in December, urging that the states in the East cooperate for these matters, and requesting me, as president of the Virginia State Horticultural Society, to call a meeting of the presidents of all of the other societies in the East for the purpose of conferring about these and other matters. I have written to the different presidents, and we expect to have a meeting very shortly in Washington. I hope very much that we may work together. Virginia doesn't desire to go alone in advertising or anything

else. We realize that all of our fortunes are linked together, that we can either succeed as a whole, or fail as a whole; we are prepared to cooperate with you in every practical and feasible way,—prepared to guarantee certain subscriptions or in any other way that this committee of the presidents of the different societies could devise.

Now I think it is hardly necessary for me to say anything more about advertising in this day and age, when it is the chief medium of increasing the sale of any product, because I believe that the progressive grower of Pennsylvania, if there could be any practical way to bring it about, would cheerfully cooperate. Of course, the great difficulty we had in Virginia lay in attempting to collect the money from the individual grower. The Western people do not have that, because they have their great selling organizations, and they can assess so much per box for advertising and deduct it from the sales as made. Up to this date we in the East, have not gone into cooperative marketing to the extent that we are able to do that. But there is no reason why this should not be done. In Virginia we had each individual grower sign a statement that he would contribute to the horticultural society two cents on every barrel of apples that he marketed, and so far we have had no difficulty whatever in collecting this sum. And we hope very much that we may be able to cooperate with Pennsylvania and work out some solution of this problem.

The next great problem confronting us, as I see it, is some way to prevent the loss of our foreign markets. I am going to talk frankly about this matter, and I do not want anything that I say to have a political inference, because while I am a Democrat, I have no desire in any way to mix up politics with my business. Our foreign markets are the greatest single difficulty as I see it, confronting us in the future. I do not mean to infer that these things that have occurred only recently in the restriction of our foreign markets are in retaliation of the tariff restrictions placed in this country. But I make this as a statement of fact, that prior to the last eighteen months that there wasn't a single nation in the world that imposed a single restriction upon the importation of American apples. Within the last eighteen months these things have occurred: The Argentine has virtually excluded barreled apples by the most drastic regulations conceivable, with which it is impossible for us to comply. They provide that you must give a certificate that there is not even a suspicion of an insect injury of any character or description; further providing that, if such injury should be discovered, they have the privilege of confiscating these apples and charging us the cost of dumping them into the ocean, or wherever they do put them. And then, furthermore, they require that every individual apple be wrapped in oiled paper. To give you an idea of how this restriction affects an individual grower, such as my brother and I, in the year 1930 we sold 25,000 barrels of Ben Davis to go to Argentina, for four dollars a barrel obtained

in cash as the apples were shipped. This year we sold one car to go to Argentina, and we got three dollars and fifty cents a barrel, after wrapping each individual apple, after examining each apple, to see that there was not a single insect sting of any character or description upon that apple. The result was that Argentina last year took 250,000 barrels of apples from America, and this year only 5,000 barrels. Now that is the greatest market that our country has for Ben Davis.

You are faced with the restrictions that have been placed upon the importation by England, and we may as well face the cold fact that England, within the next tv elve months, will unquestionably put a tariff on apples in addition to the restrictions that they have placed, and when that is done, we shall have received, so far as export trade is concerned, the worst blow that we have ever had, speaking directly of Virginia and this particular section.

Then Denmark has within the last thirty days placed a tariff on apples, of ten dollars a barrel —practically prohibitive! Spain has completely embargoed American apples; Portugal and Peru and Italy have done the same. France has greatly increased the tariff; so has Germany. Netherlands has not only increased the tariff, but has provided the most drastic regulations with respect to insect infestation.

That is the situation that has occurred in the past eighteen months. Prior to that time throughout the long years we had been able to ship the American apple anywhere without any restriction whatsoever placed upon it. I am not going to analyze the causes as to why these conditions have come about. I am simply stating the facts as they exist, because I, myself, have been shipping for years seventy per cent of my crop to these markets. Let us think for a moment what the export trade means to the apple business. We normally export twenty per cent of the apples grown in this country; twenty per cent of them are exported to some foreign nation. If that twenty per cent is forced on the domestic markets, no matter how greatly the crop may be reduced—unless it is a abnormally low crop—it will virtually destroy the profit that we may have in the domestic market. All of our prices are determined by export prices. England takes sixty-three per cent of the apples that we export; Germany takes about twenty-five per cent; France, about ten per cent; and so forth.

Now, what can we, as apple-growers, do to relieve this condition? I am frank to say, perhaps, we can do little. There is one thing that has brought about this situation, and I would like to bring it to your attention, because there is something we can do. One thing that has brought about these restrictions and retaliations, or whatever they are—entirely independent of the tariff—is that the American government has been exceedingly unreasonable in the importation of other foodstuffs coming into this country—with respect to what is known as the "quarantine regulations." I had an example not long ago from the

Argentine—where grapes alleged to have been infected with the Mediterranean fruit fly, were shipped to this country. And these grapes, through the examination, were so unreasonably handled that they were virtually destroyed by opening every package. As you know, grapes thus handled will not keep. Another instance was called to my attention, when a large shipment of turkeys was made from the Argentine to this country. While these turkeys were in transit, an order came presumably from the Secretary of Agriculture, that the legs of the turkeys had to be cut off before they landed in America, because of the danger of foot and mouth disease, although they were willing to certify that these turkeys had not been within a thousand miles of any foot and mouth disease in Argentina. We had difficulty not long ago with England. We were prohibiting England from shipping potatoes into this country, notwithstanding they were willing to pay the tariff, because of some alleged disease, and we denied the request of the English government to have an inspector from this country sent to England to inspect the potatoes before they left there, to assure us that they did not have this particular disease. In other words, we are asking these foreign governments to take our certificates, the certificates of our government, as to the freedom of our shipments from these particular insects and things like the apple maggot that are so damaging, of course, and then we deny to the other governments the same privilege that we ask for ourselves.

Entirely independent of the tariff situation, which of course will have to be handled by a general policy as formulated by the American people and not for the benefit or salvation of any particular industry, I believe that we can do much by impressing those in authority that, with respect to this quarantine regulation, we can do much by a meeting of the presidents of these different horticultural societies; impressing upon those in authority the great damage that is being done to us by the unreasonable regulations that they themselves have imposed. I hope that your society will approve of a meeting and instruct your president—as I know he will be glad to do—to cooperate with us in these matters.

I want to say a word about the general outlook for agriculture. I think it is a great problem for the American people. It affects the apple industry, of course, just as vitally as any other producer of foodstuffs. Wherever you go, over the American nation, you find the farmer, the backbone of our government, suffering from an unreasonable depression. Not only this year, but from 1920 on, the farmer has not made a fair profit on his labor or on his investment. It has been so long since he has made a profit that many farmers would hardly recognize it if they met a profit in the street.

Now, the turning point has got to come. I speak as one interested in the future of this country—not entirely from the standpoint of dollars and cents, but from the standpoint of one interested in the stability of our government. And I say,

without fear of successful contradiction, that the best guardians of these fundamental institutions of our government, those who are less likely to be led astray by these new fads and "ism's" that are being brought to the attention of the American people, are those who live on the farms, who own their farms, and who operate their own farms. I say there is a great duty of the American nation, of everybody everywhere, business men in the cities, to do something if it can be done, to save the fundamental and greatest industry of this land.

Now, I am not one who believes that the farmers should go to Washington and ask favors. That has never been may way of doing. I do not want to ask favors from anybody. I say that the farmers of this country should go to their local authorities, to their State Capitols, and to Washington—wherever they may live—and ask for JUSTICE only! To ask to have removed those things that have brought about this condition that confronts the farmers today, to ask for an equality in credit. We hear of moratoriums abroad; we hear of certain great banks that are being saved by government intervention; we hear of these things. But who hears of anything being done to extend the credit of the farmers?

We have, in my section of Virginia farmers who are being sold out today by the farm loan boards of the farm banks, sold out at a ridiculously low price—merely that these banks can obtain the cash and go in the market and buy their own bonds and get twenty, and forty, and fifty cents on the dollar. Something happened right near me the other day. The farm loan board had a mortgage of ten thousand dollars—one hundred thirty acres—forty-five hundred dollars insurance on the buildings. They put that property up for sale, which they should not have done, because this is no time to force property up for sale, because there is no one with the money to buy it. This poor farmer was forced to put his property up for sale, and it brought five thousand dollars, one-half of the mortgage. I went to the head of the farm bank in Baltimore; I went down to see him because I wanted to understand by what line of reasoning he was willing to sacrifice the property which was worth every dollar of the mortgage, and would be worth it in a short time, when conditions turn. "Why," he said, "it was a wise thing for us to do, because we took this fifty cents on the dollar and we bought our own bonds, which are selling on the market at forty-two, and we saved our company by buying these bonds."

Now that is what is occurring over this land, and I say that the time has come for you and all of us, regardless of political parties to serve notice on those in authority that we are not asking favors, but that we are asking that justice be done us in proportion to the justice done to European nations and great business interests of this country. The time has come for us to assert ourselves because if we don't there is going to be a disaster in this country which is going to affect every business, no matter what it is or where it is. I think some way should be devised.

Credit is what the farmer needs today; I don't mean, in connection with that, to borrow more money. I think it would be extremely unwise to make it easy for a farmer who does not owe, to borrow. I think he should be discouraged in every possible way. What I mean is this: That those farmers who are good, worthy citizens should be permitted to renew these loans and, if necessary, have a moratorium on the interest for a certain time, so as to enable them to pay their loans and continue in business. I can not see why that can not be done. We have all these other things being done. Let the federal government make some arrangement with these farm loan banks—release frozen assets in the banks of agricultural communities. Why, they think that land today has no value. Try to borrow! Land! The only thing in the country that can not be destroyed, the only thing that will be here, perhaps, after the cities are gone and the industries have ceased to operate. Land today, is the only thing in the United States that is not worth anything for the purpose of making a loan. Let them go to the farmers and say, "Here, we recognize this condition that exists today. We recognize that you are in just as bad shape today as Germany is, as these other European nations are, and we are going to give a moratorium to you." Let them say to the farmers, "We have confidence in your future. We will arrange some way, by governmental intervention and operation, some way to enable you to continued your loans, both in the local banks and by direct loans made from the boards, and, if necessary, reduce the interest temporarily, and in some way include the interest that is reduced in the principal of the loan." I do not mean that that is exactly how it could be carried out, but I know that if these things that are being done for the benefit of other people can be accomplished, then it can be done for the farmers!

I am here for the purpose of offering to you, on behalf of the Virginia State Horticultural Society, our cooperation in these problems—not only with regard to the apple business, but also with regard to other matters relating to agriculture. We are all together; we should stand together. This great Cumberland-Shenandoah region has a tremendous possibility in the future of the apple industry. If we should cooperate,—we have never done it heretofore—but if we should, we would be the greatest single force, I think, in the apple industry of America today. And I am here to offer to you the cooperation of the Virginia people, to express the hope that you will join with us, without the idea of any selfish advantage to any of us. We will not ask selfish advantage, and I know that you will not, but rather, join together for the preservation of ourselves. We see every other industry in this country amalgamating and joining, so that today the basic profits of the land are being controlled by single industries cooperating closely together—the oil, the copper industry, and everything else. But we see practically no cooperation among the farmers.

I want to be frank with you and say that I do not believe that the solution of the farmers' problems lies in artificial panaceas; the federal government, under Mr. Hoover, was required to endeavor artifically to hold up the price of certain commodities; but they attempted to do an impossible thing. The United States government, powerful as it is, can not artifically set aside the law of supply and demand for a product that is raised everywhere. It can't be done! And I do not think that the failure of the Farm Board in their efforts to stabilize the price of wheat—I think it was a very unfortunate thing for them to attempt, because I think it will discredit farm relief in the future —should discourage us, but that the Farm Board should be continued in operation. And my thought about the future of the Farm Board is: Let the Farm Board, financed by the United States government, be an agency for the purpose of disposing of the great surplus production of this nation.

For instance, if we have too much wheat, as we have, and China is starving for that wheat, why would it be an impossibility for the Federal Farm Board to sell direct to the country of China as much wheat as they might desire, taking the notes of China, if necessary, for the payment of that wheat? Of course, these notes might not be paid in full, but we will be performing an act of charity when we send wheat from America to feed the starving Chinese, even though that wheat may not be paid for. That would be a proper adventure in business; it would not be artificial. I object to the efforts of these panaceas that are being offered to us, which are based on artificial conditions. If the Farm Board sells to China at the regular price of wheat a great block of wheat which it would not sell, otherwise, and takes the risk of payment, it gets that much wheat out of consumption in this country. I simply cite that thing as one of the opportunities that now exists for the Farm Board to dispose of the surplus production in this country.

Then, I think that those in authority should give their careful thought and attention, by the employment of the greatest chemists that can be obtained, to finding uses for the products of the soil, independent of the human consumption for food of those products. I believe that chemistry and agriculture should be much more closely allied in the future than it has been in the past.

But I will not bore you with these opinions of mine, because I am simply here to express the hope that you will cooperate with us and that we want to cooperate with you. I again extend to you the best wishes and greetings of the fruit-growers of Virginia.

President Criswell: I am sure we very much appreciate the goodwill and offer of cooperation from the president of the Virginia State Horticultural Society. I should like to say that yesterday, at a meeting of the Executive Committee of this Association, the matter which Governor Byrd has presented was talked over, and your president was authorized to attend any

conferences and to join with Virginia in any of these problems that it seems wise. However, it might be that a resolution of this Association would be a good thing for record. If you members concur in this thought, let us have a resolution.

President Criswell announced that Mr. G. S. L. Carpenter, president of the Maryland State Horticultural Society had arrived and wished briefly to address the meeting.

Mr. Carpenter: I am more than glad to be here as a representative of the Maryland State Horticultural Society, and I am sure that Maryland will join with all of the sister states in producing and working out anything that may be of benefit to the entire industry.

Mr. H. A. Shank, Lancaster County, presented a motion that the Pennsylvania State Horticultural Association cooperate with the Virginia Society, in accordance with the invitation extended by President Byrd, as well as with Maryland, in accordance with Mr. Carpenter's message. The motion was seconded by Mr. J. Gordon Fetterman, and it carried unanimously.*

THE PROPOSED PENNSYLVANIA BRAND

On March 2 at Harrisburg, at the instance of Miles Horst of the Pennsylvania Farmer, about 75 representatives of various agricultural organizations met to consider the possibilities of a Pennsylvania label or brand, similar to the New England quality label which goes only on certain better farm products of that section. The State Horticultural Association had about 25 members on hand.

The group as a whole agreed that the idea of a Pennsylvania Brand for use on certain grades of farm products was worthwhile and a committee composed of two men from each society interested will meet in Harrisburg in the near future to select a brand.

Briefly, the idea behind it is this: Pennsylvania farmers producing several lines of farm products are said to be losing their own markets to an extent varying with the farm product in question. Why not protect our own markets and help sell our surplus in other states by using certain good grades of this perishable produce?

The particular grade or grades of apples, for example, in which the Pennsylvania brand could be used, would be determined by this Association; no new fruit grades will be made to confuse anyone. Growers who wished to use this brand on all or part of their stuff—and its use would be purely voluntary—would have to sign in writing a pledge that they would adhere to the grades with the understanding that they would lose their license to use the Pennsylvania brand, as well as their whole supply of labels for obvious continued failures to grade properly

*Secretary's Note—The Cumberland-Shenandoah Four State Committee here authorized has already met and is actively considering some of the problems of that area. See page 4 for the personnel of this committee.

under the proposed standards. The Pennsylvania brand labels would cost so much each; probably not a very large sum, which would go for advertising, etc. Each would contain the grower's license number.

Possible abuse of the brand in many ways would be protected by a law with teeth in it so that the brand would mean something. Without this backing the brand is useless. Incidentally, this inspection and police work should not increase taxes,—to this, you can all say a fervent "Amen!"

Much work must be done before this brand will be in actual use, if the fruit growers and the farmers want it. Suitable legislation must be secured and hundreds of details arranged. Much educational work will have to be done by State College so that prospective users of the brand and consumers understand what it means.

Remember, nobody will have to use this proposed brand, but if they do, they will be required to live up to it, just as in the case of the U. S. Grades in Pennsylvania. If, for instance, the users want to market part of their fruit under this label, and part otherwise, it would be perfectly all right. This scheme is not designed to help fruit exports as much as to protect our own markets and to help secure others on a quality basis. It is not designed to make you wealthy but to help move superior products at fair prices. Neither State College nor Harrisburg will push it unless you want it; neither in the first place suggested it.

This whole plan is merely begun and we want your reaction to the idea. Write your Secretary, R. H. Sudds, State College, giving him your thoughts either for or against it. If you don't like it and fail to say so, we will have no way of knowing your pleasure. If you think it is promising, write also. Your Association officers and committee want your opinions. If you respond as you should, the June News Letter will present part of the discussion. Whether you like it or not, send at least a card.

A HISTORY OF FRUIT GROWING IN PENNSYLVANIA

II. The Transition Period (1827-1887)

S. W. FLETCHER, Professor of Horticulture, The Pennsylvania State College

The sixty years from 1827 to 1887 witnessed far greater changes in fruit growing than the 200 years of the Colonial Period. Within the span of a single generation fruit growing was transformed from an incidental feature of general farming to a highly specialized industry.

THE GOLDEN AGE OF THE AMATEUR

The period from 1827 to 1859 was the golden age of the amateur. An amateur is one who grows fruit primarily for his own use and pleasure, not to sell; "To grow fine fruits, flowers and vegetables is esteemed one of the most laudable undertakings of a country gentleman." The chief impetus to fruit growing before the Civil War was the interest of wealthy amateurs, gentlemen who had country seats and employed English gardeners. Such were Marshall P. Wilder, of Boston, who grew over 2000 varieties of fruit on his fifteen acre estate, and William Hamilton, of Philadelphia, who reported, in 1840, that he had just imported 500 European varieties of pears in one shipment. Marshall P. Wilder "loved to take his friends through his fruit garden, when he would pick a pear from this tree and from that, slice them carefully, and give each a taste." He was a connoisseur on varieties.

Other distinguished pomologists of the amateur period, whose memory we delight to honor, were C. M. Hovey, editor of the *Magazine of Horticulture*, our greatest single repository of early American horticulture, for 34 years, from 1835 to 1868; A. J. Downing, editor of *The Horticulturist* from 1846 to 1853 and author of "Fruits and Fruit Trees of America" (1845), which had more influence on American pomology than has any other book, before or since; Patrick Barry, successor to Downing as editor of *The Horticulturist*, and author of "The Fruit Garden"; and W. D. Brincklé, of Philadelphia, who produced, by hybridization, a number of valuable varieties of small fruits and who was a leader in American pomology for a quarter of a century. These gentlemen made possible the organization of the Pennsylvania Horticultural Society, in 1827, the Massachusetts Horticultural Society, in 1829 and the American Pomological Society, in 1852.

The First State Horticultural Society.—It was natural that the first State Horticultural Society should be born at Philadelphia. That city had been the commercial and horticultural center of the country for over a century. It was the metropolis of the

under the proposed standards. The Pennsylvania brand labels would cost so much each; probably not a very large sum, which would go for advertising, etc. Each would contain the grower's license number.

Possible abuse of the brand in many ways would be protected by a law with teeth in it so that the brand would mean something. Without this backing the brand is useless. Incidentally, this inspection and police work should not increase taxes,—to this, you can all say a fervent "Amen!"

Much work must be done before this brand will be in actual use, if the fruit growers and the farmers want it. Suitable legislation must be secured and hundreds of details arranged. Much educational work will have to be done by State College so that prospective users of the brand and consumers understand what it means.

Remember, nobody will have to use this proposed brand, but if they do, they will be required to live up to it, just as in the case of the U. S. Grades in Pennsylvania. If, for instance, the users want to market part of their fruit under this label, and part otherwise, it would be perfectly all right. This scheme is not designed to help fruit exports as much as to protect our own markets and to help secure others on a quality basis. It is not designed to make you wealthy but to help move superior products at fair prices. Neither State College nor Harrisburg will push it unless you want it; neither in the first place suggested it.

This whole plan is merely begun and we want your reaction to the idea. Write your Secretary, R. H. Sudds, State College, giving him your thoughts either for or against it. If you don't like it and fail to say so, we will have no way of knowing your pleasure. If you think it is promising, write also. Your Association officers and committee want your opinions. If you respond as you should, the June News Letter will present part of the discussion. Whether you like it or not, send at least a card.

A HISTORY OF FRUIT GROWING IN PENNSYLVANIA

II. The Transition Period (1827-1887)

S. W. FLETCHER, Professor of Horticulture, The Pennsylvania State College

The sixty years from 1827 to 1887 witnessed far greater changes in fruit growing than the 200 years of the Colonial Period. Within the span of a single generation fruit growing was transformed from an incidental feature of general farming to a highly specialized industry.

THE GOLDEN AGE OF THE AMATEUR

The period from 1827 to 1859 was the golden age of the amateur. An amateur is one who grows fruit primarily for his own use and pleasure, not to sell; "To grow fine fruits, flowers and vegetables is esteemed one of the most laudable undertakings of a country gentleman." The chief impetus to fruit growing before the Civil War was the interest of wealthy amateurs, gentlemen who had country seats and employed English gardeners. Such were Marshall P. Wilder, of Boston, who grew over 2000 varieties of fruit on his fifteen acre estate, and William Hamilton, of Philadelphia, who reported, in 1840, that he had just imported 500 European varieties of pears in one shipment. Marshall P. Wilder "loved to take his friends through his fruit garden, when he would pick a pear from this tree and from that, slice them carefully, and give each a taste." He was a connoisseur on varieties.

Other distinguished pomologists of the amateur period, whose memory we delight to honor, were C. M. Hovey, editor of the *Magazine of Horticulture*, our greatest single repository of early American horticulture, for 34 years, from 1835 to 1868; A. J. Downing, editor of *The Horticulturist* from 1846 to 1853 and author of "Fruits and Fruit Trees of America" (1845), which had more influence on American pomology than has any other book, before or since; Patrick Barry, successor to Downing as editor of *The Horticulturist*, and author of "The Fruit Garden"; and W. D. Brincklé, of Philadelphia, who produced, by hybridization, a number of valuable varieties of small fruits and who was a leader in American pomology for a quarter of a century. These gentlemen made possible the organization of the Pennsylvania Horticultural Society, in 1827, the Massachusetts Horticultural Society, in 1829 and the American Pomological Society, in 1852.

The First State Horticultural Society.—It was natural that the first State Horticultural Society should be born at Philadelphia. That city had been the commercial and horticultural center of the country for over a century. It was the metropolis of the

nation, with a population of nearly 200,000. The only other centers of population in Pennsylvania at that time were Pittsburgh, (including Allegheny), 25,000, Lancaster, 7000, and Reading, 7000.

The Pennsylvania Horticultural Society was organized on November 24, 1827, with fifty-three members. During its early years, and until about 1870, the activities of the Society centered on fruit fully as much as on ornamentals, which now are its chief interest. Then, as now, the Society laid stress on exhibitions. The first public exhibition of fruit in America was held in Philadelphia on November 3, 1828.

This was the formative period of American systematic pomology. Seedling fruits were being brought to public attention in great numbers and there was intense interest in the subject of new varieties. Their merits were debated by different cultivators, in convention and in print, at great length, and often with much heat. The Pennsylvania Horticultural Society encouraged the introduction of promising seedlings in Pennsylvania and neighboring states, and fostered the exchange of trees and cions. At its meeting on March 18, 1853, the Society described a "promising seedling apple"; this was the York Imperial.

Little attention was given to cultural methods and none whatever to marketing problems. An attempt was made to make the Society a scientific body, by the appointment of Professors of Horticulture, Botany, Chemistry and Entomology. These titles were purely honorary; the Professors served without pay, and were merely expected to prepare "at least one essay a year on subjects connected with the application of the science to cultivation." This was a generation before the founding of the Agricultural Colleges and Experiment Stations.

It is gratifying to record that the mother of American horticultural societies is in a flourishing condition, with a membership of over 4000, practically all amateurs from the vicinity of Philadelphia. It adheres strictly to the amateur ideals upon which it was founded. With the Massachusetts Horticultural Society, it is the chief exponent in America of the culture of ornamentals for pleasure, not for profit. Would that the American Pomological Society, which originally occupied a similar field in fruit growing, had been equally faithful to its trust!

THE FRUIT GARDEN AND ORCHARD HOUSE

The fruit garden, as distinct from the orchard, was the dominant feature of American pomology until 1850. Dwarf trees, especially dwarf pears, were more popular than standards in the fruit garden. Even in those days of slavish copying of Old World horticulture, comparatively few American gardeners trained dwarf trees against walls or in the intricate geometrical designs so popular in Europe. Dwarfs were grown mostly in the open, and trained in the natural way, like standards. For many years a sharp controversy raged among horticultural

authorities as to the comparative value of dwarf and standard pear trees. After 1850 it became increasingly evident that dwarf trees could not compete with standards in commercial production, and they gradually disappeared, save in home gardens.

In the fruit gardens of wealthy amateurs, and for dwarf trees, the Old World practice of "trenching," advocated by Thomas Rivers of England, was followed faithfully by imported English gardeners. This consisted of digging a trench three feet deep around the tree, at a distance determined by its size, usually from 3 to 6 feet. The trench severed most of the lateral roots, hence it was an effective means of keeping the tree small of stature It also brought tardy trees into bearing the first season after the roots were cut. Orthodox English gardeners filled the trench, each year, with compost in which the new roots could feed. Root pruning and trenching passed out about 1870.

Forcing Fruits.—The forcing of fruits under glass was profitable in Pennsylvania, in a limited way, until southern fruits began to arrive in quantity, about 1875. Forced fruits were grown either in pots or in borders. Detailed directions for the care of the "orchard house" were given in all the horticultural magazines. In 1876, it was reported: "From a single peach tree planted in a tub and kept in a hot house there have been sold, in 18 years, no less than $2,300 worth of peaches, some of them at $36 per dozen, many at $24 to $28 per dozen, and all at an average of $18 per dozen. They were sold mostly in the months of February and March."[1] Nectarines, apples, pears, apricots, figs, strawberries and other fruits were grown in the orchard house. Pineapples were grown in pots quite extensively for the Philadelphia market as late as 1856; "At $5.00 each they would pay." Forced strawberries sold for $5.00 a quart. It may, perhaps, be permitted even the present lavish generation to wonder at these prices, and the people who would pay them.

The fruit most commonly forced, however, was the grape. European varieties were grown, mainly Black Hamburg, either in the cold grapery or with heat. The grapery was an important commercial venture near Philadelphia until about 1880; in 1875 there were fifteen in Chester County alone. They were mostly lean-to glass houses, 14 to 17 feet wide and 100 feet long, heated by a boiler but not piped; the smoke flue was carried the length of the house. Some vines produced 30 to 40 pounds of grapes each; net profits of $700 a year were reported in houses 100 by 17 feet. Forcing of fruit ceased to be successful commercially after 1880.

FOOD FOR MAN AND BEAST

Previous to 1850, fruit was grown mainly as a minor feature of general farming, save for a few large orchards near Philadelphia, New York, Boston, and Baltimore, which could be

[1]Gardener's Monthly 18:82, 1876.

reached better by the sailing sloop than by the indifferent roads of that period. Fruit still was grown largely to feed to stock. Orchards received little care. This is evidenced by the statement of J. J. Thomas, an eminent pomologist, in 1850; he estimated that it cost 2½ cents a barrel to produce apples in Western New York, "which makes them the cheapest of all foods for man and beast." This cost of production would hardly allow for much tillage, pruning, fertilizing, or spraying—but the word spraying had not been coined then. Labor was cheap. In 1828, farm laborers in Chester County received $80 to $100 a year; 40 cents a day with board, or 62½ cents a day and "find himself".[1] Even as late as 1862, prominent fruit growers recommended the more extensive culture of apples because "pork is cheap and it is necessary that cheap feed be used in making it." Sweet apples were planted extensively "to please the hogs."

The more potent fruit juices, such as apple jack, peach brandy and hard cider, continued in high favor in spite of the growing popularity of even more ardent spirits distilled from rye, wheat and corn. Nearly every farm had a cider press. Cider was not considered "prime" until it was two or three yeard old. The profits of a majority of orchards were derived chiefly from the feeding of stock and the sale of fruit liquors.

About 1830 a vigorous temperance movement swept the northern states and made many converts, even among fruit growers. "Many worthy men", said the *Farmers' Cabinet*, in 1837, "have resisted the march of the temperance cause, because they would have to sacrifice their orchards. Others, in their zeal to do away with the evils of excessive drinking, have actually cut down their trees." The centuries-old controversy between the Wets and the Drys seems to have been conducted with fully as much heat and mutual intolerance one hundred years ago, as it is today. Witness this damning indictment: "Cider drinkers are the most brutish and cruel of all the unhappy tribe of inebriates. They are also peculiarly subject to rheumatism, inflamed eyelids, headache, bleeding at the nose, sores and ulcers, affections of the stomach and bowels, and premature trembling of the hand and head."[2]

Early Commercial Fruit Growing.—Previous to the Civil War, commercial fruit growing on any considerable scale was mainly limited to a few plantings easily accessible by boat to the four large cities,—Philadelphia, New York, Boston and Baltimore. There was considerable planting of peaches and strawberries in the Chesapeake Bay region about 1840. Philadelphia was supplied with fruit mainly from Delaware and Anne Arundel County, Maryland. In 1847 *The Horticulturist* reported: "Major Reybold of Delaware has about a thousand acres of peaches. They think nothing of sending 5000 bushels to market per day for some weeks."[3] Commercial apple culture began about 1825, along the Hudson River where the fruit could be

[1]Letters of William Darlington, AMERICAN FARMER 10:73, 1828.
[2]FARMERS' CABINET 1:231, 1837.
[3]THE HORTICULTURIST 2:465, 1847.

easily shipped to New York by boat. It was packed in straw-headed barrels and brought $1.00 to $1.50 a barrel, package returned. Commercial fruit growing, however, did not develop rapidly until after 1850, when improvements in transportation and the growth of cities made this possible.

THE SILK CRAZE

The silk craze of 1826 to 1839, while not strictly horticultural, was closely allied with the nursery interests of that period. L. H. Bailey calls it "the wildest speculation in American agriculture." "Silke-worme seeds" were sent to Virginia in 1627; at various times all of the colonies had attempted to establish the industry, but with indifferent success. The introduction of the *multicaulis* mulberry, in 1826, was the spark that fired the powder: "Few farmers have any idea of the vast profits in the silk business. Four hundred and twenty pounds of silk were produced from four acres planted with mulberry. This silk sold for $3.50 per pound, amounting $1,470." Net profits of 47 to 112 per cent annually on an investment of about $437 an acre were confidently predicted. "When the fact is generally known that any young lady, by a few hours of pleasant recreation each week at home, can clothe herself in a splendid suit of native silk at the low price of 12½ cents a yard, there will not be a garden without its mulberry trees."[1] It was predicted, "Every available acre, from New England to the Gulf, will be covered with the mulberry. Every farm will have cocooneries, and the farmers' wives and daughters will feed the worms, and spin and twist the thread."

The price of mulberry trees soared skyward. They were easily propagated from hard wood cuttings, yet at the height of the mania one-year-old trees sold for $2.00 to $5.00 each. Many nurserymen gave up all other propagation in order to make the most of this golden opportunity. Fortunes were made—by nurserymen—in a single season. One over-heated propagator announced, "On one acre, 30,000 trees can be raised, and the sum of $35,000 realized in a single season." Philadelphia was the center of the craze; in 1838 there were nearly a million trees within fifty miles of the city. The largest plantings were at Burlington, New Jersey.

The bubble burst in the fall of 1839, with a resounding pop. A disease appeared, many of the trees in the northern states were winter killed, the technique of silk culture was difficult to master, and people came to their senses. In the spring of 1840, "hundreds of thousands of trees were offered to farmers, in vain, at a penny each, for pea-brush." So closed one of the most amazing episodes in American horticulture.

[1]FARMERS' CABINET 1:140, 1837.

The foundations of modern commercial fruit growing were laid in the industrial revolution of 1835 to 1860. These twenty-five years witnessed a remarkable transformation in the life of the nation; from the industry of the home, the shop and the farm, to the industry of the factory, the wage system, and the city; from the self-sufficient farm, on which was grown practically all that was needed to feed and clothe the family, to the specialized farm, which produced one or more cash crops; from a population that was mainly country-dwelling and agricultural, to a population that was mainly city-dwelling and manufacturing. Pennsylvania, with its wealth of mineral resources, played a major part in this transformation of a nation. The radical changes that took place in American fruit growing after 1859 cannot be understood without a knowledge of the economic conditions that caused them.

Turnpikes.—The most important factors in the industrial revolution were the successive improvements in transportation, from the trail to the turnpike, the steamboat, the canal and the railroad. In 1794 the first turnpike in America, from Philadelphia, to Lancaster, was opened. The cost of construction was borne by private interests, who were permitted by the State to charge toll. This turnpike was so successful that during the next 30 years Pennsylvania chartered 80 companies, which built 2200 miles of toll road. The cost of transportation, however, was high; the toll was about 1¼ cents a mile for a one-horse cart. It cost $100 to carry a ton of freight from Pittsburgh to Philadelphia over either of the two great arteries of travel to the West, now known as the Lincoln Highway and the William Penn Highway.

Steamboats.—The next improvement in transportation was the steamboat. Soon after 1807, when Robert Fulton made his first successful trip up the Hudson, steamboats appeared on all the navigable rivers. They were particularly serviceable in opening to settlement the vast territory west of the Alleghenies, which had a population of 1,500,000 in 1820. By 1825, a large percentage of the traffic from the West had deserted the overland routes and had turned down the Mississippi River to New Orleans, to the chagrin of the merchants of Philadelphia and New York.

Canals.—New York met this challenge with the Erie Canal. This was opened from the Hudson to the Great Lakes in 1825; the Great Lakes were connected with the Ohio River by canal in 1832. The Erie Canal immediately became the chief channel of trade between the West and the East. The produce of the rich Mississippi Valley, chiefly grains and meats, now had an easy outlet to Eastern markets. The Canal gave New York city commercial supremacy over Philadelphia, which it has held to this day.

Pennsylvania was fully aware of this impending disadvantage, and sought to overcome it by building a water route of her own

to the West. A great system of "internal improvements" was begun in 1824 and completed in 1834, at a cost of $10,000,000. This was a combined water, rail and turnpike route from Philadelphia to Pittsburgh, through central Pennsylvania, covering a distance of 394 miles. The Susquehanna and Juniata Rivers were canalized; the Alleghenies were scaled with the Portage Railroad. This consisted of a series of inclined planes using stationary engines for power. This route never was as successful as the Erie Canal, but it helped Philadelphia to meet the challenge of New York, for a time. Freight rates between Pittsburgh and Philadelphia dropped from $100 to $15 a ton. Other canals and canalized rivers were developed, but their period of usefulness was short and their effect in hastening the industrial revolution of the East was comparatively slight.

Railroads.—The giant that transformed the East from a region that was mainly agricultural to one that is mainly industrial was the railroad. It was born in Pennsylvania. The first railroads in the United States were short service lines used in the Pennsylvania coal regions as early as 1815. They were operated by gravity, horse power, and even by sails; locomotives were not used until 1831. The first trunk line railroad, the Erie, was opened in 1825. The first in Pennsylvania was a line from Philadelphia to Columbia on the Susquehanna River, to connect with the State-operated canal route to Pittsburgh.

The rails used on all the early lines were of wood, capped with strap iron. After iron rails appeared, in 1844, railroads increased rapidly and challenged the canals for the traffic of the rapidly expanding nation. In 1850, the rail mileage had increased to 9000; in 1860, every state east of the Mississippi was covered with a network of railroads. By 1852, when the Pennsylvania Railroad was opened to Pittsburgh, there was no longer any doubt as to the outcome of the competition between the railroads and the canals; rail transportation had been demonstrated to be quicker and cheaper.

Pennsylvania Coal and Iron.—Pennsylvania played a major role in the drama of the industrial revolution, especially in the building of railroads, because of her vast resources of coal and iron. Anthracite coal was discovered in 1769 and "ark-loads" of it were floated down the Schuylkill River to Philadelphia; but difficulties of transportation were great, and there were no suitable stoves and furnaces. The coal industry did not flourish until 1834, when the hot air blast furnace came into common use, and 1850, when coke ovens were introduced. Bituminous coal came into common use about 1850. By 1870, water power, which had been supreme hitherto, had been superseded largely by steam power.

The smelting of iron, long a minor industry in Pennsylvania, was revolutionized in 1840 by the substitution of anthracite coal for charcoal. This made it possible to replace the wooden rails of the first primitive railroads with heavy iron rails. The rapid extension of trunk line railroads that followed not only created

a market for Pennsylvania coal and iron, but also furnished a means of transporting these heavy, crude products at a moderate cost. By 1860, the iron industry of Pennsylvania was in full blast. The first oil well in western Pennsylvania was drilled in 1859; in 1862 the output was 3,000,000 barrels. Pennsylvania coal, iron and petroleum—basic resources which thus far have determined the industrial supremacy of nations—were indispensable factors in preparing the way for the new era.

Markets for Fruit.—The immediate effect of railroad building was to extend the radius of territory available for the food supply of a city from several score to several thousand miles. Farm products began to pour into the East from the Mississippi Valley. The population west of the Alleghenies increased from 1,500,000, in 1820, to 4,500,000, in 1840. The opening of vast areas of land to settlement, free, under the Homestead Act of 1862, stimulated immigration to such an extent that during the twenty-year period from 1860 to 1880, 5,500,000 persons came to the United States; most of them settled in the West. Wheat, corn and cotton became the chief money crops. The reaper, thresher and other improved machinery replaced much hand labor.

Manufacturing, which had come into being after the war of 1812, now definitely split off from agriculture. Previously it had been conducted mainly in the shop and the household, with the labor of the family and apprentice assistants. There now arose a system of factory labor, compensated by wages and assisted by power. The workers became a specialized non-agricultural class—consumers, not producers of farm products.

Self-sufficing farming ceased; specialized farming, as commercial fruit growing, appeared. Since the farmer now had products to sell, he could buy clothes and other family necessities. Industrial towns sprang up, mainly in the northeastern states. In 1800 there were only three cities of over 8000—Philadelphia, New York, and Boston. In 1840 there were 33, five of which were in Pennsylvania—Philadelphia, 205,000; Pittsburgh, 21,000; Allegheny, 10,000; Lancaster 8,000; Reading, 8,000. By 1860 the number of cities had increased to 82, and Pennsylvania had a population of 3,000,000, nearly a third of which was urban. Between 1860 and 1880 the population of the United States increased from 31,000,000 to 50,000,000, or at the rate of 26 per cent each decade. City markets, the pre-requisite of commercial fruit growing, now were available. The stage was set for the great expansion of the fruit growing industry that followed.

"BOOM" DAYS

The advent of commercial fruit growing, as distinct from general agriculture and amateur fruit growing, was marked by the organization of various state horticultural societies to repre-

sent its interests. The first was The Fruit Growers' Society of Western New York, now the New York State Horticultural Society, organized at Rochester in 1856; the second was The Fruit Growers' Society of Eastern Pennsylvania, now the State Horticultural Association of Pennsylvania, organized at Lancaster on September 1, 1859. The time honored amateur organizations, such as the Pennsylvania Horticultural Society, could not be expected to express the new spirit of commercialism in fruit growing. They were concerned chiefly with varieties and exhibitions, not with cultural problems and marketing. The State Horticultural Societies have been a major factor in shaping the development of the industry.

The building of railroads, the great increase in population, the opening of the West, the development of industries in the East, and the discovery of gold in California (1849), resulted in a prolonged period of expansion. The 27 years from 1845 to 1872 were indeed the "golden era" of American pomology. Optimism was unbounded; there was no cloud in the sky, not even one as big as a man's hand. The panic of 1857 had practically no effect on this exuberant enthusiasm. Even the exhausting Civil War checked the speculative fever but slightly; after the war it continued with increasing fervor until 1872. Then the inevitable day of reckoning came.

"Too many fruit trees can hardly be planted," counseled one sanguine Pennsylvania pomologist, in 1856; "let fruit for the million be our battle cry." The Berks County Agricultural and Horticultural Society offered substantial premiums to those who would plant the largest number of fruit trees, each year. At its first meeting, in 1856, the Fruit Growers' Society of Western New York "Resolved: that this convention confidently recommends to the farmers of western New York an increased and extensive cultivation of fruit for market, as an easy, sure and safe means of securing ample and speedy profits. It is morally certain that the fruit market cannot be overstocked to the prejudice of largely remunerative prices for many years to come, if ever."[1]

Big Profits.—The columns of *The Magazine of Horticulture*, *The Horticulturist*, and *Gardeners' Monthly* were illuminated with glowing accounts of big profits made and to be made in fruit growing. Then, as now, however, the East had to take second honors when competing with the Pacific coast in the gentle art of telling big stories. As reported in 1856, "Apples of large size from Oregon were offered at fruit stands in San Francisco at $4.50 apiece. Many persons purchased and ate them, even at this rate. If this taste continues, who will say that the orchards of Oregon shall not come to be as valuable as the gold mines of California."[2]

An ebullient Californian wrote to the editor of *The Horticulturist*, in 1855, "Apples are worth $8 to $12 per bushel and

[1]The Horticulturist 6:147, 1856.
[2]Ibid 6:328, 1856.

find ready sale at that price. At this rate, one acre of land in apple trees, allowing 14 bushels to the tree, which is a low estimate, and 40 trees to the acre, gives the sum of $4480 per acre. This is a matter of fact, not of speculation. It is the opinion of some of our wisest men that good winter apples will command just as high a price in the San Francisco market for the next thirty years, at least." It is a shame to spoil so good a story by adding a sequel; but the cold fact is that apples sold in the San Francisco market thirty years later for less than $1.00 a bushel.

The heaviest plantings were of the apple. In 1850 *The Horticulturist* reported, "It seems as though every farmer in the East is planting an apple orchard." These plantings were mostly what we now know as "the old farm orchards," plantings of 1 to 5 acres as an incidental feature of general farming. The old farm apple trees we see today are only the remnants of the millions of trees planted in Pennsylvania, New York, Ohio and other northeastern states between 1845 and 1870.

Peach plantings had attained significant proportions somewhat earlier, especially in the Chesapeake Bay region, within wagon haul or sloop ride of Philadelphia. After 1835 there was an orgy of peach planting. In 1848 the peach crop of Delaware alone was estimated at 5,000,000 baskets. Fortunes were made in a single year—and lost with equal celerity. "We are informed on the best authority," said the *Gardeners' Monthly*, in 1860, "that there is a peach orchard on the eastern shore of Maryland that contains 600 acres, the net profit on which last year was $40,000; and that the owner was offered $60,000 for the crop this year, the purchaser to pick the fruit and take it to market." Successive "peach kings" rose, reigned for a brief year or two, and then reluctantly yielded the crown to another.

THE REIGN OF THE PEAR

The pear now is such an insignificant feature of Eastern fruit growing that we are likely to forget that it vied with the apple for popular favor until about 1875. At the 1860 meeting of the Fruit Growers' Association of Eastern Pennsylvania the statement was made, and not disputed, "Pears do better everywhere in Pennsylvania than apples." A few years later, in 1867, the same group discussed the question, "Is not the pear the most certain of the tree fruits in Pennsylvania?" The answer was, "It is." In 1853, Patrick Barry reported, "Sales of pears have been made at Philadelphia this season at prices calculated to give an impetus to their culture. Duchess d' Angouleme pears sold at Isaac Newton's Fruit and Ice Cream Store, on Chestnut Street, for one dollar each, and smaller specimens at seventy-five cents each. Mr. Newton was selling a stock of Vicar of Winkfield pears, on December 2, 1852, at seventy-five cents a dozen, to eager buyers. Our correspondent says he immediately sat down and ordered pear trees for all the vacant spots in his

garden. We only add that we think him a sensible man."[1] And again: "Bartlett pears have been selling on the New York markets, at wholesale, for $9.00 a barrel. One cultivator of this delicious fruit realized *at the rate of* $9,200 per acre." The italics are mine; those four words are significant.

Tobias Martin, of Mercersburg, Pa. owned one of the most famous pear orchards of the East. It was planted 400 trees to the acre, with dwarfs as fillers. In 1870 he sold his fruit at the following prices:

"Bartlett, extra fine, $1 to $1.50 a dozen
"Bartlett, first class, $4.00 per bushel
"Lawrence, Vicar, Easter, $24 per barrel
"Duchess, Clairgeau, $3 to $5 a dozen."

Another celebrated pear grower was Edwin Satterthwaite, of Jenkintown, Pa. He had over 7000 trees, of about 500 varieties. He marketed his fruit in Philadelphia; "the prices usually obtained are $8 to $12 per barrel."[2] We must remember, however, that the editors of all the horticultural periodicals of that day also were nurserymen—they had trees to sell. Possibly there was another side to the picture.

Other fruits had their brief day in the sun during this expansive era. In 1865, "One fruit grower near New York sent 1600 bushels of plums to market, for which he received $14 a bushel."[3] In 1856, Pennsylvania-grown apricots sold for $15 a bushel in Philadelphia. In 1854 the United States Patent Office imported cions of Prune d' Agen, now the French prune of California, and distributed them throughout Pennsylvania and neighboring states. It was confidently expected that the northeastern states would become a great prune region rivalling that of France; "the State of Maine alone is capable of raising dried prunes sufficient to supply the wants of the entire Union." Prune trees sold for $5 to $10 each. At the Pennsylvania State Fair held at Pittsburgh in 1856, fresh prunes "sold readily at 50 cents a quart."[4] The prune trees produced fairly well, but the climate was not favorable for drying the fruit, and they rotted badly. The prune industry became established on the Pacific coast about 1880.

GRAPE FEVER

The speculative fever in fruit growing developed in its most virulent form in the culture of the grape. American viticulture began about 1830 on the banks of the Ohio, at Cincinnati, and prospered under the expert guidance of Nicholas Longworth. The Ohio River then was "The Rhine of America." Grapes were grown chiefly for wine making; it was thought that eventually this would become one of our major agricultural interests. Ohio retained its preeminence in grape culture until after 1850.

[1] The Horticulturist 8:98, 1853.
[2] The Horticulturist 27:345, 1872.
[3] Ibid 20:106, 1865.
[4] Ibid 6:145, 1856.

There were centers of production in the East, notably in the Finger Lake region of Western New York and at Reading, Pennsylvania. The dominant varieties were the Isabella and the Catawba.

The building of railroads and the development of city markets revolutionized the industry. With the introduction of the Concord, in 1853, the culture of grapes primarily for wine making gave way to their culture primarily for dessert purposes. Fresh grapes sold for 10 to 15 cents a pound in Philadelphia. The Chautauqua-Erie grape belt, including Erie County, Pennsylvania, came into prominence.

The next fifteen years were a nurseryman's paradise. One nurseryman recalls the "good old days:" "Ten thousand Delawares would go in a box four feet square; shipped by express C. O. D., they would bring back $1000 in a few days. A man entered our office and asked if we would take $4000 of Government bonds for 5000 Ionas, which were then selling at $1.00 each. I took his money."[1]

The days of big profits in grape growing departed about 1880, when California entered the market. In ten years, between 1880 and 1890, the grape acreage of California increased seven times, from 35,518 to 213,230 acres, which was more than the combined acreage in all the Eastern states. Prices fell to a very modest level, save for a few hectic years after the national prohibition law went into effect.

A STRAWBERRY "KING"

Strawberry growing had well developed commercial centers as early as 1830, especially in the Chesapeake Bay region. As would be expected, this fruit reacted strongly to the stimulus of "good times"; being practically an annual, it is one of the most mercurial of fruits. Strawberry "kings," with uneasy crowns, were numerous Pennsylvania contributed one, however, who deserved the title. The Reverend John Knox, of Pittsburgh, a retired Methodist minister, was one of the most skillful cultivators of the strawberry and the grape in America. Said *The Horticulturist*, in 1869, "Mr. Knox's name long since has become a household word throughout the country; but few towns have not heard of him and his Jucunda strawberry." From 1860 to 1872, his farm was the Mecca of horticulturists from every state in the East. He practiced intensive culture, and kept the plants in hills.

The berries of his leading variety, the "Knox's 700", which later was found to be the old Jucunda, grew to a very large size; they were commonly "5½ inches round; 16 to 24 fill a quart." Even the conservative editor of *Gardeners' Monthly*, Thomas Meehan, was moved to exclaim, "The size of these berries was the largest anyone ever saw. They might easily be mistaken by a near-sighted person for tomatoes. While I left strawberries

[1]Trans. Pennsylvania Fruit Growers' Society 1878, p. 535.

selling in Philadelphia at 10 cents a quart, these were being shipped to Boston, New York, and all parts of the East for $1.00 a quart." And *The Horticulturist* reported: "Rev. John Knox of Pittsburgh succeeded in making his land devoted to the Jucunda strawberry pay from $1200 to $1500 an acre, and frequently sold fancy berries at $1.00 per quart. These quart baskets often held but 18 berries From 2½ acres last year he realized $3600 net. He estimates his cost of production as about $200 an acre."[1] John Knox held annual grape and strawberry exhibitions, which attracted wide attention. The intensive methods in strawberry culture now in vogue do not differ materially from those practiced by him in 1865.

THE END OF THE RAINBOW

At the end of the rainbow was found, not a pot of gold, but disillusion and disenchantment. The inevitable reaction from twenty-five years of horticultural inflation came in 1872. There were four major causes of the depression which began then—post-war economic distress, increasing competition from distant fruit growing regions, over-planting in the East, and heavy losses from the depredations of insect pests and fungous diseases.

The railroads were not an unmixed blessing. While they made possible the industrial towns of the East—the markets of the fruit grower—they also opened the door to competition from districts several thousands of miles away. By 1858, strawberries from Norfolk, Virginia, had begun to reach northern markets in considerable quantity, mainly by boat; they soon forced northern growers to discontinue the culture of early varieties. Northern peach growers had a similar experience, beginning with the first shipments from Georgia, about 1866. "Peaches carefully packed in crates are sent from the neighborhood of Augusta, Ga., to New York and Philadelphia, the earliest reaching these markets June 20-25, and commanding at first as high as $15 to $20 per bushel. An average of $5 a bushel may be counted on."[2] Florida oranges began to appear on northern markets in quantity about 1868.

California Enters the Market.—The most serious competition, however, came from the Pacific coast, following the rush of the "forty-niners" to California in search of gold. At the exhibition of the Pennsylvania Horticultural Society in Horticultural Hall, Philadelphia, September 25-27, 1867, "the exhibit arousing the greatest enthusiasm was the one staged by Dr. Strenzel, of California. It included pears, grapes, plums, quinces and pomegranates." This was the first exhibit of California fruits in the East. There was no suspicion then of the impending sharp competition. The completion of the first transcontinental railroad, the Union Pacific, in 1869, was followed by the first all-rail shipment of fresh fruit to Eastern markets, the same year.

[1]The Horticulturist 1871, p. 210.
[2]The Horticulturist 21:241, 1866.

The Southern Pacific was completed in 1876 and the Santa Fe in 1885; these gave added impetus to the rapidly expanding California fruit industry.

In 1873, Tobias Martin, a shrewd pear grower of Mercersburg, Pa., gave voice to inspired prophecy: "California is going to knock the spots out of our pear market." His prediction has been fulfilled. Naval oranges were introduced into California from Brazil in 1873 by William Saunders, of the United States Department of Agriculture, previously a Philadelphia gardener. The first train load of California oranges was shipped to Eastern markets in 1882, and the first full train load of deciduous fruits in 1886. By 1887, California citrus fruits flooded the East, to the distress of eastern apple growers. The first full shipload of bananas arrived in 1857 but the trade did not develop rapidly until after 1881.

The lack of refrigeration in transit, however, was a constant threat to the southern and Pacific coast fruit trade. Distant growers never could be sure that their fruit would reach eastern markets in salable condition. There were heavy losses. About 1880, distant shippers became much discouraged. Then came refrigerator car service, in 1887, and transcontinental fruit growing was established on a more stable basis.

Over-Production.—The horticultural *debacle* of 1872 and the years immediately following also was due, in part, to over-production. The tremendous apple plantings of the '50's were just coming into heavy bearing. More fruit was produced than could be consumed to advantage under the crude marketing conditions that prevailed then. Moreover, a large percentage of the "boom" plantings had been injudicious, with little regard for site and soil adaptations; there was "an orchard on every farm." Cold storage facilities for fruit were practically non-existent; there were ruinous gluts in the autumn, and a dearth of apples in late winter. Pests had multiplied and there were no efficient means of controlling them.

There were numerous laments for "the good old times, when apples grew almost spontaneously, and of unsurpassed quality. The sad deterioration in apple production in this region (Lancaster County, Pa.), may be ascribed chiefly to the ravages of insects. It is probable that more than half of the apple trees planted hereabouts are killed by the borer. Curculio, fungi-pests, and codling moth (principally, perhaps, the latter), destroy the fruit. Whether we are ever able to grow the apple here again depends chiefly on whether we can get rid of the codling moth. Very few pear trees remain; blight has carried them off. Raspberries and blackberries are an uncertain crop, due to rust; and grapes are stricken with mildew and rot."

This depressing story was repeated, with variations, year after year. Between 1872 and 1887 "the decadence of horticulture in America" was the theme of many sorrowful discussions at horticultural meetings. In 1881 a disgruntled Berks County, Pa., grower reported: "The market was glutted with apples.

It scarcely paid to haul them from the orchard. Six cents a bushel was paid at the cider mills and distilleries." He derived some consolation, however, from the fact that apple jack sold at $1.50 a gallon.

In his presidential address before the Pennsylvania Fruit Growers' Society, in 1876,—the Centennial year at Philadelphia —Edwin Satterthwaite of Jenkintown, discussed the situation frankly: "It must be admitted that the prospects of fruit growing as a business are not encouraging. Rapid and cheap connection with all the world has brought us in close competition with the more favorable soils and climates of other states, and the cheap labor of distant lands. At the same time, it is obvious that the depression in the business of fruit growing is not caused entirely by these influences, but is largely due to the general stagnation in business, the blighting effects of which are ruining every enterprise. * * * It is quite evident that there is now more fruit produced and sent to market than can be disposed of at remunerative prices. It is important to know whether this condition arises entirely from excessive production, or partially, perhaps largely, from the general stagnation in business, which has reduced the ability to purchase of the mass of consumers." This statement might stand very well for 1932, also!

CHANGES IN CULTURAL METHODS

The transition period witnessed comparatively few changes in cultural methods; research in the application of the sciences to horticulture did not get well under way until after 1887. Practically all bearing orchards, except of peaches, were in sod. The prevailing opinion was expressed by W. G. Waring, Professor of Horticulture at the "Farmers' High School, near Boalsburg, Pennsylvania,"—now The Pennsylvania State College—in 1852: "The worst enemy of the orchard is the plow." At the 1863 meeting of the Pennsylvania Fruit Growers Society, it was agreed: "An orchard never should be cultivated in eastern Pennsylvania after it commences to bear." At the 1868 meeting of this society, the statement was made: "The finest crops of fruit come where the orchards are not disturbed by the plow." The propaganda for intensive tillage of orchards, which was brought to the East from California, did not make headway until after 1880.

There were many ardent advocates of the grass mulch, chief of whom was Thomas Meehan. Some of our present day investigators recommend "sod rotations," or temporary sods, in the apple orchard, as one of the most practical means of maintaining the organic content of the soil. This ought to be a good method, for it has the sanction of antiquity. It was advocated a hundred years ago: "Another cause of unthriftiness in apple orchards is to suffer grass crops to grow in the orchard for more than two or three seasons, without breaking up the sod. As a general rule, after planting an apple orchard keep the ground for the first

few years in some cultivated crop; after that, if grass crops are grown in it, three seasons at the most should not pass without plowing the sod."[1]

Fertilizer Practice.—Until after 1887, orchards received very little fertilizing, except the droppings of farm animals pastured in them, and infrequent manuring. Bone dust and wood ashes were applied occasionally. In 1856 the Philadelphia Guano Company introduced this product from "islands in the Caribbean sea," and sold it at $40 a ton. It was pronuonced the best fertilizer for orchards because it contained "80 per cent of phosphate of lime."

Beginning about 1873, applications of the mineral plant foods were advised, but seldom made. At that time the theory of fertilizing was to burn the plant, analyze the ash, and apply as fertilizer the materials it contained in largest quantity; hence, stress was laid on potash, phosphorus and lime as the essential ingredients of an orchard fertilizer. Nothing was said about nitrogen. Not until after 1880, however, was there any general interest in commercial fertilizers; in that year the Western New York Horticultural Society listened to a "Report of the Committee on Directions for Applying Fertilizers."

There was little change in the art and science of pruning. The "natural method" was practiced by most growers. The majority opinion was expressed by Cyrus T. Fox, of Reading, Pa., in 1886: "So many orchards have been ruined by pruning that my advice is, don't. Never learn to prune, and never prune. I have yet to see an orchard that has been benefited by the application of the knife." In 1868, Thomas Meehan, who was far ahead of his time in horticultural science, clearly stated a principle of pruning that now finds wide acceptance and application, as a result of recent research: "Pruning has a tendency to check the growth of the trees, and should be practiced only to gain some other point."[2]

INSECT PESTS INCREASE

Insect control was not a critical problem in fruit growing until after 1850, when commercial plantings had become extensive. In 1853, Patrick Barry expressed the opinion, "The three greatest drawbacks in fruit culture in America are the pear blight, the curculio, and the plum tree wart." The pest problems of Pennsylvania in 1852 were noted by W. G. Waring, of Boalsburg, Center County: "Caterpillars are not numerous and are easily destroyed. Aphids seldom injure any shoots but the over-luxuriant. Canker worms and borers are unknown here. The most obnoxious pest in the apple is the worm at the core; in some seasons, very few summer or fall apples are clear of it. There has been no blight, but of rank shoots, for years. The curculio is as destructive here as in other places. The plan of keeping swine in the plum orchard has been tried here, with

[1]Farmers' Cabinet 8:164, 1843.
[2]Proc. Pennsylvania Fruit Growers' Society, 1868, p. 23.

entire success. The Yellows have swept off thousands of peach trees and those remaining are so weakened by curled leaf in the spring that we rarely enjoy good peaches."[1]

The curculio was particularly destructive. Many highly original methods of control were proposed. A. J. Downing relates the experience of "a cultivator of fine fruit in Queens County, New York, who has actually succeeded in fencing out the curculio. His plum orchard is surrounded by a perfectly tight board fence, 9 feet high, furnished with a tight gate. The trees are loaded with plums, very few having been stung by the curculio; while on a few trees outside, 20 feet distant, the crops are literally destroyed."[2] No less effective, apparently, were the measures of another energetic cultivator, who "paved the ground beneath the trees, for a space 9 to 10 feet wide, lengthwise of each row." Jarring the branches, and collecting the curculios on sheets was practiced quite successfully after 1867.

The codling moth received special attention after 1860. Control was sought mainly by scraping off the rough bark, keeping stock in the orchard, and by tying a hay band around the trunk to trap the pupating larvae. "We direct the attention of all orchardists," said one public spirited fruit grower, in 1871, "to a simple and practical method of exterminating the codling moth, at an expense of not over $1.50 an acre. About the first of June, take wisps of rags—cotton or woolen—and place them in the lowest forks of the tree, or wind them around the trunk. All the worms, ascending and descending, will crawl in and remain. Now we know where the worms are; how shall we kill them?" He, himself, knows the answer. "Take a clothes wringer, place an end of the rag in the rollers, and run the rag through. Every worm will be annihilated."[3]

Insect Control in 1871.—The status of insect control in the apple orchard, in 1871, was reported by S. S. Rathvon, of Lancaster, Pa., a noted entomologist:"[4]

Oyster-shell scale.—Paint the limbs with whale oil soap or neat's foot oil.

Borers—Cut them out. Cover the base of the tree with tin or paper protectors.

Canker Worms—Place a band of sticky material around the trunk.

Tent Caterpillar.—Cut out the egg masses in winter; burn the nests in spring.

Aphids.—Syringe them with tobacco decoction.

Curculio.—Keep livestock in the orchard; jar the limbs and collect the insects on sheets.

Codling Moth.—Scrape off the loose bark; band the trees; keep stock in the orchard.

After 1870 the depredations of insect pests became very serious. In 1865 the Fruit Growers' Society of Western New

[1]Proc. American Pomological Society, 1852, pp. 80-81.
[2]The Horticulturist 1:204, 1846.
[3]Gardener's Monthly 13:169, 1871.
[4]Proc. Pennsylvania Fruit Growers' Society, 1871, pp. 70-95.

York voted: "Resolved, that the man who allows caterpillars to multiply in his orchard is a nuisance." Many orchards were stripped of their foliage annually by the canker worm and the codling moth took heavy toll.

Between 1870 and 1880 the idea was current that one of the most practicable means of keeping insect pests in control was to foster birds. With this in view, English sparrows were imported into the United States, about 1880, by E. Lewis Sturtevant, Director of the New York State Experiment Station. He lived to regret it. By 1878 many growers were desperate, and some began to cut down their orchards.

The First Arsenical Spray.—At this juncture a remedy appeared which saved the day. Paris green was used in the control of the Colorado potato beetle before 1870. It was first used in orchards about 1872, on the recommendation of LeBarron, State Entomologist of Illinois. In that year, "C. M. Hooker, of Rochester, N. Y., reported the successful use of Paris green in the control of canker worms. He mixed it with air-slaked lime, plaster, ashes or flour, and dusted it on. The same material has been used for the control of current worms, for several years."[1]

The first mention of orchard spraying was in 1881, when J. S. Woodward, of Lockport, N. Y., reported that he had found a method for controlling codling moth that was much more effective than banding. His remedy was to "apply Paris green, one pound to 100 gallons of water, by means of a force pump, while the fruit is small and in an upright position." This information seems to have been received with considerable skepticism in Pennsylvania. In 1883 Entomologist S. S. Rathvon, of Lancaster, informed the Fruit Growers' Society, "Applications of liquid Paris green, administered through a force pump or syringe, have been recommended for the control of codling moth, but I have not heard that the remedy has any following at all."

In 1887 the Society debated the question, "Should we, as a Society, encourage the use of Paris green for the destruction of codling moth?" There were many doubting Thomases. Concentrated lime-sulphur was first used as an insecticide in 1881, for the control of San Jose Scale in California. Knapsack and barrel pumps were used until 1894, when the first power sprayer was introduced. Not until after 1890, however, was there much interest in sprays for insect control.

DISEASE CONTROL

There was even less progress in disease control, largely because life history studies on the nature of fungous and bacterial diseases had not been made. Periodic outbreaks of peach Yellows devasted the country; the epidemics of 1851, 1874 and 1886 were especially destructive. The advice of Judge Richard

[1]The Horticulturist 28:79-80, 1873.

Peters, of Philadelphia, in 1806, "Promptly, on the first symptoms of the malady appearing, remove the affected trees," had not been generally followed. Many theories as to the cause of Yellows were advanced; usually is was ascribed to "sour sap resulting from immature wood that has been frozen." One of the first to suggest the parasitic nature of the disease was Josiah Hoopes, of West Chester, Pa., who was one of the best informed horticulturists of his time: "The Yellows presents every feature of an organic disease. The dissection of a diseased tree plainly shows that a poisonous *virus* has penetrated to every part of it. That is why the disease is so easily communicated to healthy trees in pruning."[1]

No progress was made in fire blight control until after its bacterial origin was discovered by Burrell, in 1878. It was commonly considered to be "vegetable apoplexy, caused by a surcharge of the electric fluid." In 1837 the Pennsylvania Horticultural Society offered "a premium of Five Hundred Dollars to be paid to the person who shall discover and make public an effective means of preventing the attack of the disease usually termed pear blight." This munificent offer brought forth a host of panaceas, such as soaking the ground with soap suds, wrapping the limbs with a rag that was sprinkled with brimstone, driving rusty nails into the tree to give it "an iron tonic," and "physicing" the tree with doses of calomel, inserted beneath the bark. No award was made.

Black Knot of plums was found to be due to "the sting of an insect, which was identified by a noted entomologist as *Membracis bubalus*, one of the tree hoppers." John F. Bennett, of Pittsburgh, whom the editor of *The Horticulturist* considered "a close observer," discovered the cause of rot in grapes: "It is a blow or wound received, causing death to the part receiving it, and spreading decomposition into the surrounding parts. What is there in Nature that gives blows causing death? Lightning does."[2]

"Black spots" (scab) were observed on apples, also the cracking of pears, but these were dismissed casually by Patrick Barry, in 1853, as "the results of seasonable variations in climate and of unsuitable locations." In 1847 Brown Rot of plums and peaches was attributed by another pomological authority, A. J. Downing, to "grossness and over-luxuriance. Apply shell lime at the rate of 40 bushels per acre." Thirty years later, in 1887, the Fruit Committee of the State Horticultural Association of Pennsylvania still attributed the rotting of plums to "some mysterious climatic influence, and no remedy is likely to be found." But William Saunders advised Pennsylvania fruit growers in 1868, "I have come to the conclusion that lime and sulphur are disastrous to all fungous matter."[3] He advocated dusting grapes with sulphur to control rot and mildew; this counsel was followed, with considerable success.

[1]Proc. Pennsylvania Fruit Growers' Society, 1870, p. 76.
[2]The Horticulturist 22:14, 1867.
[3]Proc. Pennsylvania Fruit Growers' Society, 1868, p. 29.

After 1875 complaints about "fungoid troubles" increased, particularly brown rot on the peach and black spot on the apple. Relief was at hand. After the discovery of Bordeaux mixture by Millardet at Bordeaux, France, in 1882, it was introduced into the United States by F. Lamson Scribner, in 1885; but there was practically no spraying with fungicides until after 1890.

OTHER CULTURAL PRACTICES

The operation of fruit thinning recently has had many converts, as a result of contemporary research, but it is by no means a modern practice. About 1840 the peach orchard of Isaac Reeve and Jacob Ridgway, "situated on the Delaware River, near Philadelphia" had more than a local reputation. "In 1839 they gathered 18,000 bushels of first rate fruit from 170 acres, whereof only 50 acres were in full bearing. When the fruit has attained the size of a small musket ball, it is thinned. By this judicious management, the amount of fruit is but little diminished in measure, but its size and beauty are greatly improved. During most of the season it sold on the Philadelphia market for $4.50 to $6.00 the basket of three pecks."[1]

No less an authority than Andrew Jackson Downing recommended the *paragrile*, or hail rod, a European device. He described it thus: "To make the hail rod, a rope of straw is necessary; it must be made of ripe wheat straw soaked and twisted, and twenty-five feet long. Through the center must run a strong twine of tow yarn. The cable is fastened to a stake of the same length, with copper wire, and armed at the top with a point of tin, 1½ inches thick and 8 inches long, placed in direct contact with the tow yarn. The hail rods should be set about 600 feet apart, on the most elevated points." This device was reputed to have protected whole districts in Europe from hail, by "abstracting the superabundance of electricity from highly charged clouds." It was powerless, however, to sooth the more tempestous spirit of American hail storms.

About 1870, "barren" or "sterile" trees and orchards, began to attract much attention. It was thought that the blossoms failed to set fruit because of excessive wood growth. In 1870, that keen observer, Josiah Hoopes of West Chester, Pa., examined the pollen of many different varieties of apples and decided that the main cause of sterility was the lack of a sufficient quantity of viable pollen. He recommended cross-pollination, through the mixed planting of varieties.[2]

THE PROCESSION OF VARIETIES

This sixty-year period saw the decline, in the East, of the pear, plum, nectarine, apricot, quince, currant and gooseberry, and the rise of the apple, peach, grape, raspberry and strawberry.

[1]Farmers' Cabinet 6:338, 1841.
[2]Proc. Pennsylvania Fruit Growers' Society, 1870.

By 1875 the pear, once a rival of the apple for the crown of the "King of Fruits," had sunk into comparative insignificance. In 1881, it was reported by the Pennsylvania Fruit Growers' Society, "The consumption of pears is small, compared to apples and peaches. There is no demand for pears in winter and during most of the summer and fail the markets are full of peaches, grapes, plums and melons, which are preferred to pears. The Blight, also, has been responsible for the decline of the pear." The Society then recommended that pears "be not planted for a money crop."

The quince, neglected and almost forgotten today, was one of the most popular of all fruits previous to 1850, when every housewife prided herself on having a bountiful supply of home-made jellies, jams and preserves. "The quince is one of the most profitable of our fruits, always finding a ready market at a generous price. The demand for this fruit in the Philadelphia market has far outrun the supply for many years past."[1] The currant and gooseberry suffered a similar fate, and for the same reason. Thus fruits, as well as varieties, rise and fall, and perhaps rise again, with the passing of the years.

Varieties Increase.—At the beginning of this period, the advantages of grafted fruits were just beginning to be recognized. For fifty years, from 1827 to 1867, most of the time at horticultural meetings was devoted to discussions of varieties. Named sorts increased rapidly, and nurseries flourished. In 1825 Prince, the celebrated Long Island nurseryman, offered 116 varieties of apples, of which 61 were American. Fifty years later, in 1872, Downing described 1856 varieties of apples, of which 1099 were of American origin. Probably less than one third of these, however, were in general cultivation.

The American Pomological Society, organized in 1852, was the most important stimulus to the introduction and testing of varieties; its Catalog of Fruits was accepted as the infallible guide to variety adaptations. This was the heyday of systematic pomology. The fame of A. J. Downing and his brother Charles, of Patrick Barry, J. J. Thomas and Marshall P. Wilder, rested far more on their knowledge of varieties than on their cultural skill. About 1860 systematic pomology was submerged in the rising tide of commercial fruit growing; it has been a comparatively minor factor in American pomology ever since.

Between 1840 and 1860 there was much discussion of the "running out" of varieties. "There is a notion prevalent with many cultivators of fruit that the cankered state of many old pears is due to their approaching extinction, in consequence of the death of the original or parent tree, from which the first cions were taken. They believe that the progeny never outlive the original seedling or, if they do, are never thirfty growers thereafter."[2] It was supposed that the seedling tree derived its

[1]Farmers' Cabinet 5:210, 1840; 8:223, 1844.
[2]The Horticulturist 2:109, 1847.

longevity and vital force from the seed; that every time the seedling tree was divided, as in propagation, its longevity and vitally were decreased in proportion; that there was a fixed limit to the life of the seedling and all its progeny (about 100 years, in the case of the apple), hence the necessity of constantly producing new varieties from seeds.

This theory was first advanced by Thomas Andrew Knight, in England, who made the dogmatic assertion, "Every variety carries within itself the limitations of its own existence." It was difficult, however, to reconcile this theory with the luxuriant growth of the Bon Chretien pear, a European variety at least 700 years old which was renamed the Bartlett in America. Henry Ward Beecher, a distinguished horticulturist as well as an eloquent preacher and publicist, replied, "Any one tree may wear out, but a variety never." That was the conclusion finally reached, and now held. Running out is due chiefly to neglectful culture.

The fruit list adopted by the Pennsylvania Fruit Growers' Society, in 1869, is representative of the variety situation in the early days of commercial fruit growing:

APPLES

Summer	*Fall*	*Winter*
Red Astrachan	Maiden Blush	Fallawater
Early Harvest	Porter	Smith's Cider
Sweet Bough	White Doctor	Baldwin
		Smokehouse
		Ridge Pippin
		Long Island Russett

PEARS

Summer	*Fall*	*Winter*
Doyenne d' Eté	Bartlett	Lawrence
Osband's Summer	Seckel	Vicar of Winkfield
Tyson	Belle Lucrative	Winter Nelis
	Howell	
	Urbaniste	
	Sheldon	

PEACHES	PLUMS	CHERRIES
Hale's Early	Yellow Gage	May Duke
Troth's Early	Jefferson	Early Richmond
Crawford's Early	Richland	Black Tartarian
Large Early York		Governor Ward
Old Mixon Free		Yellow Spanish
Susquehanna		English Morello
Stump the World		Bleeding Heart
Ward's Late		Late Kentucky
Crawford's Late		
Smock		

GRAPES	STRAWBERRIES	RASPBERRIES
For Table Use:		
Hartford Prolific	Wilson's Albany	Philadelphia
Concord	Agriculturist	Clark
Clinton	Triomphe de Gand	Doolittle
Martha	Green Prolific	Brincklé's Orange
Catawba	Ida	Falstolff
	Philadelphia	Hornet
For Wine:		
Clinton		
Ives		

BLACKBERRIES	CURRANTS	GOOSEBERRIES
Lawton	Red Dutch	Houghton
Wilson	Cherry	Cluster
	White Grape	Downing

There has been a practically complete change in varieties of the peach, strawberry and raspberry since 1869. The reign of the Elberta peach did not begin until after 1880. The standard varieties contributed by Pennsylvania have been comparatively few; chief of these are the York Imperial, Smokehouse and Jeffries apples, and the Kieffer, Seckel and Tyson pears.

STORING AND MARKETING

Improvements in methods of storing and marketing fruit during this period were slight. After 1850 there was renewed interest in the construction of common storage houses, mostly bank cellars. These were found valuable for local market growers, but unsatisfactory for wholesale growers. Between 1860 and 1870, many insulated fruit houses were erected, ice being stored in a room above the fruit. The patented "Nyce Fruit House" was of this type. In 1865 Thomas Meehan reported "Mr. Nyce and his friends are making fortunes out of the idea." A considerable number of these houses were erected in Pennsylvania, especially near Reading. The cost (stone construction, walls insulated with sawdust) was "about $2000 for a house holding 4,000 bushels, and requiring 1,000 tons of ice a year." One of the most successful of these ice fruit houses was that of Dr. J. H. Funk, of Boyertown, Pa.; it "had a capacity of 3,000 barrels and cost $7000." Cold storage with artificial refrigeration, as applied to fruit growing, has developed mainly since 1895.

Canning.—The commercial canning of fruits and vegetables, patent for which was granted in 1825, began to attract attention about 1847. After 1860 it developed rapidly; by 1870 it was firmly established as an adjunct to the fruit industry. According to *The Horticulturist* for 1871, "It is quite common to find

THOMAS MEEHAN, of Philadelphia

Editor of Gardener's Monthly for thirty years. He made many contributions to American pomology, especially in the application of the science of botany to fruit growing.

canning factories in every county in all of our large peach growing districts. If it were not for them, to relieve our markets of surplus fruits, we fear fruit culture would be a very unsatisfactory occupation." The commercial sun-drying and evaporation of fruits has developed since 1872, mainly on the Pacific coast; they were the salvation of the California deciduous fruit industry of that period.

By the close of this period, in 1887, there had been but little improvement in marketing methods. There were no standard grades, no standard packages, and no cooperative marketing. Barrels, baskets and boxes were of all sizes and shapes. The ethical and business standards of growers in grading and packing were none too high; the "stove-piping" of barrelled apples was not uncommon. Growers all too frequently were fleeced by middlemen; there was no market news service.

Transportation losses frequently were heavy. The lack of refrigeration in transit was a constant menace to distant shippers. The ventilator car, introduced in 1870, was an improvement over the box car, but did not give assurance that the fruit would reach distant markets in salable condition. The labor of a year might come to nought because of a seemingly unavoidable delay of a few hours in transit. Then, far more than now, the grower with good local markets enjoyed a great advantage over his distant competitors. The refrigerator car, first used in the meat packing industry in 1869, and adapted to the fruit trade in 1887, destroyed that advantage to a large extent.

This period witnessed the rise of the export trade, which is an important factor in the economics of the apple industry. Apples had been exported in limited quantities to the West Indies and to Europe, in ice boats, since 1790, but the trade did not reach any considerable proportions until after 1845. In 1868 the United States exported 15,000,000 bushels, mainly to Great Britain; in 1888, 37,000,000 bushels. These were mainly Baldwin, Yellow Newton and Bellflower. The first mention of York Imperial as an export variety was in 1878.

THOMAS MEEHAN

Pennsylvania's contribution to the group of distinguished horticulturists of the Transition Period was Thomas Meehan, of Philadelphia. He stands out from his contemporaries as did John Bartram, Bernhard M'Mahon and Richard Peters, also of Philadelphia, in the Colonial Period. Meehan ranks with Hovey, Downing, Thomas and Wilder in his contribution to American pomology, more especially in the application of the science of botany to fruit growing. He was recognized as the leading vegetable biologist of his day.

Thomas Meehan was an English gardener, a graduate of the apprentice system at Kew Gardens. He came to America in 1848, at the age of twenty-two. For five years he was Superintendent of Bartram's Garden, and private gardener to several

THOMAS MEEHAN, of Philadelphia

Editor of Gardener's Monthly for thirty years. He made many contributions to American pomology, especially in the application of the science of botany to fruit growing.

canning factories in every county in all of our large peach growing districts. If it were not for them, to relieve our markets of surplus fruits, we fear fruit culture would be a very unsatisfactory occupation." The commercial sun-drying and evaporation of fruits has developed since 1872, mainly on the Pacific coast; they were the salvation of the California deciduous fruit industry of that period.

By the close of this period, in 1887, there had been but little improvement in marketing methods. There were no standard grades, no standard packages, and no cooperative marketing. Barrels, baskets and boxes were of all sizes and shapes. The ethical and business standards of growers in grading and packing were none too high; the "stove-piping" of barrelled apples was not uncommon. Growers all too frequently were fleeced by middlemen; there was no market news service.

Transportation losses frequently were heavy. The lack of refrigeration in transit was a constant menace to distant shippers. The ventilator car, introduced in 1870, was an improvement over the box car, but did not give assurance that the fruit would reach distant markets in salable condition. The labor of a year might come to nought because of a seemingly unavoidable delay of a few hours in transit. Then, far more than now, the grower with good local markets enjoyed a great advantage over his distant competitors. The refrigerator car, first used in the meat packing industry in 1869, and adapted to the fruit trade in 1887, destroyed that advantage to a large extent.

This period witnessed the rise of the export trade, which is an important factor in the economics of the apple industry. Apples had been exported in limited quantities to the West Indies and to Europe, in ice boats, since 1790, but the trade did not reach any considerable proportions until after 1845. In 1868 the United States exported 15,000,000 bushels, mainly to Great Britain; in 1888, 37,000,000 bushels. These were mainly Baldwin, Yellow Newton and Bellflower. The first mention of York Imperial as an export variety was in 1878.

THOMAS MEEHAN

Pennsylvania's contribution to the group of distinguished horticulturists of the Transition Period was Thomas Meehan, of Philadelphia. He stands out from his contemporaries as did John Bartram, Bernhard M'Mahon and Richard Peters, also of Philadelphia, in the Colonial Period. Meehan ranks with Hovey, Downing, Thomas and Wilder in his contribution to American pomology, more especially in the application of the science of botany to fruit growing. He was recognized as the leading vegetable biologist of his day.

Thomas Meehan was an English gardener, a graduate of the apprentice system at Kew Gardens. He came to America in 1848, at the age of twenty-two. For five years he was Superintendent of Bartram's Garden, and private gardener to several

wealthy patrons of horticulture near Philadelphia. In 1853, he established Meehan's Nurseries. He was the sole editor of *Gardener's Monthly*, published at Philadelphia, during its existence of thirty years, from 1859 to 1889. This magazine had an influence on American horticulture not surpassed by any other publication, not even Hovey's *Magazine of Horticulture*. There were no Experiment Station bulletins then, and but few books; the horticultural periodical was the chief source of information, and the editor spoke with authority.

Gardener's Monthly was exceptionally free from the personal bias and petty controversies that marred the pages of contemporary magazines. Meehan also differed from many editors in that he never used his journal to further his nursery interests. He helped to organize the State Horticultural Association of Pennsylvania in 1859, and participated in every annual meeting for thirty years.

When the Transition Period closed, in 1887, fruit growers were submerged in gloom. In that year, the Committee on Orcharding of the State Horticultural Association of Pennsylvania reported: "Fruit growing in Pennsylvania is not a profitable business", and there was no dissent to this from the floor of the Convention. Many orchards were abandoned or cut down. But there were better days ahead.

STATE HORTICULTURAL ASSOCIATION OF PENNSYLVANIA

MEMBERSHIP LIST---1931

Name	Post Office	County
Abbey, J. H.	North Girard	Erie
Abildgaard, Wm.	John Bean Co., Lansing, Mich.	
Abraczinskas, Andrew	Catawissa	Columbia
Abrams, I. B.	Beach Haven	Luzerne
Acme Veneer Pkg. Co.	Orchard Park, N. Y.	
Adam, J. N.	West Chester	Chester
Adams, C. S.	Easterly	Berks
Adams, J. F.	Dover, Delaware	
Adams, W. S.	Aspers	Adams
Adams County Fruit Packing and Dist. Co.	Biglerville	Adams
Adler, A. and Son	Front & Richmond St., Philadelphia	Philadelphia
Allen, S. W.	Ottsville	Bucks
Allen, S. L. Co.	5th & Glenwood Sts., Philadelphia	Philadelphia
Allen, Howard G.	New Park	York
American Lime and Stone Co.	Bellefonte	Centre
Anderson, Ralph	Fawn Grove	York
Anderson, H. M.	New Park	York
Anderson, H. W.	Stewartstown	York
Anderson, C. R.	920 Shore Ave., Pittsburgh	Allegheny
Ansbacher Siegel Corp.	50 Union Square, New York City	
Anwyll, Harry L.	Harrisburg	Dauphin
Atkinson, D. W.	Wrightstown	Bucks
Atkinson, R. E.	Wrightstown	Bucks
Aument, Andrew	Safe Harbor, R. 2	Lancaster
Baldesberger, W. P.	Bridgeville, R. 2	Allegheny
Balmer, Clayton	Manheim, R. 1	Lancaster
Balthaser, G. W.	Wernersville	Berks
Banzhaf, W. H.	Muncy	Lycoming
Barnard, C. P.	Kennett Square	Chester
Barnes Hursery & Orchard Co.	Wallingford, Conn.	
Barr, I. C.	Greencastle, R. 2	Franklin
Bartram, Frank M.	Kennett Square	Chester
Bartram, G. Maurice	West Chester	Chester
Baugher, G. L.	Aspers	Adams
Baugher, H. G.	Aspers	Adams
Baumgartel, Wm. E.	Fairacis Farm, Sewickley Hgts.	Allegheny
Beach, F. H.	Columbus, Ohio	
Bean, John Mfg. Co.	Lansing, Mich.	
Bear, Jacob	York, R. 10	York
Bear, John W.	York, R. 10	York
Bear, Arthur	York, R. 10	York
Bear, Paul A.	Mt. Wolf, R. 4	York
Beatty, J. E.	North Girard	Erie
Beaver, James B.	Mifflinburg	Union
Beaverbrook Farm	Brandywine Summit	Chester
Beaverson, E. S.	York, R. 5	York
Beck, John A.	White Deer, R. 1	Union
Beck, A. F.	Perkasie, R. 1	Bucks
Beeman, S. C.	Dundee Farm, Sewickley Hgts.	Allegheny
Behrens, H. A.	120 Sambourne St., Wilkes-Barre	Luzerne
Bender, L. J.	Allentown, R. 4	Lehigh

Name	Post Office	County
Benn, Robert P.	Bangor	Northampton
Benner, Hartford G.	Coopersburg	Lehigh
Bell, R. H.	Bureau of Plant Industry, Harrisburg	
Bickley, Mrs. Mae E.	Quakertown, R. 5	Bucks
Billmeyer, H. W.	Quakertown, R. 2	Lehigh
Bingham, A. H.	St. Thomas	Franklin
Bingham, W. O.	St. Thomas	Franklin
Bishop, Wm.	Doylestown	Bucks
Black, H. M.	Idamar, R. D.	Indiana
Black, M. C.	Allison Park	Allegheny
Blaine, G. W.	North East	Erie
Blessing, David H.	4 N. Court St., Harrisburg	Dauphin
Boak, Everett	New Castle, R. 4	Lawrence
Boles, McClellan T.	Hanlin Station	Washington
Boltz, Peter R.	Lebanon	Lebanon
Bonear, Chester	Honesdale	Wayne
Bonham, Boyd, Jr.	Hunlocks Creek, R. 2	Luzerne
Borry, E. E.	Stevens, R. 2.	Lancaster
Bountiful Ridge Nurseries	Princess Ann, Md.	
Bovard & Baldwin	655 E. Washington St., New Castle	Lawrence
Boyd, Paul C.	Delta	York
Boyer, Jay	Mt. Pleasant Mills	Snyder
Boyer, John F.	Middleburg, R. 4	Snyder
Boyer, W. W.	Bilgerville	Adams
Boyer, J. M.	Lykens	Dauphin
Brace, Harold G.	Dallas, R. 3	Luzerne
Bream, D. M.	Chambersburg	Franklin
Breidenbaugh, H. L.	Boyertown	Berks
Brenneman, John S.	Lancaster, R. 7	Lancaster
Bricker, E. B.	Lititz	Lancaster
Brinton, R. F.	West Chester	Chester
Brinton, H. C.	Hanover	York
Broomell, J. Howard	Bridgeport	Montgomery
Brossman, Morse	Ephrata, R. 4	Lancaster
Brown, H. W.	Box 756, Allentown	Lehigh
Brown, J. Turner	New Park	York
Brown, Bert C.	Marion Center, R. 3	Indiana
Brown, M. G.	Woodbine, Md.	
Brown, Norman C.	Waynesboro, R. D.	Franklin
Brown, S. A.	Orefield, R. 1	Lehigh
Brown, J. E.	McDonald	Washington
Brubaker, J. C.	Lititz, R. 1	Lancaster
Bruce, R. C., Jr.	Superba Laboratory, 910 Michigan Blvd., Chicago, Ill.	
Bruckhart & Son, J. W.	Lititz	Lancaster
Bruner, W. W.	Middleburg, R. 4	Snyder
Bucher, F. S.	Lancaster, 642 Woolworth Bldg.	Lancaster
Buck, Warren W.	Elizabeth	Allegheny
Bullock, W. H.	Honesdale	Wayne
Bupp, Jere	York, R. 2	York
Burk, Paul H.	Buttonwood Farm, Beverly, N. J.	
Burkett, Peter B.	Fogelsville	Lehigh
Carpenter, G. S. L.	Hancock, Md.	
Carroll, Frank B.	Neshaminy	Bucks
Carter, E. C., Jr.	Allison Park	Allegheny
Carter, L. A.	Treesdale Farms, Mars	Allegheny
Carter, George	Emaus	Lehigh
Catherwood, James C.	Gibsonia, R. 3	Allegheny
Cation, W. R.	Orrtanna	Adams
Central Chemical Co.	Hagerstown, Md.	
Chapin, Irvin	Shickshinny, R. 3	Luzerne
Chase Bros. Co.	Rochester, N. Y.	

Name	Post Office	County
Chase, Chas. T.	Bala	Montgomery
Clair, H. A.	610 Walnut St., Perkasie	Bucks
Clark, B. M.	Indiana	Indiana
Close, E. V.	Lawrenceville	Tioga
Coates, W. B.	Gum Tree	Chester
Coffroad, L. C.	New Holland, R. 2	Lancaster
Garber, H. F.	Mt. Joy, R. 3	Lancaster
Consolidated Paper Co.	Monroe, Mich.	
Cooper, C. A.	1000 Highland Ave., Coraopolis	Allegheny
Cope, F. A., Jr.	Dimock	Susquehanna
Couch, H. R.	Shelocta, R. 3	Indiana
Cowan, W. H.	Roaring Spring, R. 2	Blair
Cornwall Farms and Orchards	Cornwall	Lebanon
Cox, J. W.	New Castle, R. 5	Lawrence
Craig, Albert B.	Sewickley	Allegheny
Craighead, E. M.	2742 N. 2nd St., Harrisburg	Dauphin
Crawford, J. B.	Fayetteville, R. 1	Franklin
Crawford, Thos. H.	Fayetteville	Franklin
Creasy, C. W.	Catawissa, R. 1	Columbia
Creasy, Luther P.	Catawissa, R. 1	Columbia
Creighton, Mrs. T. S.	Blue Ridge Summit	Franklin
Cressman, C. K.	Barto, R. D.	Berks
Crissman, W. R.	Indiana	Indiana
Crist, James D.	Walden, N. Y.	
Criswell, R. T.	12 N. 2nd St., Chambersburg	Franklin
Croft, F. W.	St. Thomas	Franklin
Cromley, P. S.	Danville, R. 6	Montour
Crouse, E. A.	Gettysburg	Adams
Crowell, Samuel B.	Edgemont	Delaware
Crowell, A. & T.	Avondale	Chester
Crowell, Ralph T.	Buckingham	Bucks
Cummings, J. F.	Sunbury	Northumberland
Cummings, J. W.	New Wilmington	Lawrence
Curtis, Ellicott D.	Bantam, Conn.	
Daniels, Arthur	Lake Ariel, R. 3	Wayne
Davenport, Eugene	Plymouth	Luzerne
Dayton, R. S.	Woodbourne Orchards, Dimock	Susquehanna
Dean, Rev. J. W.	Adrian	Armstrong
DeCou, Benj. S.	Norristown, R. 1	Montgomery
DeLong, Cletus Y.	Mertztown, R. 2	Berks
Dennis, A. J.	Zionsville, R. 1	Lehigh
Detweiler, Ira K.	36 N. 8th St., Lebanon	Lebanon
Dickenshied, F. S.	Zionsville, R. 1	Lehigh
Dickey, Samuel	Oxford	Chester
Dickinson, B. M.	5634 Station Ave., Pittsburgh	Allegheny
Diehl, Ed. B.	St. Thomas	Franklin
Dietz, H. J.	Penn Square	Lancaster
Dill, Robt.	North East	Erie
Diven, W. C.	Livermore, R. 2	Indiana
Dochat, C. J.	Lancaster, R. 2	Lancaster
Druck, Albert	Wrightsville, R. 2	York
Drumheller, J. R.	Boyertown, R. 1	Berks
Duke, D. R. & B. F.	60 W. Queen St., Chambersburg	Franklin
Duncan, Miss Eleanor C.	323 E. King St., Shippensburg	Cumberland
Dunlap, James M.	Shippensburg, R. 2	Cumberland
Dunlap, R. Bruce	Dept. of Welfare, Harrisburg	Dauphin
Dye, H. W.	Middleport, N. Y.	
Eby, Henry R.	Room 2, Court House, Pittsburgh	Allegheny
Eckman, I. W.	Sunbury, R. 2	Northumberland
The Edgerton Mfg. Co.	Plymouth, Ind.	
Edgerton, J. Russell	Westtown	Chester

Name	Post Office	County
Edminson, William	New Wilmington	Lawrence
Eisaman, G. A.	East Springfield	Erie
Elbell, Geo. H.	Rossiter, R. 1	Indiana
Elder, George K.	Lewistown, Maine	
Eldon, Robert M.	Aspers	Adams
Eagleman, J. G.	Geigers Mills	Berks
Ebling, Aaron	Reading, R. 2	Berks
Englemen, E. Y.	Noxen	Wyoming
Evans, Roland	Longwood Farms, Kennett Square	Chester
Evans Brothers	Meadow Craft Farm, Glen Mills	Delaware
Evans, W. H.	Plainsville	Luzerne
Everhart, W. J.	219 E. Philadelphia St., York	York
Everhart, G. W.	S. George St., York	York
Fagan, F. N.	State College	Centre
Fahs, David C.	York, R. 9	York
Farley, A. J.	New Brunswick, N. J.	
Fassett, F. H.	Meshoppen	Wyoming
Fawcett, K. I	Lafayette, Indiana	
Feeg, A. C.	Robeson a, R. 1	Berks
Felty, G. O. B.	Millersville	Lancaster
Fenstermacher, P. S.	Allentown, R. 3	Lehigh
Ferrall, Geo. K.	401 Barr Ave., Crafton	Allegheny
Fetterman, J. Gordon	Media	Delaware
Field Force Pump Co.	Elmira, N. Y.	
Filbert, R. J.	Fox Chase	Philadelphia
Fisher, Isaac L.	Soudersburg	Lancaster
Fisher, Fred	Wernersville	Berks
Flack, M. Raymond	West Chester, R. 5	Chester
Fletcher, S. W.	State College	Centre
Flinchbaugh, H. H.	Loganville	York
Flora, Wm. H.	Wrightsville	York
Forbes, R. M.	Erie, R. 1	Erie
Forry, S. E.	Ephrata, R. 1	Lancaster
Foster, C. W.	Girard, R. 2	Erie
Francis, C. D.	225 N. 17th St., Allentown	Lehigh
Frantz, Ira	Dallas, R. 3	Luzerne
Freed, A. J.	Racine	Beaver
Freed, W. A.	Racine	Beaver
Fretz, J. Franklin	Ottsville, R. D. 1	Bucks
Frey, Harry E.	York, R. 6	York
Frey, C. H.	North Girard	Erie
Frey, John L.	c-o C. K. Whitner Co., Reading	Berks
Friday, G. P. & Son	New Castle, R. 1	Lawrence
Friend Mfg. Co.	Gasport, N. Y.	
Funk, Sheldon	Boyertown	Berks
Gackenbach, C. A.	Orefield, R. 1	Lehigh
Gardenhour, G. W.	Smithsburg, Md.	
Garman, Albert S.	North Charles St., Manheim	Lancaster
Garrahan, R. H.	Kingston	Luzerne
Gay, Arthur	Dallas, R. 3	Luzerne
Gehman & Rosenberger	Souderton	Bucks
Gehr, Harvey J.	Waynesboro	Franklin
Gensl, Edw. A.	Zion Hill	Bucks
Gibson, Ira E.	Blairsville, R. 4	Indiana
Gibson, W. F.	Yoe	York
Gillan, C. F.	St. Thoma	Franklin
Gillan, G. C.	St. Thomas	Franklin
Gillan, R. J.	St. Thomas	Franklin
Glebe, Wm.	Delaware Water Gap	Monroe
Glick, Jacob R.	Lancaster, R. 5	Lancaster

Name	Post Office	County
Good, James, Inc.	2111 E. Susquehanna Ave., Philadelphia	Lancaster
Good, Harvey	Lancaster, R. 8	Lancaster
Goodling, G. A.	Loganville	York
Goshorn, Taylor L.	Quincy	Franklin
Gould, C. H.	Haydenville, Mass.	
Gramm, H. V.	St. Thomas, R. 1	Franklin
Graybill, C. W.	Middleburg, R. 4	Snyder
Graybill, N. Charles	New Windsor, Md.	
Greenwalt, Edgar	Lenhartsville, R. 1	Berks
Greger, E. N.	324 N. Glenside Ave., Glenside	Montgomery
Greist, C. A.	Guernsey	Adams
Griest, Frederick E.	Flora Dale	Adams
Grimshaw, Harry	North Girard	Erie
Gross, H. S.	York, R. 10	York
Group, Foster C.	Gardners	Adams
Grove, W. E.	York Springs	Adams
Grubbs, E. B.	Fair iew	Erie
Gutelius, Ray D.	Mifflinburg	Union
Guyton, T. L.	Bureau of Plant Industry, Harrisburg	
Haag, Arthur M.	1230 Robeson St., Reading	Berks
Haas, William	Overlook Orchards, Coplay	Lehigh
Haase, Herman	Narrowsburg, R. 1, N. Y.	
Haase, Alfred H.	Narrowsburg, N. Y.	
Hacker, A. L.	451 Hamilton St., Allentown	Lehigh
Haddock, John C.	Wilkes-Barre	Luzerne
Hafer, Ray	Fayetteville, R. 1	Franklin
Haines, Granville E.	Mt. Holly, N. J.	
Halderman, E. N.	Doylestown	Bucks
Hall, L. C.	North Girard	Erie
Hann, Jesse	Hunlocks Creek	Luzerne
Harbison, C. F.	New Castle, R.	Lawrence
Hardt, C. W.	245 N. 2nd St., Harrisburg	
Hart, H. V. Co.	Hagerstown, Md.	
Hartzell, Floyd R.	Sharpsburg	Allegheny
Harshman, John W.	Smithsburg, Md. R. 1	
Hartman, Scott W.	Palm	Berks
Hartman, D. L.	Little River, Fla.	
Hartman, L. E.	Cly	York
Hassinger, H. C.	Beavertown	Snyder
Haudenshield, Chas. H.	Noblestown Road, Crafton	Allegheny
Haudenshield, Crist L.	Mt. Oliver, Pittsburgh, R. 6	Allegheny
Hausman, George B.	Coopersburg, R. 2	Lehigh
Haverstick, Paul E.	642 Woolworth Bldg., Lancaster	Lancaster
Hawkins, E. B.	Delta	York
Hawkins, Chas. A.	Delta	York
Hayes, S. B.	Enon Valley, R. 1	Lawrence
Hayman, Guy L.	Northbrook	Chester
Hays, H. S.	York, R. 2	York
Heacock, O. J.	Biglerville	Adams
Head, J. B.	114 E. Market St., York	York
Heinz, Henry	Narrowsburg, N. Y.	
Heisey, S. A.	Greencastle, R. 4	Franklin
Helwig, D. B.	Catawissa, R. 1	Columbia
Herr, C. H.	Lancaster, R. 2	Lancaster
Herrick, R. S.	Des Moines, Iowa	
Hershey, H. S.	East Petersburg	Lancaster
Hershey, Paul M.	Ronks, R. 2	Lancaster
Hershey, C. Maurice	Paradise, R. 1	Lancaster
Hershey, H. F.	Hamburg	Berks
Hersh, H. H.	Steinsburg	Burks
Hess, Paul G.	Mt. Alto, R. 1	Franklin

Name	Post Office	County
Hess, Ray B.	Mt. Alto, R. 1	Franklin
Hess, Elmer E.	Conestoga, R. 1	Lancaster
Hess, Willis A.	Winchester, Va.	
Hetrick, D. W.	Beavertown	Snyder
Hile, Anthony	Curwensville	Clearfield
Hileman, W. Carl	New Castle, R. 3	Lawrence
Hill, William D.	North East	Erie
Hines, Zenas	Clymer, R. 2	Indiana
Hoffman, H. A.	Bridgeville, R. 2	Allegheny
Hoffman, Frank G.	Birdsboro, R. 2	Berks
Hoffman, H. L.	Butler, Star Route	Butler
Hoffman, R. C.	Arendtsville	Adams
Hoffmaster, J. G.	Muddy Creek Forks	York
Holt, Herbert	Coopersburg, R. 2	Lehigh
Hood, T. C.	Saltsburg, R. 1	Indiana
Hoopes, Wilmer W.	West Chester	Chester
Hootman, H. D.	East Lansing, Mich.	
Horn, W. H.	Chambersburg, R. 10	Franklin
Horne, Davi	York, R. 3	York
Horner, J. M.	250 Conway St., Carlisle	Cumberland
Horst, J. Morris	Lebanon, R. 3	Lebanon
Hostetler, Abram	Johnstown, R. 3	Cambria
Hostetter, Dr. J. E.	Gap, R. 1	Lancaster
Hostetter, H. Herman	Lebanon, R. 5	Lebanon
Howard, P. H.	Dover, R. 1	York
Howe, Homer B.	Benton	Columbia
Huber, Edwin B.	232 S. Main St., Chambersburg	Franklin
Huey, S. R.	New Castle, R. 3	Lawrence
Hunsberger, Howard K.	Perkasie	Bucks
Hunt, M. H. & Son	510 N. Cedar St., Lansing, Mich.	
Hunt, N. M.	New Castle, R. 4	Lawrence
Hunter, James	Wexford	Allegheny
Hutchinson, J. D.	Rear 84 Scott St., Wilkes-Barre	Luzerne
Hutchinson, T. G.	New Wilmington	Lawrence
Huyett, Irwin B.	Reading, R. 2	Berks
Hydraulic Press Mfg. Co.	Mt. Gilead, Ohio	
Hykes, E. S.	York, R. 10	York
Ingham, M. M.	New Castle, R. 5	Lawrence
Irey, Allen M.	Boyertown	Berks
James, D. M.	Bureau of Markets, Harrisburg	
Janes, G. T.	North Girard	Erie
Jayne, Allen	West Auburn	Susquehanna
Jefferson, Thomas H.	Wycombe	Bucks
Johnston, Mrs. F. C.	Dallas	Luzerne
Johnston, M. E.	Connoquenessing	Butler
Johnston, R. S.	New Wilmington, R. 1	Lawrence
Johnston, J. H.	New Wilmington, R. 1	Lawrence
Kaiser, Frank A.	1031 Capouse St., Scranton	Lackawanna
Karns, J. H.	Chambersburg	Franklin
Kauffman, A. L.	Ronks, R. 1	Lancaster
Kauffman, C. E.	124 S. Hartley St., York	York
Kauffman, J. B.	York, R. 7	York
Keller, L. F.	Selinsgrove	Snyder
Keller, Paul J.	Gettysburg, R. 5	Adams
Kelly Bros. Nurseries	Dansville, N. Y.	
Kelso, James	Enon Valley	Lawrence
Kemery, C. H.	West Chester	Chester
Kendig, Dr. J. D.	Salunga	Lancaster
Kerchner, Harvey T.	Lenhartsville	Berks
Kerr, F. P.	233 Kelly Ave., Wilkinsburg	Allegheny
Kerr, S. W.	Jacksonwald	Berks
Kessler, Geo. W.	Tyrone	Blair
Ketner, Jacob B.	Wernersville	Berks

Name	Post Office	County
Key, Wm. H.	Verona, R. 1	Allegheny
Kibbler, C. P.	572 W. Market St., York	York
King, M. G.	Mt. Wolf, R. 1	York
King, Howard	New Castle, R. 7	Lawrence
Kintner, G. H.	Mehoopany	Wyoming
Kister, U. G.	Etters	York
Kistler, H. C.	Lenhartsville, R. 1	Berks
Kleppinger, B. M.	Coopersburg, R. 2	Lehigh
Klugh, H. E.	Harrisburg	Dauphin
Knappenberger, Thomas	Zionsville	Lehigh
Koch, C. H.	McKeansburg	Schuylkill
Koehler, Paulus E.	826 Washington Ave., Monaca	Beaver
Koozer, Harry	Indiana	Indiana
Koppers Co., Labs.	Koppers Bldg., Pittsburgh	Allegheny
Kraus, J. W.	Barnesville	Schuylkill
Kraybill, S. S.	Mt. Joy	Lancaster
Kreidweis, John	Bridgeville	Allegheny
Kuhns, Oscar H.	Allentown, R. 3	Lehigh
Kuhns, Victor	Allentown, R. 2	Lawrence
Kunkel, Geo. E.	Orwigsburg	Schuylkill
Kyle, Wm. B.	Zionsville	Lehigh
Landis, H. D.	Girard	Erie
Landis, D. M.	Lancaster, R. 7	Lancaster
Lau, Rev. I. M.	715 Manor St., York	York
Lau, L. E.	East Berlin, R. 2	York
Lau, L. B.	East Berlin, R. 2	York
Laub, H. H., Jr.	77 Chestnut St., Lewistown	Mifflin
Laudenslager, John	Orefield, R. 1	Lehigh
Laudenslager, Martin	Orefield, R. 1	Lehigh
Lehman, G. E.	Wrightsville, R. 2	York
Lehman, Sylvester	York, R. 9	York
Leibhart, Samuel	Wrightsville, R. 1	York
Lemmon, D. R.	North Girard	Erie
Lengle, Paul H.	Pine Grove	Schuylkill
Leonard, F. E.	Carlisle, R. 1	Cumberland
Lepole, Walter	Akron	Lancaster
Lewis, S. V.	Wyoming, R. 1	Luzerne
Lewis, L. A.	Wyoming, R. 3	Luzerne
Lewis, Nelson	Pittston, R. 1	Luzerne
Lewis, L. N.	210 Summit Ave., Ligonier	Westmoreland
Linde, J. Eric	Orefield, R. 1	Lehigh
Linville, Arthur S.	Media, R. 2	Delaware
Livingood, W. W.	Robesonia	Berks
Long, D. Edward	Fayetteville	Franklin
Long, Clayton	Corvallis, Oregon	
Longenecker, Howard G.	Mt. Joy	Lancaster
Loop, H. S.	North East	Erie
Loop, A. I.	North East	Erie
Loose, H. H.	Menges Mills	York
Lord, John	Wyoming, R. 1	Luzerne
Luginbuhl, R.	3 Nassau Blvd., Lynbrook, Long Island	
McClelland, J. B.	Canonsburg	Washington
McCormick, C. M.	New Castle, R. 2	Lawrence
McCormick, James	Harrisburg	Dauphin
McDonald, R. C.	Inwood, W. Va.	
McFarland, J. Horace	Harrisburg	Dauphin
McGeorge, Mrs. Katherine	Orrtanna	Adams
McGinnis, C. R.	Reading, 523 Oley Street	Berks
McGowan, Howard	Geigers Mills	Berks
McHenry, Clarence	Indiana	Indiana
McIlvaine, J. S.	Fayetteville	Franklin
McKee, T. C.	East Springfield	Erie
McKee, J. M.	Harrisburg	Dauphin

Name	Post Office	County
MacNeal, William H.	Parkesburg	Chester
McPherson Brothers	Bridgeton	York
McPherson, Roy P.	LeRoy, New York	
Maderia, A. B.	Sinking Springs	Berks
Maffet, Miss M. A.	264 Franklin St., Wilkes-Barre	Luzerne
Maloney Brothers Nursery	Dansville, N. Y.	
Marble, L. M.	Canton	Bradford
Markey, Elmer J.	York, R. 2	York
Marsh, H. V.	Seven Valleys, R. 2	York
Martin, A. C.	Muddy Creek Forks	York
Martin, J. O.	Mercersburg	Franklin
Marvil Package Co.	Laurel, Delaware	
Mattern, Jos. C.	310 Newry St., Hollidaysburg	Blair
Mattes, Paul	Emaus, R. 1	Lehigh
Matthews, W. H.	Box 313, Salem, Ohio	
Maule, Norman C.	Willow Street, R. 1	Lancaster
Maurer, J. Edward	Kratzerville	Snyder
Mayer, L. E.	Boyertown	Berke
Mayer, Guy S.	Willow Street	Lancaster
Mechling, E. A.	Moorestown, N. J.	
Meeder, J. V.	North Girard	Erie
Meehan, S. Mendelsohn	380 Dorset St., Germantown	Philadelphia
Melcher, George W.	Bally	Berks
Merkel, Floyd	Hamburg	Berks
Messmer Brass Co.	2700-2706 S. 7th Blvd., St. Louis, Mo.	
Mesta Brothers	Finleyville, R. 1	Washington
Meyer, Allen	Annville	Lebanon
Meyer Milling Co.	Annville	Lebanon
Miles, H. C. C.	Milford, Conn.	
Mill, Erwin	Ottsville	Bucks
Miller, Edward W.	Romney, W. Va.	
Miller, C. Clayton	Marion	Franklin
Miller, Frank M.	42 Main St., Waynesboro	Franklin
Miller, Carroll P.	Martinsburg, W. Va.	
Miller, L. P.	Paw Paw, W. Va.	
Miller, H. W.	Paw Paw, W. Va.	
Miller, C. M.	Newville	Cumberland
Miller, Amos	Hanover, R.	York
Miller, H rvey	Loganville	York
Miller, Jos. C.	Safe Harbor, R. 1	Lancaster
Miller, W. C.	Catawissa, R. 1	Columbia
Minnich, C. S.	Leesport, R. 1	Berks
Mitchell, E. B.	Harrisburg, R. 3	Dauphin
Mitterling, John T.	Mt. Pleasant Mills	Snyder
Mohr, Frank J.	Fogelsville	Lehigh
Mohring, F. G.	North Girard	Erie
Monosmith, S. B.	Weisel	Bucks
Montz, Wm.	Coplay, R. 1	Lehigh
Moon, Henry T.	Morrisville	Bucks
Moore, M. A.	Lititz	Lancaster
"Contributing Member"	c-o M. A. Moore, Lititz	Lancaster
Morgan, J. C.	Girard	Erie
Morhman, Dick	Narrowsburg, N. Y.	
Morse, Carl	New Wilmington	Lawrence
Mt. Breeze Orchard Co.	Fayetteville, R. 1	Franklin
Moyer, B. J.	Middleburg	Snyder
Moyer, Levi S.	Blooming Glen	Bucks
Murry, Edward A.	Punxsutawney, R. D.	Indiana
Musselman, I. Z.	Orrtanna	Adams
Musser, H. W.	Lititz, R. 5	Lancaster
Musser, W. E.	New Bethlehem, R. 3	Clarion
Myers, F. F. & Bro.	Ashland, Ohio	

Name	Post Office	County
Myers, H. L.	Dover, R. 2	York
Myers, Paul M.	Lancaster, R. 8	Lancaster
Myers, Levi M.	Siddonsburg	York
Nash, Duane H.	336 Hickory Lane, Haddonfield, N. J.	
Neiman, Otto	Dover, R. 3	York
Nelson, C. D.	1211 Scotland Ave., Chambersburg	Franklin
Newell, Henrietta B.	Langhorne, R. D.	Bucks
Newman, H. W.	New Castle, R. 4	Lawrence
Newcomer, Aaron	Smithsburg, Md.	
Newton, E. M.	New Wilmington, R. 1	Lawrence
Niagara Sprayer & Chemical Company	Middleport, N. Y.	
Nibert, Wm.	Indiana, R. D.	Indiana
Nichols, Oliver T.	Downingtown	Chester
Nicodemus, Ed.	Waynesboro	Franklin
Niering, Theo.	Wapwallopen, R. D.	Luzerne
Nissley, D. H.	142 E. Chestnut St., Lancaster	Lancaster
Nolt, Harrison S.	Columbia, R. 1	Lancaster
Norton, Carlos E.	Sewickley, Box 160	Allegheny
Northup, H. J.	Dalton	Luzerne
Northrup, A. M.	Wilkes-Barre	Luzerne
Noss, J. A.	New Castle, R. 3	Lawrence
O'Conner, Haldeman	13 N. Front St., Harrisburg	Dauphin
Omwake Brothers	Greencastle	Franklin
Oswald, Francis E.	Orefield	Lehigh
Page, C. M.	Etters	York
Palmer, Alex S.	Berwick, Nova Scotia	
Panovec. Victor	Easton, R. D.	Northampton
Parker, Capt. H. B.	State House, Boston, Mass.	
Parks, Milson	Canonsburg, R. 3	Washington
Pannebaker, Wm. M.	Virgilina, Va.	
Paschal, John	Kennett Square	Chester
Passmore, Norman S.	Glen Mills, R. 1	Delaware
Passmore, S. S.	Mendenhall	Delaware
Paxson, Edw. M.	Lumberville, R. D.	Bucks
Paxson, Samuel L.	Lumberville	Bucks
Peifer, Walter	St. Thomas, R. 1	Franklin
Pennock, Geo. S.	165 W. Essex Ave., Landsdowne	Delaware
Perrigo, A. H.	West Chester	Chester
Pherson, J. L.	Volant	Lawrence
Philip, George	1700 McFarland Road, South Hills Pittsburgh	Allegheny
Poff, Curvin	York, R. 5	York
Poor, D. W.	Narrowsburg, N. Y.	
Powers, R. A.	Glenshaw, R. 1	Allegheny
Pratt, B. G.	50 Church St., New York City	
Rahauser Brothers	Greencastle	Franklin
Raine, J. Tom	Fairview	Erie
Rankin, Charles C.	The Kenilworth, Alden Park Germantown	Philadelphia
Ray, Edgar S.	West Chester	Chester
Redinger, Austin B.	Oley, R. 2	Berks
Reed, Merton	McKean	Erie
Reichard, Chas. W.	Waynesboro	Franklin
Reid, Vernon & Sons	McKean	Erie
Reilly, R. G.	North Girard	Erie
Reinhold, E. C.	Elizabeth, R. 1	Allegheny
Reist, Allen E.	Palmyra, R. 2	Lebanon
Reist, Henry G.	1166 Avon Rd., Schenectady, N. Y.	
Reiter, F. G.	Mars	Allegheny
Rhine, H. L.	McClure	Snyder
Rhodes, Chesley	Elysburg	Northumberland

Name	Post Office	County
Rice, Daniel	New Bloomfield	Perry
Richardson, W. T.	Whiteford, Md.	
Rick, John	c/o C. K. Whitner Co., Reading	Berks
Rick, Charles M.	431 Windsor St., Reading	Berks
Ridgway, H. W.	Ambler	Montgomery
Rilling, Harvey	North Girard	Erie
Rinn, D. F.	Indiana	Indiana
Rittenhouse, J. S.	Lorane	Berks
Rittenhouse, S. B.	Lorane	Berks
Ritter, Henry A.	Coopersburg	Lehigh
Ritter, Elias	Selinsgrove	Snyder
Ritter, Astor	Allentown, R. 3	Lehigh
Rinehart, E. S.	Mercersburg	Franklin
Roberts, J. Earle	220 Dock St., Philadelphia	Philadelphia
Roberts, Arthur	McKnightstown, R. 1	Adams
Roberts, Preston T.	Prospect Hill Fruit Farm, Moorestown, N. J.	
Roberts, A. J.	Moorestown, N. J.	
Roberts, Byron	Moorestown, N. J.	
Roberts, Emmor	Moorestown, N. J.	
Roberts, Horace	Moorestown, N. J.	
Rhode, W. C.	Pikesville, Md.	
Rhode, William	Johnstown	Cambria
Rohlfing, F. F.	Hummelstown	Dauphin
Rohrer, Geo. H.	Dryville	Berks
Root, J. W.	Manheim, R. 1	Lancaster
Roth, Edwin	Orefield	Lehigh
Royer, John	Akron	Lancaster
Rozelle, H. E.	Pittston, R. 1	Luzerne
Ruef, J. U.	State College	Centre
Ruhl, Dr. H. F.	Manheim	Lancaster
Rumsey, Wm. A.	Conneaut, Ohio	
Rumsey, William H.	East Springfield	Erie
Runk, J. A.	Huntingdon	Huntingdon
Rutt, Amos S.	Lancaster, R. 7	Lancaster
Rutter, Walter W.	New Holland, R. 2	Lancaster
Sadler, C. H.	214 Beaver Road, Emsworth	Allegheny
Salsgiver, Andrew	Indiana, R. 7	Indiana
Sanford, Don	Dow Chemical Co., Midland. Mich.	
Sanville, F.	Westtown, Box 25	Chester
Satterthwaite, Lewis P.	Newton	Bucks
Satterthwaite, Frederick	Yardley	Bucks
Scarff's Nurseries	New Carlisle, Ohio	
Schantz, Horace	1736 Hamilton St., Allentown	Lehigh
Schantz, H. A.	Lentz Bldg., Allentown	Lehigh
Schantz, L. M.	Orefield, R. 1	Lehigh
Schieferstein, Wm.	Leesport	Berks
Schlegel, Edwin	Orefield, R. 1	Lehigh
Schmidt, Jos. G.	Hawley	Wayne
Schmidt, Morris	437 E. Allegheny Ave., Philadelphia	Philadelphia
Scholl, Paul	Fogelsville	Lehigh
Schoonover, W. E.	Dallas, R. 3	Luzerne
Schreiber, Harry F.	Zionsville	Lehigh
Schuldt, J. Carlton	Elizabethtown	Lancaster
Seachman, Geo. E.	Red Lion, R. 1	York
Seaman, George	Honesdale	Wayne
Searle, Alonza T.	Honesdale	Wayne
Seifert, H.	Springtown	Berks
Settlemeyer, C. T.	Wilmore, R. D.	Cambria
Shaffer, Frank H.	Chmaber of Commerce Bldg., Pittsburgh	Allegheny
Shaffer, Charles N.	Perkasie	Bucks
Shaffer Brothers	Ariel	Wayne

Name	Post Office	County
Shank, H. A.	Lancaster, R. 7	Lancaster
Sharpe, Walter K.	167 Lincoln Way East, Chambersburg	Franklin
Shattuck, J. H.	Erie, R. 6	Erie
Shaw, R. C.	Stewartstown	York
Sheadle, Misses	Jersey Shore, R. 4	Lycoming
Shearer, E. R.	Saltsburg, R. 1	Indiana
Shearer, Walter J.	Vinemont	Berks
Sheble, Earl	Hamburg	Berks
Shenk, D. W.	Lancaster, R. 7	Lancaster
Shenot, Edward	Wexford	Allegheny
Shenot, Henry	Sharpsburg	Allegheny
Shenot, C. P.	Wexford	Allegheny
Sherman, Mrs. Francis	Frazer	Chester
Shermeyer, Harry A.	York, R. 5	York
Sherwin-Williams Co.	Cleveland, Ohio	
Showalter, A. R.	Reinholds, R. 1	Lancaster
Shultz, Chester K.	Barto	Berks
Sidler, Anton	York, R. 9	York
Siegfried, A. H.	Selinsgrove	Snyder
Sierer, John	Mt. Pleasant Mills	Snyder
Sierer, Clark	Mt. Pleasant Mills	Snyder
Simmons, S. L.	Mt. Oliver, R. 6., Pittsburgh	Allegheny
Simpson, J. A.	Indiana, R. 5	Indiana
Skinner, H. W.	Chambersburg	Franklin
Skinner, Sam M.	Shepherdstown, W. Va.	
Slade, J. E.	25 N. 14th St., Allentown	Lehigh
Slaybaugh, Glen	Gettysburg, R. 5	Adams
Smedley, W. P.	Media	Delaware
Smedley, S. L., Jr.	Newtown Square	Delaware
Smedley, S. L., Sr.	Newtown Square	Delaware
Smith, A. Woodward	Blairsville, R. 1	Indiana
Smith, S. A.	Yoe	York
Smith, J. R.	Indiana	Indiana
Smith, William	Berwick, R. 2	Columbia
Smith, Lawrence	Box 22 South River, N. J.	
Smith, George K.	Akron	Lancaster
Smith, Philip S.	Laughlintown	Westmoreland
Smith, G. E.	Bethlehem, R. 4	Lehigh
Smith, Leonard R.	Farm Bureau, Mt. Holly, N. J.	
Smith, Roland M.	Marion Center, R. 2	Indiana
Smith, James E.	Bethlehem, R. 4	Lehigh
Smith, Wm. M.	Orefield, R. 1	Lehigh
Snavely, Misses	Westmont Fruit Farm, Lebanon	Lebanon
Snavely, H. Meyer	Lebanon, 1505 Oak St.	Lebanon
Snavely, Ammon	Manheim, R. 1	Lancaster
Snavely, H. H.	Willow Street	Lancaster
Snyder, C. B.	Ephrata, R. 1	Lancaster
Snyder, Fry and Rick	Reading, R.	Berks
Snyder, Simon R.	Ephrata, R. 1	Lancaster
Snyder, Elmer	Masonic Homes, Elizabethtown	Lancaster
Snyder, T. S.	Brodbecks	York
Snyder, C. E.	Valley View	Schuylkill
Spangenberg, M. T.	Hamlin	Wayne
Standard Chemical W rks	Reading	Berks
Stauffer, T. H.	Lititz, R. 4	Lancaster
Stauffer, Wallace	Quakertown, R. 2	Lehigh
Stear, J. R.	Ligonier	Westmoreland
Stein, Ge . E. & Son	Wrightsville, R.	York
Stein, Henry	Woodville	Allegheny
Stephens, A. Woodward	Mooresburg	Montour
Stitzer, G. E.	221 E. Chestnut St., Mifflinburg	Union
Stonebraker, H. W.	Indiana, R. 7	Indiana

Name	Post Office	County
Stoner, Bertha	Hellam	York
Stover, Jacob E.	York, R. 9	York
Strasbaugh, E. F.	Orrtanna	Adams
Straub, W. D.	Middleburg, R. 4	Snyder
Strawser, A. A.	Mt. Pleasant Mills	Snyder
Strong, T. M.	Blairsville, R. 4	Indiana
Struble, Vern T.	Athens	Bradford
Strype, Fred C.	148 L fayette St., New York City	
Sudds, Richard H.	State Coll ge	Centre
Sun Oil Compan	1608 Walnut St., Philadelphia	Philadelphia
Swank, Luke H.	Johnstown	Cambria
Swartz, D. H.	Clymer, R. 1	Indiana
Swartz, Emma	Spring Grove	York
Swartz, A. D.	Spring Grove	York
Tarbert, D. F.	Dallastown, R. 1	York
Taylor, Ralph S.	West Chester, R. D.	Chester
Thayer, Paul	Carlisle, R. 6	Cumberland
Thomas, Charles L.	King of Prussia	Montgomery
Thomas, John	Dauphin	York
Thomas, Edwin W.	King of Prussia	Montgomery
Titus Nursery Co.	Waynesboro, Va.	
Tobacco By-Products Co.	Louisville, Ky.	
Treichler, Raymond	Coplay	Lehigh
Trexler, Harry C.	Allentown	Lehigh
Trexler, T. A.	126 Chestnut St., Sunbury	Northumberland
Turrell, Elmore	Noxen	Wyoming
Tyler, W. D.	Dante, Va.	
Tyson, Chester J.	Gardners	Adams
Tyson, Edwin	Flora Dale	Adams
Tyson, William	Flora Dale	Adams
Uncle Peter's Fruit Farm	Mt. Carmel	Northumberland
Unger, D. H.	Boyertown	Berks
Urffer, Charles	Coopersburg, R. 2	Lehigh
Valentine, August	Coopersburg, R. 2	Lehigh
Vierheller, A. F.	College Park, Md.	
Vogel, E. H.	Lancaster, R. 3	Lancaster
Wagener, D. D. & Co.	Easton	Northumberland
Wagner, J. S.	Black Lick, R. 1	Indiana
Wagner, Charles	McClure	Snyder
Wakefield, E. B.	Homer City, Star Route	Indiana
Walborn, Geo. W.	Freeburg	Snyder
Walker, F. W.	Connoquenessing, R. 5	Allegheny
Walker, William	New Castle, R. 1	Lawrence
Walp, Charles F.	401 E. 3rd St., Berwick	Columbia
Walton, Robert J.	Hummelstown	Dauphin
Wandless, G. H.	Wexford	Allegheny
Way, D. H.	Port Matilda	Centre
Wayne County Farm Bureau	Honesdale	Wayne
Weaver, C. F.	York, R. 9	York
Weaver, Abram	Scalp Level	Somerset
Weaver, Wm. S.	Macungie	Lehigh
Webster, Joseph	West Grove	Chester
Weigel, H. M.	Harrisburg	Dauphin
Weicksel, Dr. Amelia	Perkasie, R. D.	Bucks
Weimer, E. A.	Lebanon	Lebanon
Weinberger, J. H.	Zionsville	Lehigh
Weinman, R. B.	Koppers Bldg., Pittsburgh	Allegheny
Welshans, D. D.	Jersey Shore, R. 3	Lycoming
Welshans, M. C.	Jersey Shore, R. 3	Lycoming
Wenger, Benj. G.	Ephrata, R. 3	Lancaster
Wernig, Charles M.	York, R. 2	York
Wertsch, Edwin	Stevens, R. 2	Lancaster

Name	Post Office	County
Wertz, D. Maurice	Waynesboro	Franklin
Wertz, George M.	Johnstown	Cambria
Westrick, F. A.	Patton, R. 2	Cambria
Wheeler, C. B.	Hunlocks Creek, R. 2	Luzerne
Whisler, Edgar	Etters, R. 1	York
Whitcomb, Paul	York, R. 4	York
White, F. Hayes	Liverpool, R. 1	Perry
Widders, J. B.	Lancaster, R. 3	Lancaster
Wiland, Carl	922 N. 2nd St., Harrisburg	Dauphin
Williams, Luther	Indiana, R. 1	Indiana
Williams, F. W.	Indiana, R. 4	Indiana
Wills, F. A.	1523 N. 26th St., Philadelphia	Philadelphia
Wilson, Geo. E.	Wilkinsburg, R. 1	Allegheny
Wink, E. F.	Lenhartsville, R. 1	Berks
Winter, L. M.	Hellam, R. 1	York
Wister, John C.	Clarkson & Wister Sts., Germantown, Philadelphia	Philadelphia
Witherow, R. T.	Punxsutawney	Jefferson
Wohlin, Fred	Perrysville	Allegheny
Wolf, Frank L.	North Girard	Erie
Wolfe, Charles	Aspers	Adams
Wolff, F. B.	Lima	Delaware
Wolgemuth, Abner	Mt. Joy, R. 1	Lancaster
Woods, D. A.	Alexandria	Huntingdon
Woodward, N. H.	Mendenhall	Delaware
Worley's Nursery	York Springs	Adams
Worthington, H. R.	West Chester	Chester
Wotring, Oscar A.	Orefield	Lehigh
Yiengst, John	Lebanon, R. 5	Lebanon
Yoder, Ira L.	Middleburg	Snyder
Yohe, Jay W.	Fayetteville	Franklin
Yohe, Geo. S.	Spring Grove	York
Young, R. C.	Chambersburg, R. 1	Franklin
Young, June	Narrowsburg, N. Y.	
Young, Miles	Narrowsburg, N. Y.	
Young, J. Fred	Ellwood City, R. 1	Lawrence
Youngs, L. G.	North East	Erie
Zeigler, John A.	York, R. 11	York
Zeigler, Calvin E.	529 W. Market St., York	York
Zellers, E. B.	Montgomery	Lycoming
Ziesenheim, J. R.	North Girard	Erie
Zook, I. F.	Curryville	Blair
Zundel, G. L.	State College	Centre

INDEX

ADVERTISERS

Patronize these firms—They make our publications possible. Mention the Association Proceedings when inquiring.

End of Volume