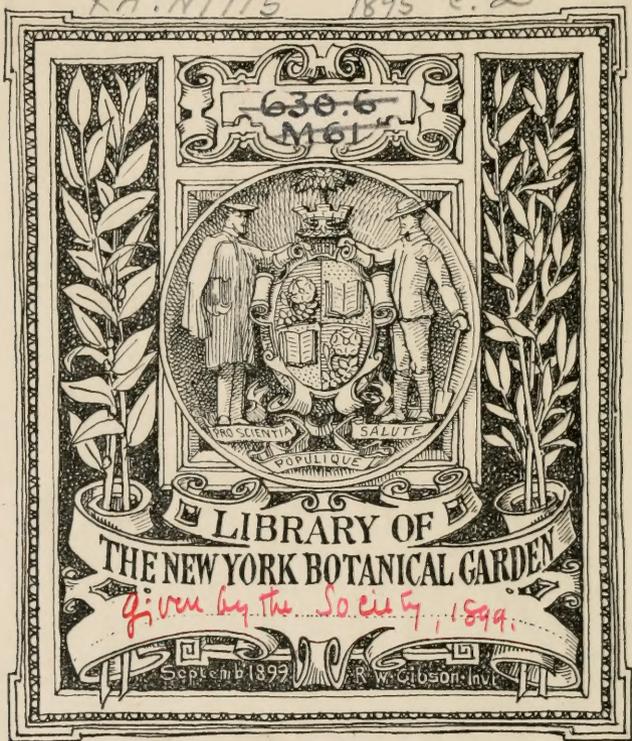
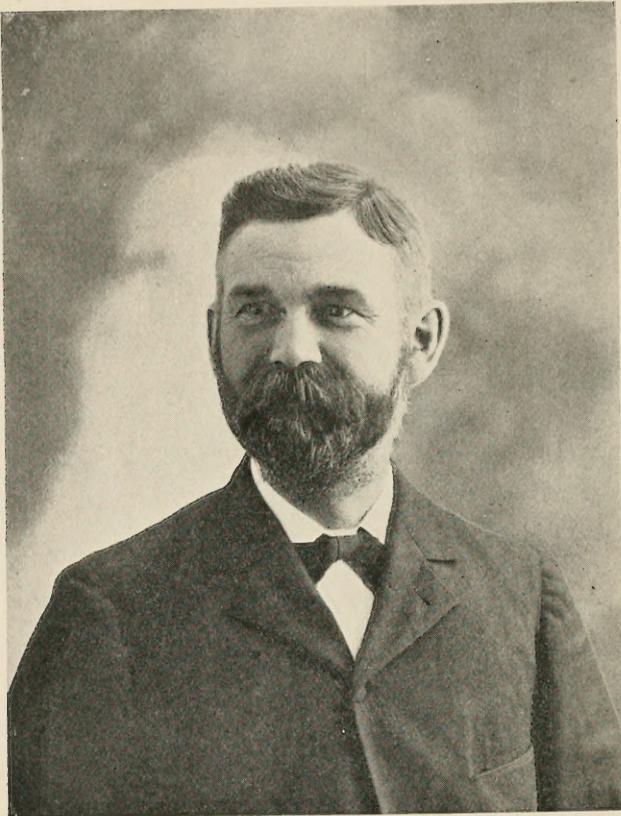


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CHARLES W. GARFIELD.

A BIOGRAPHICAL SKETCH.

While Michigan may not claim honor as the natal state of Charles W. Garfield, she can proudly claim credit that it was upon her soil, under her skies, and within the influence of her institutions he developed, and that as one of her citizens he has accomplished good works which have more than repaid to her all his obligations.

His birthplace was near Milwaukee, and the date of beginning of his earth life was March 14, 1848. His father was S. Marshall Garfield, who followed in Wisconsin the business of farmer and lumberman. In 1858 he removed to Grand Rapids and purchased the Burton farm, one of the first tracts of land cultivated in that vicinity. It was two or three miles south of the town, but now the city has extended to the very doors of the charming old homestead, and part of the farm has been changed to city lots.

There was spent the boyhood of Charles W. Garfield, and there he lives today, and there he has lived nearly all the intervening time. After he reached his 10th year his labor was required on the farm and his attendance at school was limited to the winter seasons. He was not content, however, to accept these conditions as the limits of his education, but studied with entry to college in view, although prospects of achieving this were far from hopeful. They were rendered the more uncertain by his lack of bodily strength, a hindrance which, though it has not prevented his doing a very great amount of useful labor, has made the doing a constant menace to his life, and on several occasions he has almost passed time's boundary, only to be again restored to the companionship of devoted friends.

At the age of 20, Mr. Garfield entered the sophomore class of Michigan Agricultural college, and two years later completed the course. He was attracted by the opportunity this college offered for outdoor work in connection with study, and because that work was concerned with horticulture, for he had already become an ardent lover of the orchard and garden. The annals of the college will always bear evidence of his participation in the work of its earlier years, and its campus and orchards will long contain portions of his planting and adornment.

His first business venture was the publication of an educational paper, the Common School Journal, which failed because he made it too good for its subscription price; and his next effort, a nursery business in connection with S. S. Rockwell, was ruined by the severe winter of 1872-73, which immediately followed its establishment. Mr. Garfield then, in 1873, became foreman of the gardens of the Agricultural college, so continuing until 1876, using his income to liquidate

the debts incurred in his unfortunate venture in tree growing. Meanwhile he became agricultural editor of the Detroit Free Press, showing great aptitude for this branch of newspaper work. In 1877, his father having died, he removed to Burton farm and engaged directly in its management.

During the time of his employment at the Agricultural college, Mr. Garfield married Miss Alice Rockwell, a daughter of his former partner. Although no children blessed their union, they led an ideal life in a model home until her death several years ago. At this time, too, Mr. Garfield endured one of his severe sicknesses. It was long uncertain which would be taken, and doubtful if either would recover. It was only by the utmost care that the survivor was slowly brought back to health, a summer in Europe contributing much to that end. While admirable and unexcelled in management of the practical details of household work, Mrs. Garfield was one of the gentlest of women. No visitor to Burton farm during her residence there could ever lose the impression he received of the superiority of her mind, and the sweetness and purity of her life.

While concerned in many ways with public affairs, Mr. Garfield has but once held political office. He was elected in 1879 to the state house of representatives, as a Republican, succeeding to the seat held by his father, but he declined re-nomination in 1881. During his legislative term he secured the enactment of a number of bills of value to farmers and fruitgrowers, besides giving painstaking attention to the general work of the session. Among these were measures establishing Arbor day; amending the yellows law in important particulars; providing for compulsory planting of trees in public highways at public expense, and the laws providing for the annual state crop reports. He also secured the appropriation by which was made an exhibit of fruits at the Boston meeting of the American Pomological society, in 1881. Mr. Garfield was appointed to the state board of agriculture in 1887, and has remained in office to the present time, doing much to improve the Agricultural college and extend the usefulness of the school which from the days of his entry to it has been an object of his deep regard.

Since returning to Burton farm, Mr. Garfield has become concerned in a number of business enterprises of Grand Rapids, and has been highly successful in participation in or management of them. His chief interest at present is the Grand Rapids Savings bank, of which he has for several years been president. He has been actively useful, too, in social and religious work. The city contains today few men more prominent in its affairs or more highly regarded for personal merit.

Mr. Garfield's work in horticulture is familiar to nearly every Michigan fruit-grower, and our pomologists are as appreciative of its quality as they are aware of its quantity. His official connection with the Michigan State Horticultural society began in December, 1874, when he was elected its secretary. This position he held until June, 1888, when failing health compelled his retirement. At the same time he was obliged to relinquish the secretaryship of the American Pomological society, a position to which he had been chosen a short time before, and in which he had hoped for activity and usefulness in a wider field. Next to President Lyon, no one has contributed so much to the society's prestige and success as Mr. Garfield. He gave it life and strength, and in a hundred ways directed its energies to both the advancement of Michigan horticulture at home and its fame abroad. The membership of the society rapidly increased; its meetings became largely attended; its programmes models of their kind; the fame of the society spread even beyond the bounds of the United States, and his annual reports were acknowledged to be standard authorities in horticulture. After his retirement as secretary, Mr. Garfield became a member of the executive committee of the society, and remained

such until 1895, when his pressing business engagements necessitated his resignation. But with this did not go his interest in the society and its work.

Mr. Garfield's prominence in horticulture caused several offers to him of collegiate professorships, but these were declined. He has, however, done much as a lecturer before college classes and farmers' institutes, in the latter work being frequently engaged in other states than Michigan. Two years ago it was largely by his influence that an increased appropriation was made for farmers' institutes in Michigan, and to the success of the meetings so provided for he has very largely contributed. No appeal to him passes unheeded which has for its object the elevation and advancement of rural life, to the refinement and popularizing of which he has devoted all his mature years.

The writer could not speak his esteem for Mr. Garfield as a man without use of such terms as would cause suspicion of the bias of intimate friendship, resulting perhaps in harm rather than good to the object of his admiration. While I know him otherwise, and in the delights of close companionship, I know him also, as do so many others, as one of the most genial, frank, honorable, and lovable of men, and as one

“ Who breaks his birth's invidious bar,
And grasps the skirts of happy chance,
And breasts the blows of circumstance,
And grapples with his evil star.”

TWENTY-FIFTH ANNUAL REPORT

OF THE

SECRETARY

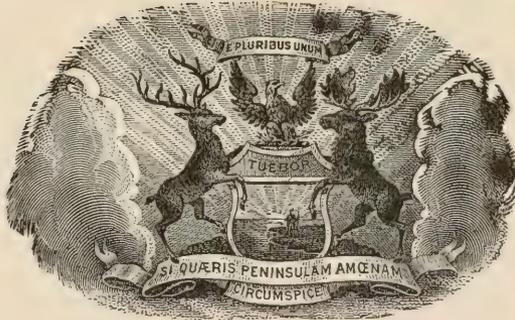
OF THE

STATE HORTICULTURAL SOCIETY

OF

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REPORT OF THE SECRETARY

OF THE

MICHIGAN STATE HORTICULTURAL SOCIETY

ALLEGAN, MICHIGAN, }
December 31, 1895. }

TO HON. JOHN T. RICH, *Governor of the State of Michigan:*

I have the honor to submit herewith, in compliance with legal requirement, the accompanying report of 1895, with supplementary papers.

Respectfully yours,

EDWY C. REID,

Secretary of the Michigan State Horticultural Society.

OFFICERS

OF THE

STATE HORTICULTURAL SOCIETY FOR 1896.

PRESIDENT—ROLAND MORRILL, Benton Harbor.
HONORARY PRESIDENT—T. T. LYON, South Haven.
VICE-PRESIDENT—C. J. MONROE, South Haven.
SECRETARY—EDWY C. REID, Allegan.
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C. W. GARFIELD, Grand Rapids, 1 year.	C. J. MONROE, South Haven, 2 years.
ELMER D. SMITH, Adrian, 3 years.	W. W. TRACY, Detroit, 2 years.
F. J. RUSSELL, Hart, 1 year.	L. R. TAFT, Agricultural College, 3 years.

STANDING COMMITTEES.

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ON NEW FRUITS—T. T. LYON, Chairman; C. A. SESSIONS, Grand Rapids; S. R. FULLER, Eaton Rapids; C. ENGEL, Paw Paw.

ON FINANCE—C. J. MONROE, C. W. GARFIELD.

ON ENTOMOLOGY—G. C. DAVIS, Chairman.

ON VEGETABLE PHYSIOLOGY—L. R. TAFT, Chairman.

ON LANDSCAPE GARDENING—E. FERRAND, Chairman.

ON VEGETABLE GARDEN—W. W. TRACY, Chairman.

ON FORESTRY—C. W. GARFIELD, Chairman, Grand Rapids; L. R. TAFT, Agricultural College; C. A. SESSIONS, Grand Rapids.

PROCEEDINGS OF THE SUMMER MEETING.

HELD AT AGRICULTURAL COLLEGE, JUNE 26-27, 1895.

Nothing was lacking to the success and pleasure of the meeting of the Society at the Agricultural College, the 26th and 27th of June, except that the attendance was very far from what it should have been. Still, considering the busy season with fruitgrowers, the number present was as great as could have reasonably been expected. However, if the horticulturists of the state are ever to see this institution and understand by observation the important work it is doing, they must on some such occasion put aside their labor and go during the growing season. There was a strong desire among those who did go, to have it tried over again next year, in hope to interest a far greater number.

The utmost care was exercised by the faculty to make the visit of the horticulturists as pleasant as possible and productive of a thorough insight into the efforts making for the advance of their particular branch of agriculture. Certainly, none of the visitors could have failed to see that horticulture, in its various branches, receives fully its share of attention. The evidences of this are at hand from the moment of entering upon the grounds, for almost the first object is the pear orchard and many groups of shrubbery and trees planted to enhance the beauty of the grounds. Almost everywhere may be seen other forms of horticulture. The great campus is adorned abundantly by aid of landscape gardening, while floriculture adds beauty at every hand. This campus, by the way, is said, by those competent to pass judgment, to be the finest possessed by any American college. It is improved noticeably each year, and was at this time, despite the evidences of the long drouth, a place of entrancing beauty. Upon it are nearly or quite all the trees native to Michigan, with a very great number of those of foreign climes which are adaptable to this state. Latterly, under direction of Prof. Taft, efforts have been made to group together the species of each class, so as the better to enable students to compare them and study their peculiarities and variations. Most of the trees, shrubs, and flowers bear labels giving their botanical names, to which are added, in most cases, the common names. This enables even the unskilled in such matters to learn valuable lessons in nature.

Upon their arrival, the horticulturists were taken in conveyances for a trip about the grounds and farm, including a large strip of the natural forest which is being improved with a driveway and clearing of the undergrowth in places, its preservation in others, and the planting of trees where necessary. This will eventually be one of the noblest features of the college. This trip included a view of the farm proper, which was in as good condition as could be expected in this remarkably dry season. Much that was seen was familiar to some of the visitors, but to most it was entirely new, and a revelation which caused many expressions of surprise and warm approval.

Returning to the College, a tour on foot was begun, the visit being first to the grounds of the experiment station, particularly to Prof. Taft's new irrigating plant, which was a source of wonderment to many. There were abundant evidences of its practical utility and its excellent effects upon the crops to which it had been applied. This visit was disturbed by rain, which was so welcome that the interruption was readily condoned. Later in the meeting the inspection was renewed and completed by most of the visitors. Many of the buildings were also visited, nor was the sight-seeing confined to the horticultural department, but embraced the agricultural, chemical, botanic, mechanical, and other buildings, as well as the barns, the dairy school, and live stock. What was seen at the experimental grounds can not be better described in brief than by quoting a circular issued for information of the visitors, under title of "A walk through the station grounds." We suspect that this was a part of the ever watchful, thoughtful, and thorough work of Prof. Taft, as it bears many of his ear marks. Here it is:

After you have inspected the grounds and buildings of the college to your heart's desire, we invite you to take a walk with us over the grounds of the experiment station. All of you have read the bulletins from the horticultural department of the station and will now be interested in viewing the plots and greenhouses where the experiments, the results of which have been published, were carried on and where new experiments are now in progress.

Starting east from the horticultural building, the first object of interest is the forcing-house at your right. This house was erected by Prof. Taft to illustrate, first, the methods of construction, and second, the two methods of heating, one wing being heated by steam, the other by hot water. At this season of the year most of the crops are removed from the house and nothing of note remains except the tomatoes and cucumbers.

The hydrants seen at the left of the drive as you walk on east toward the orchard are visible evidences of the irrigating plant put in this summer for experimental purposes. The water is derived from the river and is forced through the system by the large steam pump in the central heating plant of the college. The pipes are over 3,800 feet in length and distribute the water to the major part of the horticultural grounds.

At the left of the drive, nearly opposite the forcing-house, is a large plot devoted to a variety test of many kinds of vegetables, lettuce, peas, beans, and radishes, a veritable curiosity strip.

On the right of the drive, going east, comes next a plot containing the varieties of strawberry set out in 1893. Directly opposite, across the

drive, are the varieties planted last year and this. Here part of the variety tests are carried on and the effects of irrigating in this dry season are very much in evidence.

Next on the right, beyond the hedge, is a plot of peas illustrating in a very forcible manner the beneficent effects of the irrigation. East of the peas, the early potatoes also show that part of them have been irrigated.

On the left of the drive the plot of tomatoes shows varietal differences and at the same time serves for a test of the value of irrigation. One row receives no water from the irrigating plant, the next is watered at the surface, the third receives the water through tile laid immediately below the surface, while the last row is irrigated through tile buried one foot deep.

Still further to the left along the highway north of the tomatoes is a varietal test of cabbage, cauliflower, and sweet corn, and a field of potatoes testing varieties and various new methods of planting and cultivating.

The old apple orchard immediately in front was planted in 1858. The west half in sod, the east half cultivated. Part of the trees are manured with stable manure, the remainder with various mixtures of mineral fertilizers.

Passing through the orchard, turning south on the drive, you come to twelve acres of tree fruits, raspberries, and grapes planted since 1890. This fruit garden is maintained for testing the varieties of fruits and the various methods of pruning and training.

Here are 350 varieties of apple, 100 varieties each of pear, grape, and peach, and 50 varieties each of plum and cherry.

As you entered the grounds at the college an orchard lay to your left, back of the president's house, containing a collection of pears, plums, and cherries, and a vineyard of Concord grapes.

Near the hospital are the Russian cherries and plums and the native plums and peaches.

Leaving now the orchards and gardens of the horticultural department, you enter the roadway leading for more than a mile due south through the center of the farm. The fields on either side are numbered consecutively, the odd numbers on the east and the even numbers on the west side of the lane.

The first field south of the horticultural orchards, and east of the large grain barn, is devoted to numerous plots of wheat and oats upon which are being tested various remedies for smut and rust. Here are also small plots of beans, rye, millet, and a collection of varieties of oat, a series of twelve plots of red clover, one sown in each month of the year. About two and one half acres are devoted to the new forage plant, *Lathyrus silvestris*.

Next south comes the "curiosity strip," a half acre containing interesting, new and useful agricultural plants, hops, hemp, broom corn, sorghum, spurry, peanuts, legumes in variety, and other forage plants.

The next series of plots, now sown to oats, is provided with a separate drain for each tenth acre. The drain is so arranged that the drainage water can be collected for measurement and analysis.

Along the river bank is a series of half-acre plots of grasses of different species or varieties.

Across the river, east of the first field to the left, is the north woods, laid out with drives as a park.

The first field to the right, south of the river, contains two acres of alfalfa, a plot of the new Success barley, without beards; experimental plots of beans and spring rye.

The next field south has the experiments with roots, carried on by students.

The varieties of wheat may be found in field No. 11, third from the river on the east side of the lane.

The remainder of the farm is planted to ordinary farm crops.

Examine on your return the stock in the yards and stables. Here are three famous Holstein cows with large records, Brown Swiss heifers and their calves, Jerseys, Guerneys, Shorthorns, and other breeds of cattle, various breeds of sheep and swine, and last, several breeds of chickens.

Stop and see the incubators and brooders and the host of young chickens.

The actual operation of irrigation was shown. From a hydrant ran across the rows of vegetables a wooden trough with gates opening between the rows. These gates were opened and a stream of water ran off several hundred feet down between the rows, and it was surprising to see how easily the work of application of the water was accomplished. So soon as possible after application of water, the ground is cultivated, so as to keep the moisture under the fine surface and so prevent the formation of crust and rapid evaporation. Some were inclined to doubt and shake their heads over the improvement, prophesying bad ultimate results as compared with constant cultivation of the upper soil without application of water by artificial means; but all conceded the apparent success so far attained. Interest in the experiment, however, was general among the visitors, and they are sure to watch the development of it with active concern.

After dinner, the first session of the meeting was called to order in the chapel, by President Morrill. As this was to be devoted to the Grand River Valley society's program, Secretary Brown of that society was called to the chair, in the absence of President Pearce, and the topic, "Strawberries and Cherries," was considered. About a score of members of the society had come down on the morning train, but with the intention of returning, which they did, though with much regret that the pressing duties at home compelled them to quit when every other influence impelled them to stay.

The chapel was decorated with many choice and rare plants from the greenhouses, under direction of the gardener, Mr. Thomas Gunson, as well as with cut flowers from the same source. There were bananas, ferns, palms, dracænas, crotans, and many others, which were shown to the visitors at times, and their properties and values explained. Thursday morning a tour of the greenhouses and flower gardens was made, both by individuals and, later in the day, under conduct of Mr. Gunson and Dr. Beal. A feature of the houses which attracted very much attention was the many vines full of great bunches of Black Hamburg grapes.

The meeting closed at one o'clock, Thursday, with a lunch given by the Board of Agriculture, at conclusion of which responses were made to

Toastmaster Morrill, by a number of gentlemen, concluding with Mr. R. M. Kellogg, who offered the following resolutions, which were adopted with hearty unanimity:

Having for two days passed an almost charmed existence within the groves of the grandly beautiful campus of Michigan Agricultural College, and having received all possible attention and courtesy from the college board and faculty, it is by the members of the Michigan Horticultural Society,

Resolved, That we find ourselves a thousand fold repaid for our pains and expense in coming here, by the knowledge we have gained of the methods and results of work in the several departments of the college, the valuable papers and addresses to which we have listened, and the scenes of beauty we have beheld in the gardens, lawns, groves, fields, and forest. We find this college to be an institution admirably managed in all its details, worthy of the continued liberal and appreciative care of this State; and we urge every fruitgrower and every farmer to pay it a thorough visit that he may see and know for himself, for scarcely could he find elsewhere in the United States so much of value, interest, and pleasure.

Resolved, That we thus express and tender to the College board and faculty, for their manifold kindnesses, our most sincere thanks.

PAPERS AND DISCUSSIONS.

INJURIOUS INSECTS PECULIAR TO THIS SEASON.

BY PROF. G. C. DAVIS, MICHIGAN AGRICULTURAL COLLEGE.

As each spring opens with its melting snow and bright sunshine, I can but wonder what new insects will appear this season; what will be the first new pest to need my attention; what and how many injurious species will be abundant this year, and what ones will not be common. Each season is sure to bring some insect to our notice by producing some injury where it was never known to do harm before. Certain species, such as the codlin moth, seem to have come to stay, and vary but little in numbers each season; other species that are well known as injurious, may be scarce, from various causes, for years, and then suddenly reappear in great numbers, continue to be very common for one or more years, and again disappear. The apple tree canker-worm is a good illustration of this. Two years ago it began to make its presence known by placing on exhibition a few leafless orchards. Last year scarcely an orchard escaped its attack. This spring it was common, though not so common as last year; and, too, people were prepared to treat it this spring, and few orchards were stripped of their foliage. Next year it is doubtful whether the canker worm will do any injury except it be in a few isolated cases. Insects and their attacks vary quite as much as the different kinds of fruit or vegetables vary. Some years certain species are abundant, and other years they are too scarce to cause any noticeable injury.

Your interests as fruitgrowers, in insect warfare, are my interests, too; that is, we are both seeking to know all that is possible of these injurious insects, and the best remedies in combatting them; yet our interests are slightly different in some respects. While you are preparing and using the common remedies for the common insects, such as the codlin moth, plum curculio, currant worm, cabbage worm, and similar insects, my work is more in looking after the exceptional insect attacks and for new and improved remedies. However, these exceptional insects are quite as likely to attack your fruit, your garden, or your farm crop as they are other people's, and hence it is just as essential that we know them and how to deal with them when they do come as it is to know the common ones that are with us every year. Perhaps it is even more essential, as the exceptional ones, when they do appear, are usually very abundant and their destruction is often rapid, and the reaction with us must be quite as quick and decisive. Feeling that your interest is in this direction, my object at this meeting will be to take you with me, as much as I can, through the season's work thus far, and show you some of the exceptional as well as some of the common insects that have been called to my attention more particularly this season than in previous ones.

WILLOW LEAF BEETLE.

One of the first attacks out of the ordinary was made on our willows by a leaf-eating beetle, *Lina lapponica*. In the spring of 1890, one or two specimens of this beetle were taken on our college grounds, and we then considered it a very rare beetle, and it is probably the first record of its appearance in this state. This spring, before the willow leaves were out, the beetles of this same species could be counted by the hundred on any little willow bush in the vicinity. The appearance of the beetle at first sight is much the same as that of a lady-bird, and no doubt many would mistake it for a lady-bird, but it is more oblong and flat. The body is oval, deep red, with six or seven black spots on the wing covers, that vary considerably in size. The head is black with a red margin. There are two broods each season. The eggs on the leaves resemble a cluster of potato beetle eggs, and the larvæ, except that they are more slender and different in color, resemble the wingless potato beetle larvæ. Then, too, like the potato beetle on the potato, this species breeds on the willow leaves and feeds on them both in the adult and growing stages. The second brood of beetles can now be found on the willows. This brood is yellow instead of red, and the black spots are very much larger. The willows have not had more than half the usual leaf surface this season, and the struggle will be a close one if the beetles continue to be as numerous as they have been this spring. Another species closely related to this one is very destructive to the cotton-wood trees on the western tree claims, and will prove much more of an annoyance to those people than our species will to us, where the willow grows wild and is so common. The same medicine that kills the potato beetle will kill this beetle on the willow.

CLIMBING CUT-WORMS.

Climbing cut-worms were numerous again this year, and several days were spent at Muskegon with Mr. Rood in studying their habits and in testing various remedies on them. Fully nine out of every ten of the climbing cut-worms were the mottled cut-worms, *Mamestra subjuncta*. The other two cut-worms, one of red color speckled with gray, and the other large and white with black dots, would not have been common enough to have done much injury. Including all three species we had no difficulty in finding from 75 to 800 cut-worms to each tree in a single night. This, however, was in a more limited area than it was last year, as Mr. Rood cultivated the most of his orchard very thoroughly last year, and as a result the cut-worms were not a serious pest except in the vineyard where grapes and apples were both growing and thorough cultivation was impossible. Mr. Rood's method of killing the cut-worms has already been given quite fully in last year's Agricultural Report. His method this year was much the same. He used bands on the trunks to prevent the cut-worms reaching the leaves. About 9 or 10 o'clock he would start out with a lantern and, with an old leather mitten on the right hand, would crush the cut-worms that had already gathered on the trunk below the band. He also had traps of rough boards around the base of each tree, and most of the cut-worms that came after this would congregate under these broad strips to remain over the day. From these traps he would collect as many more each morning and place the catch before his flock of poultry which greedily devoured the whole in short order. This process of collecting was continued for at least two weeks before there was any perceptible decrease in the number of cut-worms.

In my own experiments, four kinds of band were used, viz.: tin, wool, cotton, and a tar band known as caterpillar lime, or, as the Germans call it, "raupenleim." Unfortunately for this experiment, we had no rain to wet the bands, and all of them, except the tin collars, worked to perfection. We however poured water on the wool band and found that it protected quite as well as when dry. The cotton band is the best of all and the cheapest, so long as it is dry, but so soon as wet (and the weather is usually rainy in the spring) it packs and then affords no protection. The raupenleim is slightly more expensive. It worked nicely except on very cool nights, when it was likely to become a little too stiff, and then the cut-worms would scramble over. The tin collar is but little better than nothing. The cut-worm, when it comes to the collar, will travel around until it comes to the lap, or where the two ends meet, and then it will climb up almost as readily as on the bark. The tin collar is also more difficult to fit to the tree than the band and is more expensive. The cone-shape pasteboard is also difficult to fit to the trunk and is also very easily moved in working or cultivating around the trees. It is better adapted to small trees and grapevines. The wool band is undoubtedly the best and will prove the cheapest and most satisfactory in the end.

If to prevent the climbing cut-worms from reaching the tree tops were sufficient, the putting of a wool band on the trunk would be enough; but a man who is troubled with climbing cut-worms should try to rid his fields of them. He should not only keep them from his trees, but he

should keep them from developing on the grass and other plants that they live on when they can not get into the trees. Mr. Rood's method of dealing with them is sure, but rather laborious, making a man work night and day. Experiments were tried in poisoning the cut-worms, that proved quite satisfactory. Bran, given a green tinge, with Paris green, was dropped in little bunches around the base of the tree. The cut-worms ate it readily, both as they passed it in starting up the tree and as they came back hungry from their vain effort to get beyond the band. The next morning more than half of the cut-worms would be found hanging to the bark, limp and dead, or in the same condition on the ground. In some cases ninety per cent. were killed. The other poisoning experiment was in spraying apple twigs with Paris green and placing them around where the cut-worms would find them near the bands. This served as a good decoy and killed about the same number that the bran did. If one does not prune his orchard until this time, he can easily cut some fresh twigs every few days and apply poison to them. Quite likely the poisoned bran will need renewing frequently, also. Bran with and without sweetening was tried, but the cut-worms seemed to eat one as well as the other.

JUNE BEETLES.

As the forest trees were leafing there was considerable complaint of leaves being injured and torn off from shade trees in Jackson, Grand Rapids, and other places. Trees on our own college grounds were troubled in the same way, and looked very much as though torn in a hail storm. This trouble was caused by two or more species of June beetle. If one would go out under the trees just at dusk he would hear a beetle buzz here and there under the tree as it came out of the ground where it had been through the day. As more of the beetles came out and flew into the tree tops there would be a hum, something similar to that produced by a swarm of bees. This hum would become so noticeable that one could hear it when many rods away, and his attention would be attracted by it. On looking up into the tree top with the bright, clear sky for a background, one could see great numbers of the beetles humming and thumping about the limbs, but always well up in the tree toward the top. Their work in the trees was noticeable for about two weeks. The most common species this year was a small, hairy June beetle, *Lachnosterna tristis*. This species would come very early in the evening and then later it would be joined by our common June beetle, *Lachnosterna fusca*. These June beetles are the mature form of what is known to us as the white grub that we so often find among the grass roots in old meadows and pastures. The life of June beetles is spent mostly in the grub state, under the ground, and it is only for a short time that they are above ground as beetles. They seldom are so numerous as they have been this season, and are rarely numerous enough to do great harm. Many experiments have been tried on the beetles while feeding on the foliage of trees, but none of them have proven satisfactory. The arsenites, the remedy that we should expect to find effectual, are very slow in their action.

SHOT-HOLE PEACH-TREE BORERS.

While the June beetles were still at work on our shade trees, I was called to McCord's, near Grand Rapids, to look after a peach orchard that was apparently being killed by some little shot-hole borers. This name is given the beetles because they are so small that, when they bore into the tree the holes which they make are no larger than holes made by shot; and, when numerous, the tree has the appearance of having had several loads of scattered shot fired into it from different directions.

On reaching Mr. Chas. B. Peet's orchard, I found about ten acres of very thrifty four-year-old trees situated on a high hill sloping to the north and west and protected by woods on the other two sides. The soil was mostly sandy, though there were spots that varied even to the stiffest clay. The soil and slope apparently made no difference in the attack. The beetle often attacked the largest, finest, and most thrifty-looking trees in the orchard, with little or no regard to location. At the time I was there, May 25, these injured trees had blossomed and were as full of fruit as the others. The leaves, however, told the story, as they were turning yellow even though not yet fully developed. On examining the fibrous roots of such trees, one would find them quite dead, and the bark on the larger roots was brown. On peeling off the bark on the trunk and larger limbs, scores of these little shot-holes would be seen. Some of the beetles would be but little beyond the bark, while others would be from an inch to an inch and a half from the outside, and running usually toward the heart, though many were found running in various other directions. Every once in a while a hole was found to branch in two or more directions when a short distance in from the surface. Each of these branches contained a beetle. This peculiarity was probably caused by one or more beetles following into the hole behind the one that made it, and as soon as they came upon the beetle in the lead, and could go no further, they at once commenced to side-tunnel a branch.

The trees were found to contain three distinct species of scolytid, viz.: *Monarthrum fasciatum* Say, *Monarthrum mali* Fitch, and *Xyleborus fuscatus* Eich. The two species of *Monarthrum* have been known to injure fruit trees before, particularly the apple; the *Xyleborus* has been found in oak and hickory, but I find no record of its work on fruit trees, and the department at Washington say that it is the first incident of the kind known to them. None of the species, I think, have ever been known to attack the peach before. This entire family of shot-hole borers prefer dying or diseased trees for their work, but there seems to be little doubt that they at times become injurious to live, thrifty trees.

This is not the first injury to peach trees by borers of this kind that we ever had. Even this spring we have had reports from Sanilac, Ionia county, and from South Haven, of similar work. On several different occasions we have received samples of peach-tree trunks from South Haven, or near there, but in each case there were only the little holes left in the dead trunk, and no beetles, and consequently we could only guess what the depredator was that caused the injury. There is a species, *Phlæotribus liminaris* Harr., that has been known to injure peach trees in the same way in the New England states, and we suspected the same

species here, as specimens have been taken in Michigan. This is the first case where we know the insects that have done the work, and something of their habits, and it gives us a leverage that will enable us to do more definite work for the fruitgrower in the future, though comparatively little is known in the United States regarding this family of beetles.

So soon as the beetles were received from Mr. Peet, directions were given him to use a whitewash with Paris green in it, on all of his trees, whether injured or not. The coating that he put on was so thick that it must prevent the beetles ever coming out so long as the whitewash remains on the trees, and it will surely prevent other beetles from entering trees already infested. It is quite probable that all of the shot-hole beetles attack trees in May and June, and, if one suspects a possible injury from them, he would be safest in applying some mechanical coat of this nature to his trees early in the spring.

BLISTER BEETLES.

Owing to the exceptionally dry season, blister beetles have been unusually common this spring. They came earlier than usual, too, which has made it doubly hard on young plants and those just recovering from the late frost and with foliage yet young and tender. They have done considerable injury on our grounds and have been sent in from quite a number of places over the state. The most common one has been the gray blister beetle, *Macrobasis unicolor*, but the black blister beetle, *Epicauta pennsylvanica*, has also been common. They have confined their work almost exclusively, so far this season, to the leguminous family of plants, such as the various kinds of clover, including alfalfa, lupines, peas, and many of the more rare plants in our wild garden. A man near Lansing has recently reported the almost complete destruction of several acres of field beans by the gray blister beetle. Blister beetles come and go very suddenly, and usually in swarms, so that their work often amounts nearly to destruction before they are found. The arsenites, which we would naturally expect to be the remedy, are too slow to be practical. We have always been most successful with kerosene, as an emulsion or with water, sprayed upon the beetles while they are at work. The beetles are very easily driven, and if one gives them a warm reception by killing what he can in a thorough spraying, and also in coating the plants with the unpleasant oily material, the remaining members will soon depart for parts unknown. Inside of a very few hours not a living blister beetle can be found where they were so plentiful as to almost hide the plant.

SCALE INSECTS.

The present season is quite remarkable for the number and variety of scale insects that are everywhere present. There is hardly a tree but upon which one can find a few brown scales scattered over the twigs, and on many of the trees the scales are very numerous. Many specimens of scale have been sent this spring from Jackson, Grand Rapids, Detroit, Cheboygan, Fowler, and other places, from people wanting to know what they are and what to do for them. These, with the many other insect specimens of various kinds sent from the shade trees of our various cities,

show a decided interest in that line that I have never seen in the state of Michigan before. Nor is the anxiety unwarranted, for there are many insects that are at least a menace, and others that will injure and in time destroy many trees if not interfered with in some way. The scale insects are one of the kind that are slow but sure. Frequently they are kept in subjection by the numerous parasites that prey upon them, but, if not, they soon become so numerous that they will crowd each other for space to fasten themselves on the bark of the tree. When a tree has to support so many little moths that suck the life sap from its tissues, it can not survive long under the strain. Fortunately, the scale lice do not sap the tree for the entire year. In the fall the female dies, leaving hundreds of minute white eggs to fill the shell which she had occupied through the summer. The eggs do not hatch until the latter part of the next May or early June. Then the little yellow lice, too small to be recognized by the unaided eye, run hither and yon with perfect freedom, for a few days, after which they settle down, secrete a scale over themselves, and never leave the spot, as they shed their legs and lose all power of locomotion.

Scale lice are difficult insects to treat unless taken at the opportune time. If treated with a spray of kerosene emulsion, in early June, while the young are running, and before they secrete the waxy scale over them, they are very easily killed, though two sprayings, a week or two apart, are necessary, as the young lice do not all hatch at once. If the spraying is postponed until the scale becomes thick and well formed, kerosene and other substances have little effect upon it, and rarely injure the occupant.

These are a few of the more important insects brought to my notice thus far in the season. It is still early for the insects that usually make their appearance in July and August. As it has been so dry, grasshoppers will be abundant in many places, though fortunately we need not worry over swarms of them invading our domains as they do the west, and in fact are doing in many localities of Nebraska and Minnesota. People in the southwestern part of the state and along the lake shore must be on the alert for stray colonies of chinch bugs, for they are already appearing in destructive numbers in southern Illinois and in Iowa; but here, again, we are so little affected by this pest that we should feel grateful for our immunity. Taking our insect pests as a whole, and comparing them with those of neighboring states, we should be quite content to cheerfully fight the few that do molest us, even though we are not always entirely successful in the contest.

DISCUSSION.

Mr. Lyon: I wish to give you an illustration of the ease with which we can attack this scale insect just at the right time. Some time in the fifties I had an orchard in the eastern part of the state, and the trees were so thoroughly infested that I began to think I should have to burn the trees in order to get rid of the insects. We had a very cold storm just at the time the insects were traveling about to find a new place for their residence. After that storm I was unable to find an insect, all due, evidently, to the fact that a cold, driving rain storm came on just as they were going to their new lodging. I inferred that if they can be attacked just at the time that they are leaving, they can be easily killed, but are very hard to destroy at any other time.

Mr. Morrill: We all understand it would be very difficult to reach all of them on the tree with the spray, at this time, on account of the foliage. Now, if kerosene emulsion will kill them after the foliage is shed in the fall, they are easily killed.

Mr. Davis: Regarding that, I would sooner recommend something a little different. I would wait until spring, when these eggs are in the scale. It is much easier to find them then than in the fall. I think you could be very successful with a solution of potash. That has been used in New Jersey with great success. It can not be used while the tree is growing, but while it is dormant, in the winter, it can be used. I should prefer to take it in the spring rather than in the fall. Speaking of scales, I have a sample I can show you. It is different from anything I have seen. You strike the bark and they will buzz just like a swarm of bees. Flies will gather around over these insects, and the young ones will crawl upon the flies, and the flies will carry them off a long distance. I have also a sample of the round-head apple-tree borer. [Mr. Davis exhibited a branch of elm, thickly covered with scale insects.]

Mr. L. W. Wilton: Have you had any experience with black ants troubling orchards? I have an orchard that is about three years old and I find that the ants are getting very numerous—black ants. Whether they are likely to damage the tree, or whether there is any way to kill them, is what I wish to know.

Prof. Davis: The most damage done to the tree is to the roots, by these ants. The ants can be disposed of very easily by the use of bisulphide of carbon. It is a liquid, but as soon as you expose it to the air it becomes a gas. Pour from a pint to a quart into an ant-hole, and quickly cover the hole with a wet blanket and leave it there for from twelve to twenty-four hours, and it will smother the ants. When it evaporates it becomes a gas much like coal gas, and smothers the ants.

Question: What remedy do you use for the round-headed borers?

Prof. Davis: I think the best remedy is Paris green or carbolic acid. It should be put on before the borers make their appearance. They are laying their eggs about this time. It should be put on about the twentieth of May. It should be put on two or three times because the rains will wash it off. Whitewash with arsenic is also good. When the young borers eat through that whitewash it will kill them. You should be careful to get all the crevices covered when you wash the trees.

Mr. Rice: We are troubled with that borer, especially in crab-apple trees. In desperation, I thought the trees were of no use; I got the kerosene oil can and thought I would kill it anyway. To my astonishment the tree lived and got well. I only tried it in that one instance.

Mr. Morrill: I am much afraid of such statements.

Mr. Lyon: I have reason to believe that the flat-headed borer is generally found around the base of the trees, and the round-headed is a great deal more voracious. The flat-headed borer will almost always bore directly into the base of the trees. The round-headed borer is seldom, if ever, found near the base of the trees. I don't believe you can find a borer in my orchard at South Haven. I have never seen one.

Mr. Rice: We are troubled most with the flat-headed borer in maples that are moved from forests.

Prof. Davis: Both of these borers prefer injured or diseased wood, and they will preferably attack a tree that is not thrifty. I will say that it is true, what Mr. Lyon has said, except in a very few instances.

Mr. Wilton: I have had some experience with these borers and I find the most successful way of treating them is by washing the trees with whale-oil soap. I first put this preparation on to keep the sheep from eating the bark. I found after I commenced washing the trees to keep the sheep from troubling them, I had no more trouble with the borers. The wash is whale-oil soft soap, carbolic acid, and lime, made about the thickness of common cream. You can smell it in the bark the next spring after you put it on, and the carbolic acid and the lime will stay on about a year and a half. Mice or rabbits will not trouble the trees while that is on. Some of my neighbors were troubled with rabbits eating their trees. I told them I thought this wash would help them. They used it and in every instance the rabbits left the trees.

Question: Don't you go a little light on the carbolic acid?

I only used a very little. There is not so much danger from use of the crude carbolic acid as the refined. I use that more than the other. In a barrel of that wash I would not use more than a quart of carbolic acid.

Question: How much soap to the barrel?

I buy whale oil and make soft soap from it, just as from any other, grease, and use of the lime just enough to make a fair whitewash. The lime is what holds it. It is a very good thing, specially in a wet season, to put in a little tar; it gives it a little greasy coat that will resist the rain. It washes off the whitewash unless there is a little tar. I would not put in over a pint of tar in a half barrel of this. A barrel would cost but little. The whale oil costs about seventy-five cents per gallon. It doesn't cost over fifty cents per gallon, by the barrel, at the outside.

Prof. Davis: The whale-oil soap that you buy all made, costs about twenty-five cents per pound.

Mr. Wilton: I have used this several times. I have used sometimes the whale-oil soap already prepared, and it is not nearly so good as that made from the whale oil and made into soft soap.

Mr. Morrill: Prof. Davis, what is your estimate of that wash?

Prof. Davis: I think it would be a good thing. I don't know as it would be any better than kerosene emulsion. Have you had any experience with carbolic acid that makes you so careful?

Mr. Morrill: No, because I have always been very careful, but I had neighbors use potash, carbolic acid, and soft soap with lime. They read of it in a catalogue of Hale, I think. They wrote to Hale for the formula. They made up their mixture and painted the trees with it, as fine trees as I ever saw, and in twenty days there were no trees. They wrote to Hale and it developed that they had sent to Chicago and got the pure article, good, pure carbolic acid and pure potash, and he laid it to the fact that they got the pure instead of the crude, which he had always used. That is the reason that I throw out a caution for anything like that going on record.

Prof. Davis: I would sooner trust the carbolic acid than the potash. The potash is very severe.

Mr. Morrill: I feel that great caution should be exercised in all these things.

EFFECTS OF FROST ON GRAPES.

BY HON. C. D. LAWTON OF LAWTON.

The month of May last was conspicuous, from the grape-growers' stand point, for the severe frosts that occurred, and one of the most affecting results which this calamity occasioned was the palpable change in the mental and material conditions of a great number of individuals. The sudden transition from hope, expectation, and confidence to the depths of discouragement, failure, and great pecuniary loss is a change that taxes the fortitude of those who suffer, while the despondency of the owners and the blighted trellises are alike suggestive and distressful to the observer.

My remarks will be confined to what I have noted here about Lawton; but I presume that the same conditions prevailed elsewhere throughout the state, and, also, as a general fact, in Ohio and New York as well. In fact, no doubt, the effects of the frost were the same, where they occurred, in all grape-growing sections, and this discussion is applicable to all such places alike.

At Lawton, grape-growing has come to be the chief fruit industry; peaches, berries, and other fruits are also raised, and, years ago, much more largely, comparatively, than now. But peaches became uncertain and berries were not always greatly profitable, while grapes proved remunerative and were thought to be certain. A few persons had vineyards which had been bearing fruit for many years, and these had never failed, from any cause, to yield their annual harvest. Thus, while the raising of grapes for market caused a greater amount of care and labor on the part of the producer, and afforded him less profit than did peaches, when he was fortunate enough to secure a crop of peaches, still it was believed that grapes were sure, and as peaches were not, the element of certainty, an important fact in agriculture, prevailed; and thus it has come about that almost everyone for miles around has set out grapevines, until now, if all were bearing fruit in reasonably good quantity, the amount would be indeed great. The few oldest vineyards, that were planted twenty-eight years, occupied elevated portions of land bordering an extensive valley reaching to the west and southwest, and the subsequent growers for several years thereafter chose for their vineyards similar situations. As a fact, there was never any material damage from frost, either in spring or fall, to the vines or the fruit in these old vineyards; thus it was that people had learned to regard grapes as among the safest of all crops on which to depend for a livelihood.

Not until the spring of 1894 were the grapes ever greatly injured by frost. On the night of the 28th of May of that year the mercury descended to 28 degrees in places, and great injury was done to vegetation; grapes particularly, being the most valuable of our fruit crops, the injury to them, which was great, was the most seriously felt.

Of late years, contrary to the custom early adhered to, and ignoring the experience of the older cultivators, many vineyards have been set on low lands and in medium low situations.

In all these low-land vineyards fruit and foliage were utterly destroyed. In vineyards in slightly elevated places the fruit suffered utter extinction, but the leaves and new growth in part remained; at least, in such situations the vines soon recovered and restored their foliage.

In vineyards on the hills there was even less fruit in most of them, but generally a good portion of the foliage remained green and seemingly unhurt except in the hollows and depressions where, if too deep, the vines were cut down to the roots and recovered only by putting forth new growth from the surface of the ground. Thus, as the result of the frost in May, 1894, the fruit was destroyed in all vineyards except in those on the highest lands, and generally, in these latter situations, the damage was confined chiefly to the hollows and depressions and certain westerly exposures that seem to have suffered unduly; so that, in the aggregate, there were still enough vineyards so fortunately placed as to render the total shipment of grapes quite large. There were vineyards that returned nearly a full average crop; certainly a satisfactory revenue.

It was noticeable after the frosts of May, 1894, that on the hills those vineyards escaped injury the best that sloped to the east or that had higher ground on the west. Such situations escaped the frost almost wholly. All western and northern exposures proved less fortunate.

Vineyards that were suitably cared for during the summer, even on low lands, recovered from the effects of the frost sufficiently to make good growth of wood, and at the close of the season were in fair condition for trimming; and they came through the winter in the usual good condition—in fact, looking extremely well. Up to the 11th of May last the outlook for a crop of fruit was most excellent. But on the date mentioned the weather turned suddenly from extreme heat to excessive cold, the mercury sinking to the freezing point in the night, with a high wind from the north. The effect of this cold wind, with frost, was plainly visible the next day in the withered appearance of the foliage of the trees and vines on the side toward the north.

Subsequently, on the 14th of May, occurred a severe snow storm. The snow fell in quantity sufficient to cover the ground and the vines, and the weather was extremely cold, even to the freezing point, so that small icicles could be seen depending from the leaves, etc., of the trees.

As the result of the previous cold wind and the cold snow storm the tender clusters of grapes showed a change of color from the bright, clear, healthy green to a light grayish-drab tinge. Some anxiety was felt as to what would be the final effect of these storms on the fruit, but as yet the foliage was, substantially everywhere, all right.

On the night of the 17th occurred a very severe frost that cut down utterly the leaves on the vines on all low lands and in all unfavorable situations; but did not, apparently, materially affect the vines in more elevated localities; that is, it did not as a rule. There were exceptions. A few vineyards were severely hurt that had escaped the frost a year previous, and others that were injured the year before were not affected on this occasion.

Subsequently to the 17th, in May, two other severe frosts occurred, one the night of the 19th and the other on the 20th. The first was followed by a fog which obscured the sun until noon of the succeeding day and the frost showed little or no ultimate damage. On the night of the 20th, however, the thermometer indicated the lowest temperature that it reached during this series of frosts, to-wit: 24 degrees Fahrenheit. This way followed by bright, sunshiny weather, so that the freezing had its full effect. But even still, the foliage in the highest vineyards was not greatly damaged. The leaves remained mostly green, and the fruit clusters precisely as they appeared after the first cold wind storm when they were tinged to a slightly grayish-drab color. Many people, after examination, thought that there would still be a fair crop of grapes in vineyards in favorable locations. The leaves remained green and the clusters remained intact; but at blossoming time came a change. Then it was seen that the fruit was stricken vitally. It fell to the ground, leaving the stems naked, or still holding a few of the tiny grapes that continued to adhere. Thus the great promise of grapes has dwindled to the few ragged clusters that yet remain and to a sprinkling in greater or less quantity of a second setting of fruit that has appeared since the frosts. Some expectation of advantage, probably more than will be realized, was entertained from this so-called second setting of fruit. Quite generally the owners, immediately after the frost, made haste to strip the vines of the frozen foliage, with the expectation that they would the sooner, and to a greater extent, put forth new leaves and fruit. I can not say positively whether this stripping off the frozen stems and leaves has proved to be of advantage or not. There are those who think it has. They tried it a year ago, and they think they derived some benefit from so doing. I notice that there are some kinds and some situations which show to comparative advantage whether the vines were stripped or not, and in such instances, when the vines were stripped, there is more than elsewhere a showing of fruit. The opinion is likely to obtain that the cause of the apparent gain is due to the fact of the stripping of the vines of the frozen leaves and stems. I note other instances, however, where there is equally good showing of foliage and of fruit, and where no stripping was done.

Some varieties seem to have withstood the effects of the frost better than others, that is, they have held their fruit better. I might mention the Champion, Perkins, Delaware, Concord, as in this category. None of these anywhere, under the best of circumstances, shows a full crop, or anything like a full crop of fruit, but in some vineyards in high, favorable places there is quite a percentage of fruit; and in all vineyards where the leaves were not killed, the vines hold some fruit both of the original setting and of that which has appeared since the frosts.

The experience obtained during these May frosts, particularly the more recent ones, shows that there is no help in escaping their effects, when they are so severe as these have been, from building fires and making smudges in the vineyard. Many tried that, some to a limited extent, in the effort to save a part of the fruit or as an experiment to be acted upon in future as the results should seem to sanction. Others made the attempt with the desperate resolve to save their fruit by doing the work of smoke-making thoroughly, but in no instance was any degree of success attained in the object for which the work was done. Heat and smoke,

generated to counteract the effects of the frost, utterly failed. I have not heard of the least advantage derived in any case.

An acquaintance living on the east side of Mile lake states that he was determined to save his grapes. They yielded him a nice income last year, and he wished to secure a like result the present season. His grapes were all right up to the last great frost, and he and his family, with other assistance, worked all night with a team drawing straw—the bottom of an old stack—and kept up continuous smudges throughout the vineyard during the entire night. He states that there was a thick cloud of smoke over all the vineyard all the time. Yet, notwithstanding, fruit and leaves were entirely destroyed; not a green thing left save close to the fires. The vineyard looked afterward precisely as did others in the vicinity, all of them presenting a blackened, withered aspect.

It occurs to me that, with the temperature about at the freezing point—not much below, not more than a degree or two below—smudges might be valuable to save, but when the temperature drops to six or eight degrees below the freezing point, artificial heat and smoke do not count. Under such conditions, situation is the only saving clause, and the chief requisite in situation is elevation.

There are no vineyards in the vicinity of Lawton on high lands that had the foliage of the vines entirely destroyed. Some of them were touched by the frost so as to be easily apparent, but in others it required close observation to note any effects at all. It is the opinion of the best growers and observers here, without exception, so far as I know, that the grapes on the high lands were not destroyed by the frosts that cut down the lowland vineyards, but that they were blasted by the first cold wind and the succeeding bitter snow storm.

So far as could be seen, the high-ground vineyards were not changed by the frosts that followed the storms above mentioned. The leaves and clusters remained the same in appearance after the frosts as before.

The change of color in the clusters, previously spoken of, took place, as heretofore described, as the result of the first storms, to whose biting influence the loss of the fruit is attributed.

It is to be remembered that these cold storms are of far less frequent occurrence at that season than frosts, and notwithstanding the latter, had it not been for the former, the grape crop in this vicinity would, probably, have equaled that of last year. It is generally believed here that if it had not been for the blighting effect of the first storms, and in spite of the frosts, the high-land vineyards would have borne a fair crop of grapes. There will be some fruit as it is, but only a meagre quantity—a small percentage of a crop.

Thus the late experience of the past two seasons, and of all seasons when late spring frosts have occurred, verifies the theory early entertained and acted upon by the first growers of grapes in this locality, that to insure success, growers should select elevated situations in which to plant the vines. Not a table-land, however high, but land with alternating elevations and depressions—of uneven topography—preferably land rising from an extensive valley which reaches to the west and north and southwest, the elevated land continuing with broken contour.

WORK AT THE SOUTH HAVEN SUB-STATION.

BY EX-PREST. T. T. LYON OF SOUTH HAVEN.

A large share of the planting at the fruit-testing station was done prior to any purpose to make use of the place for experimental purposes. Had this been the original purpose, and had such been approved at headquarters, it would have been my purpose to thoroughly prepare the ground, in advance of tree planting, by means of a system of tile drainage; and furthermore, by a careful preparation and subsoiling of the ground as a means of securing more equable results and rendering the comparisons of varieties more reliable. Experiences during the excessively wet spring of 1893, together with the unprecedented drouths of this year and 1894, have strongly emphasized this conclusion.

Cherries, especially those of the Duke and Mazzard classes, show unmistakably their special inability to withstand excessive moisture in the soil. In sandy loam, upon a clay subsoil, these were very healthy and vigorous, till the wet spring of 1893, which so injured them that for a time their premature death seemed probable, while pears and plums in adjacent rows were apparently uninjured. This ground was thoroughly tile drained during the ensuing fall, with the result that these diseased trees have fully resumed their pristine health and vigor, notwithstanding the very severe drouth of the two following years.

Several varieties of the hardy north European cherries, received from Prof. Budd of Iowa, so far appear hardy and vigorous. Nearly all of them, however, appear to be tardy bearers and quite late in season.

Twenty-seven varieties of the native plum of the west and northwest have been planted at the station, to test their alleged ability to resist the curculio, rot, and premature loss of foliage, with such other maladies as frequently attack the varieties of *domestica* parentage. So far as liability to attack by curculio is concerned, they are by no means exempt, although the "Little Turk" evidently prefers the *domesticas*. It is, however, a notable fact that either there is an omission to deposit the egg, or that the larva almost invariably fails to develop, since examination usually fails to show that it leaves the crescent mark. There is apparently less tendency to the rotting of the fruit and to premature loss of foliage. Still, with thoroughness in the jarring process and a free use of spraying material, these are now so fully under control that there need be no question of our ability, eastward of lake Michigan, to abundantly supply our needs without resort to a class of plums worthless as compared with our old-time favorites of the *domestica* type.

There are seventeen varieties of the Japanese type, and hybrids, upon the grounds, several of which give evidence of wonderful productiveness, though in quality scarcely up to our standard. They are yet too recent to have fully established a reputation, save perhaps for productiveness. Their quality is confessedly deficient, as compared with the better class of *domestica* varieties, while their very early blooming increases the danger of injury from late spring frosts.

Several varieties of so-called Russian apricot have been on trial since 1888, with few blossoms and no fruit so far. The trees are obviously short-lived, and they apparently lack hardiness. They are being replaced, as they fail, with something more promising.

There are now upon the grounds, of apples 300 varieties; blackberries, 32 varieties; cherries, 44; currants, 23; gooseberries, 21; grapes, 147; mulberries, 5; nuts, 25; peaches, 212; pears, 90; plums, 111; quinces, 11; raspberries, 72; service berries, 3; strawberries, about 200. A large number, especially of apples and pears, are not yet in bearing.

The past two seasons have afforded an unlooked-for lesson upon methods of protection against drouth. A plantation of sixty cherry trees, during the year 1893 and previously, had made luxuriant growth; and, many of them being sweet or Mazzard varieties, the ground was seeded with lawn grasses, early in the spring of 1894, to check the excess of growth, and thus avoid bark-burst and other kindred difficulties. Followed, as this has been, by two successive seasons of severe drouth, although the trees have been thoroughly mulched and the grass closely mowed, the trees are, many of them, in a very satisfactory condition.

On the other hand, similar cherry trees, in soil of the same general character, which has been thoroughly cultivated during the same period, are abundantly vigorous and healthy, without mulch or other preparation save that of a coat of mellow earth above their roots. In fact, with frequent cultivation, the growths of both last season and the present one, so far, have been highly satisfactory, while upon bearing trees the fruit of last year was unusually large and highly colored. Thus far, this year, under similar treatment, the promise is excellent for similar results. Exception must, however, be made in the case of strawberries, which are given clean, shallow culture till near ripening, when just enough mulch is applied to keep the berries clean. This so far prevents cultivation that, with the tramping of the feet of visitors and pickers, the soil becomes compacted, and in a good degree loses its ability to conserve moisture. From this cause, combined with severe drouth and excessive heat, the strawberry yield of this season has probably been diminished fully fifty per cent.

Beyond the filling of vacancies where plants or trees have failed, there is now little space unfilled, so that in the future the process of adding novelties must mainly be by removal and replacement or by the regrafting of those sufficiently tested.

It has not been the policy, so far, to pursue a stimulating system, by high manuring; but instead to endeavor, under thorough culture, to secure results within reach of careful, thorough cultivators generally, and for that reason, a safer guide for the action of others.

CHEMISTRY OF INSECTICIDES AND FUNGICIDES.

BY PROF. R. C. KEDZIE, AGRICULTURAL COLLEGE.

I regret that I had agreed to speak on this subject, because one of our students has agreed to prepare a thesis upon it and I am a little afraid I shall tread on his ground. I am somewhat in the position of the Sunday-school pupil. It was his first day and he was a little bashful; and the teacher, looking at him with a somewhat stern expression on his countenance, asked, "Who first brought sin and death into this world with all its woes?" He answered, "I did, ma'am, but I will never do it again."

Somebody proposed the use of Paris green poison for the potato bug. It is a very effective poison, and if properly used will answer this purpose very effectively. But there is a better form of it than the one commonly used. It is a material that could be much more easily prepared. It is more of the nature of Scheele's green. This Paris green I am using is used very largely as a paint and has consequently a large demand which the Scheele's green has not. Next after the use of Paris green and Scheele's green came corrosive sublimate or mercuric chloride. The great objection to this is it is costly.

I might lay down these three principal requisites for an insecticide and fungicide: It must do the work thoroughly, it must be safe, not injure the plant, and must be cheap. The use of Paris green and Scheele's green answers the first and second conditions, but unfortunately it does not fulfil the third condition. It is a somewhat costly material, and the thing that now troubles us is that the price has lately increased and promises to increase still more. The law in this state requiring use of insecticides and fungicides commands the use of such materials. A trust is forming and bids fair to control the price for some time to come. This trust, as I am informed by a leading dealer in Lansing, has control entirely of the Paris green market in this country. While Paris green can be imported from abroad, the cheapest they can sell it is twenty-six cents per pound in quantities of half a ton, and in less than that quantity, twenty-eight cents. It retails at fifty cents per pound, and may go up to sixty. If a dealer makes it, the trust announces it will sell none to him thereafter; he must buy of the trust or the trust will sell none to him at all.

To digress a little we may say we have a large class of poisons usually used for this purpose—the commonly recognized blue vitriol, the carbonate of copper, bought at retail for forty cents, and the other for sixty cents per pound. The poisonous property of the copper is about twice as great in the carbonate as it is in the sulphate. We have a large number of other substances which are used for the purpose. Some recommend that arsenate of lead be used in place of the Paris green. We may get the material in the form of an arsenate of lead or arsenite of lead. The material is very easily formed. We may use the lead salt or the zinc salt which I form before you; equally valuable, equally useful for a poison. They must be, however, in the form of a neutral salt, insoluble in water, and not form a precipitate with tests for arsenic; but here we get

the precipitate, with the lead salt, the same as we do with the zinc salt. We may form a very beautiful precipitate of this class by using some other material, as for example, with this nitrate of silver, when we get the beautiful canary-colored precipitate. It will answer very nicely for an insecticide, but costs about a dollar per ounce and so is objectionable on that account. Finally, we have this waste product, London purple, a waste product formed in the manufacture of aniline dyes. They attempted to throw it away on land and then tried to pour it into the rivers, but it poisoned the land and killed the fish in the rivers and the government forbade its being deposited anywhere except in deep sea water. They couldn't dispose of it except at a large expense. They found it could be used for Paris green, and it is now largely exported and used in this country for a poison. We may use any of these compounds of arsenic if we have the arsenic in such form as to make it safe, and not injure the plant. If we have it in the form of arsenite of soda the soluble arsenic is injurious to the plant. We must have it in some form in which the material is entirely insoluble. We may have it in the form of Paris green or of Scheele's green, or in the form of arsenite of lead, but we must get it in such form as to make it as cheap as possible, and for this purpose we can get it in the form of arsenite of lime, which is entirely insoluble.

I have a little of the arsenite of lime formed here. The question is, does all of the arsenic remain insoluble and not injurious to the plant? We have a very delicate test for the presence of arsenic made by sulphuretted hydrogen. I have a quantity of the arsenic dissolved by boiling it in water. I will take a little of this solution and see if we detect the presence of arsenic by this test. The sulphuretted hydrogen detects the arsenic by forming the yellow sulphite of arsenic. We will see whether this arsenite of lime contains any of the arsenic in solution, because, if the arsenic is in solution, it will kill the trees as well as the fungi. You see there is no precipitate, showing there is less than one part in a million because no precipitate is formed. Here is the arsenic, or "white arsenic" of the shops, a very cheap material. I have bought it for fifteen cents per pound. It can be bought for ten cents. One ounce and a half of this will form a spraying mixture of forty gallons when formed into the arsenite of lime. Take an ounce and a half of this arsenic and bring it into solution. It dissolves very slowly, for here is some that I boiled a considerable time, in water, and you see that most of it remains insoluble. It takes a very large amount of water to bring it into solution. But it readily dissolves in an alkaline solution. Take an ounce and a half of this arsenic and four of sal-soda and put the whole into water and boil it, and you get the whole into solution very easily. Now take this arsenite of soda and bring it into contact with slaked lime, which is a very cheap material. For less than two and a half cents you can get a spraying mixture which can be very readily used by anybody and very easily prepared and you get for less than two and a half cents forty gallons of spraying mixture. It is both an insecticide and fungicide. As a spraying mixture this material is very effective. So far as a germicide is concerned, the arsenite of lime combined with Bordeaux mixture may be used. If you add that to the Bordeaux you will get a little of Scheele's green. It does not need to be combined with Bordeaux mixture. If you

want the poisonous property of copper combined with the poisonous property of arsenic, you can get the arsenite of copper, which is more poisonous than the arsenite of lime. This has been tested as an insecticide. I have prepared some of this arsenite of lime and we have used it with equally as good results as from Paris green.

DISCUSSION.

Prof. Taft: It gets the potato bug right along. It is fully as effective as Paris green. We used a pound in four hundred gallons for spraying fruit trees, only half the amount we used of Paris green. We also used it with lime alone. By using the test Dr. Kedzie speaks of you can detect the presence of free arsenic. If a person uses this instead of Paris green, I would test either in this way or by boiling before using. Bulletin No. 124, from the Experiment Station, gives this method of preparing it, and if the directions there given are followed, you will have no difficulty. Suppose you take your arsenic and lime together, and boil one pound of arsenic to two pounds of lime. You have your complete mixture in the form of arsenite of lime. The quickest and safest and easiest of all ways is to boil it with sal-soda, and add that to the slaked lime, and a pound of lime will precipitate a pound of arsenic as arsenite of lime.

Q. Would it be necessary to test with the sulphuretted hydrogen?

A. If I take some of this and stir it up, to see if it contains any arsenic, you see that no arsenic is in solution. I add to this a little acid to dissolve the lime, and bring the whole of the material into solution, and now the reaction for arsenic is very strong. If you are going to test this material you must be sure to get a clear solution and have no suspended arsenite of lime. The beauty of this spraying mixture is that the whole of the arsenic is in an insoluble form. You may be perfectly safe in boiling the material (white arsenic, $1\frac{1}{2}$ ounce) in sal-soda (five ounces) and adding it to the slaked lime (two pounds). Dilute to forty gallons of water.

Mr. Morrill: A great many people are using London purple because it is cheap; but, as it is being adulterated it may be that it will not kill at all. Do you make any test to find out this killing property? Not one man in the state will know of that for years. The fact that London purple is being adulterated is causing a great many people damage, and it is worth investigating. A neighbor used it and he could not kill any potato bugs. He put it on four times its strength.

Dr. Kedzie: How many are going to learn about that? We had better begin to use the arsenite of lime, straight.

Mr. Morrill: Paris green seems to have about as good effect as ever.

A member: Last year, in our neighborhood, we had Paris green that would not kill unless we used three or four times the usual amount.

Q. Is it practical to have this as a commercial article, so we could get it instead of having to make it ourselves?

A. It is bulky, and if the farmers know just how this is made I don't see why they can't make it. There is a swindle on Paris green. A lot of conscienceless men got together and took advantage of the trust. We know that this is perfectly reliable and safe. I don't see why this news can't go through the community. Why could not some one person manu-

facture it for his community? As a commercial article at the drug stores it is too bulky.

Q. Could not it be got dry?

A. When you get it dry it is very difficult to get it mixed up with the water. You get lumps. The lime must be thoroughly slaked before using. It could be handled in cheap jugs. It is not any more difficult to make than Bordeaux mixture.

IRRIGATION.

BY MR. S. S. BAILEY OF EAST PARIS.

Never in the history of the state has there been such a general longing for more rain and more water for crops than in the present month of June. In such times the watering of crops by irrigation is receiving, as it deserves, serious consideration.

To a limited extent, Michigan, which is so blessed with its many small lakes and streams and brooks, has a future before it for irrigation and profit equal to any other state, and artesian wells are yet to play an important part in the work.

If all the available sources for irrigation were utilized, the state would be enriched beyond computation. Plants once established would last many generations.

Just how best to utilize and avail ourselves, without too great expense, of the waters that now flow away unused as well as "unvexed to the sea," with no perceptible benefit to mankind, except to commerce, is a question that demands the serious consideration not only of the individual but of the state itself, for whatever benefits the individual benefits the state at large. A thorough investigation and discussion of this subject may bring practical results and show us how we can best utilize these waste waters.

For the last few years my son and myself have in a small way been practicing irrigation with satisfactory results. On our farm is a small stream made from springs on the farm. At first we diverted the brook by plowing furrows in different directions out on the land in pasture, and by so doing made green fields and fresh pasture out of dried-up grasses. In August, during a severe drouth, the fields were made as green as in spring.

These rough experiments led us to thinking we might derive greater benefit by husbanding the water and using it for gardening and more intensive farming. We thought the waters that had been running to waste for thousands of years were designed for man's benefit, the same as land; and so, in a suitable place, we built a dam and made a pond covering about three fourths of an acre, and diverted the water into it with a depth of from four to six feet. About twenty rods below this pond is some twenty acres of comparatively level land, about five feet lower than the top of the pond. On the upper side of this land we made a ditch (using plow and scraper) about three feet wide and eighteen inches deep.

The water is conveyed from near the top of the pond, in land as high as the pond, into this ditch, and from this ditch when filled, is distributed wherever most wanted, by furrows plowed between the crops planted, or adjoining them. Forty rods below this first ditch is another of the same size and about 120 rods long, into which the surplus water is conveyed after watering the first plat, which is used mostly for gardening purposes. This second ditch is on the upper side of some forty acres of low land, near the river, which is usually overflowed in spring. This ditch has an additional supply from another small brook diverted into it.

Twenty rods below this second ditch is still another, 140 rods long, six feet wide and two feet deep. This ditch is in the center of the forty acres of low land. This is also filled with the water from the other ditches, by running the same in furrows where most needed. The water in this ditch by the use of side ditches and seepage moistens most of the forty acres. The soil is porous, a reclaimed bayou, with considerable black muck.

On twenty acres of this, in corn last year, for the silo, we had more than ten times as much fodder corn as on twenty acres of rich upland that could not be irrigated. The upland corn was of but little account; that irrigated was literally immense. At the last cultivation of the corn we sowed rye, and on some ten acres more not in corn. When the corn was taken off the rye was over eight inches high and covered the ground like a mat. On a portion of this land we planted about forty thousand cabbages, and although planted late we had a big crop—heads too large to suit the retail grocers. After the removal of the corn and cabbages it was pastured with sheep and horses and young cattle till the last of December, and this spring till the 10th of this month (June), and then a portion of it cut for hay.

We are planting most of these forty acres to corn for the silo, using mostly dent corn of early maturing variety, and some sweet corn; and but for this preparation for irrigating we would almost despair of getting fodder for the cows the coming winter. One can hardly put too high a value on such an irrigating plant. The water is now in the ditches and is working for us night and day, refusing compensation, asking only, seemingly, a vote of thanks, which is given every time we visit the field.

In 1893, the drought caught us on sweet corn. We had about one and one half acres on upland, and about the same on land we could irrigate—all planted the same day and on land equally rich. From that not watered, we sold less than \$10 worth; on that watered, over \$93 worth, and had an immense lot of fodder and corn left for soiling.

We had similar results on plats set to strawberries. The strawberries in size and yield were a wonder to all who saw them. This year we extended the irrigation further, with results most astonishing and satisfactory.

The little spring brook has been worth to us many hundred dollars, and the end is not yet. The plant is there to stay for our benefit, and for the benefit of our successors. As now controlled and utilized for irrigation, at a low estimate we consider it worth many thousand dollars. In traveling over the country we find thousands of just such little streams, and a great many small creeks and lakes that might be utilized for man's benefit. In many cases the streams run through several farms before

reaching their outlet. In order that such streams could be used for irrigation to the full extent where they pass through different farms belonging to different owners, it will be necessary for the several states to pass some general law under which farmers can organize and utilize the streams for the benefit of all, and for the protection of each in such rights as may be acquired, such rights to become a part of the realty and pass with the land when sold or otherwise disposed of.

I have another irrigating plant on my home farm, though not on so extensive a scale, as it is used mostly for a few acres of garden. Selecting a suitable place in a small ravine just below where the springs come out of a bank, I built a dam, making a pond covering a space of about one fourth of an acre. From this pond, water is conveyed through three-inch continuous pipe, made of waterlime and sand, about 100 rods. The outlet is from another pond from which we get ice in winter, and from which the water is taken for irrigating the garden. Water is also taken from several places along the line of pipe, for watering the plants. If the asparagus or beets or onions or cabbage or any other vegetables or plants or flowers need water, they get it. No one who has not made the experiment can conceive the pleasure it creates to give the cup of cold water (not too cold) to these thirsty plants. It is an added pleasure to farm life that turns the prose of it for the time being into genuine poetry. While in that poetic frame of mind, if one listens he seems to hear, and does almost hear, the approval of Him who created the plants, and flowers, and fruit for man's benefit and enjoyment.

We call it cruel and criminal to place an animal in a dry time where he can get no water to quench thirst and relieve suffering; and we are held responsible unless it is beyond our power to give relief. Is it not just as cruel and criminal for us to set out plants and let them suffer for the want of water when the means are within our reach to quench their thirst by irrigation? If not by irrigation, then by that kind of cultivation that conserves the moisture already in the soil and brings it up within the reach of plants where they can drink at pleasure. If animals have souls, however small they may be, may not the vegetable kingdom claim equal recognition? The day may come, as we see more clearly our relation to the Creator and his creation, when cruelty to plants of our own setting will bring upon us the same censure that now follows cruelty to animals.

Along industrial lines the world is moving with a rapidity never before known; and if the tillers of the soil would keep steady and elastic step in the front ranks of progress, all the latent powers of the brain as well as muscle must be aroused, that they may avail themselves of all the helps that nature has given them. If irrigation is to aid them, the time is opportune for devising by experiment the best and cheapest means for accomplishing the end sought.

DISCUSSIONS AND REPORTS.

STRAWBERRIES.

Mr. R. M. Kellogg of Ionia: I confess to somewhat of hesitancy. In the line of aid to strawberry culture, any attempt to discuss the crop of this year is rather a difficult matter. It has been a season of great disappointment to all present depending upon the berry. We in Ionia have nothing to report except disaster to the crop. We began with as bright an outlook as we had had for years. From the time snow went off until the 14th or 15th of May, we had no rain of any consequence, then we had about four inches of snow, which stayed with us four days, and this was followed by two hard frosts. After the smoke of the frost had cleared away, we had the best of reasons for being hopeful, believing the frost had done nothing more than relieve us of our surplus. But the berries proved to be largely deformed, no doubt due to frosts. There is nothing about this that should discourage strawberry-growers. They should learn that tillage would tide them over the drought. Our spring set of plants, those we gave proper tillage, are in good shape. The outlook for the coming year as a whole is very good. Most of the people have learned that these dry seasons are to be expected. On my own ground I have never had better showing than at the present time.

Q. Were the plants killed outright?

Everything. Some patches have died out of each variety. Some resist the attack of the frost more. I did not keep a sufficient record. I am inclined to think Epping is one of the strongest varieties we have. Warfields ran very small, and a great many of them did not develop. They root deeper than Haverland.

L. M. Palmer of Grand Rapids: Drought got the best of me all around. I don't know that I have anything to say one way or the other. It is a dry year, and that is the best of it. Bubach did the best of anything. I have a little of everything in soil. I have a piece of Michigan. A great many have considered that Epping was likely to be killed by frost. I have heard a great many claim, if you want success, put it on sand. I have had good success with it on sand, and have also had nothing. There is something strange about my patch. It is reasonably moist, and yet berries lie right there and burn up. What I supposed would keep the moisture best were the Warfields, but they were the first to dry up.

Q. Did you mulch your berries with straw?

A. I did not, until I thought there was going to be a frost, and those that I covered with straw did not have as many berries as those I did not. I uncovered them early in the morning.

Q. Have you any theories as to what caused those you mulched not to be as good as those you didn't mulch?

A. Not unless we cultivated those we mulched more than we did those we didn't.

Mr. Morrill: I would like to ask Mr. Palmer if he has found it good practice to cultivate the vines he is going to fruit.

A. Last year I found it was not good practice. The first two seasons I thought it was. Last season they didn't do as well where I cultivated.

Q. How deep do you cultivate?

A. Two inches. I notice that berries here on the college ground have not been cultivated, and I would like to hear from Prof. Taft.

Prof. Taft: You notice that on the north side of the drive the berries are very uneven. That was due to the drought of last year. Sometimes I thought every plant was killed. You couldn't find a green leaf the first of August. Nine tenths of the kinds show very few green leaves, and the worst of them failed to start after the rains came. We have a fair growth coming on now. The piece on the south side of the road is now three years old and will give us a good crop. We have only given it two fair applications, and it did not take over a day to water it, and you can see what the effect has been from that small amount of labor and water. The condition of those on the north side of the road is due entirely to the dry season. Regarding cultivation in the fruiting year, if you are sure of a wet season, and use only a fine-tooth cultivator, you will have improved results unless it is very heavily mulched.

Q. What time did you put the mulch on?

A. Not very far from the middle of November, between that and Thanksgiving.

Q. You always mulch in the fall?

A. Always in the fall.

Q. Do you cover from frost in the spring?

A. This spring, I think about Monday of the week when the frost commenced, it seemed they were covered enough. Friday we thought it time to take the covering off. We took it off when we thought the weather had turned, but that night we had a hard frost which of course nipped them, all the worse, perhaps, because they had been covered.

Mr. Gladden: I would mention as of especial value here at the college, Greenville, Brandywine, Judsonia, Weston, Thompson, Epping, and Bisel. I might also name Princeton Chief, Edwards Favorite, and Maxwell of the newer sorts.

Q. What berries were the poorest?

A. Wilson did the poorest of the common kinds this year. Crescent also gave a poor crop. Haverland has been one of the best in the long run.

Q. What are the characteristics of Bisel?

A. I value it chiefly for its vigor of growth and its fruiting qualities, although we can not judge fairly of its productiveness this season.

Mr. Morrill: Our section is a pretty dry country. What with frost and dry, hot weather combined, I have never seen strawberries so dry as they were with us. The temperature (I am not speaking accurately) was probably from six to ten degrees above normal for the last half of June, and I believe it was heat as well as lack of moisture. I might speak of the varieties such as a discussion of this kind brings out. We must learn that every variety has its own graces. Warfield I consider the best market berry that grows. The roots are very short, and that is against it in the droughty season. Still, there is no plant of more vitality on the ground. On the other hand the Haverland roots very deeply. If the roots of Warfield are not deep in the fall you will have a large crop.

These are some of the things we have to learn by experience. Now, Michel Early has become quite a favorite. It does not bring so large a crop but it is early. Jessie is one of the finest of berries, but a little frost kills it. These are things we have to learn by experience and experiments, and the more we know of them the further it puts to sea. We can not guess on the future. There are more of those things which I wish our experimental station would get at, that they would notice such characteristics of varieties and their ability to resist frosts. I have come to the conclusion that I will not cultivate too deeply. It must be a moist season if you get as good a crop as you would otherwise. The average season is against you if you cultivate. On my soil I have a little of everything, but have grown strawberries mostly on sandy soil. I will not mulch in the fall and leave it there until spring, but after the fruit is set I will put it on.

Mr. T. T. Lyon of South Haven: So far as our experience at South Haven is concerned, I can only say that it has been quite similar to that of others. Last year we all understand was not a particularly favorable time. The frost came about the middle of the strawberry season, so that we lost about a third or a half of what would have been the crop. So we feel this year more the effect of last year's drought. We had to depend upon what the soil already contained for this year's growth. We had a frost, a very unusual thing at our place, which blighted the blooms that were already out. The crop set was a large one, and more than half has failed to develop on account of the drought and the extreme hot weather. This is true especially of strawberries, and to some extent with currants and gooseberries; at least they are not producing a full crop. So far as the larger fruits are concerned, I have no reason to complain. We are doing as well as usual, I think. I fancy if this type of season is to continue we would better resort to something beyond the mere cultivation of the surface, so far as strawberries are concerned, for the reason that we are obliged, in order to keep our crop in condition, to mulch it. Besides, the tramp of feet during the season of gathering compacts the soil, so we lose the benefit of the fruit.

C. E. Whitten: I live on the lake shore some fifteen miles further south than Mr. Morrill. We had fair prospects at the start but were bitten by the frost and dried out by the hot weather. Some varieties seemed to resist the frost more than others. Haverland and Barton's Eclipse show the most fruit—the most uninjured. We had fruits that were half grown that were dead—never ripened. Then we had good growing weather, but no rain and extremely hot, and the crop was probably a third cut off. We probably fared the best with the Barton crop, so far as money goes.

Q. What is your mode of cultivation? A. We usually depend upon the matted row.

Q. Don't you mulch at all? A. Very little mulching is done.

Q. Can you keep your berries clean? A. If we don't get any more rain than this year. As to cultivation in the spring, some practice it, some do not. If you cultivate at all I should do it very early and then stop. Do not disturb the roots after the plants are in bloom.

Q. Have you fruited any of the later varieties, and which give the greater promise? A. It is hard to give any idea of what the very latest

ones might have been. Bisel set any amount of fruit. I never saw anything set fuller. I had them on good ground. I had a great many imperfect, small berries on Bisel.

Mr. Morrill: I think if I had an abundance of well-rotted manure I would not go to fertilizers for strawberries. I would use wood ashes and fine bone. At one time I fitted four rows, nine rods long, to see what I could do with commercial fertilizers upon land naturally good. I made furrows with a double mould-board plow. I strewed Mapes' commercial fertilizer in the bottom of that furrow. Then I took a spring-tooth cultivator and worked it thoroughly in. Then I put the soil back, and put on five hundred pounds to the acre on top of that. This was a space eighteen inches wide. This makes a thousand pounds to the acre. Then I set half of that to Crescent strawberries and the other half to Sharpless. The second year Sharpless was largely killed by frost. Crescent pulled through in good shape. As figured out, the sales would have amounted to over \$800 per acre. The ordinary price for berries was seventy-five cents to \$1.25 per case. These sold for \$2. It was the difference in the quality of the fruit. At another time I took a few rows of Warfield. I took a thousand pounds of raw bone and strewed them over the surface, and we spread ashes at the rate of one hundred bushels to the acre. But those four rows of Warfields twenty rods long netted sufficient to have run over \$700 to the acre, and it was not an exceptionally high-price year. It was a year of plenty. I have done just as well with thoroughly rotted manure. But it is my experience that no man can tell what the commercial fertilizer is going to do. This soil was a fine sand and loam mixture, soil that produced on the average twenty-five bushels of wheat to the acre.

Mr. Brown: The main reason why we underrate the value of the commercial fertilizer is on account of the drought. With good weather it is undoubtedly a good thing. With my soil you might as well throw on a lot of sand. It seems only to aid in burning it up. Mine is clay soil. There is a great difference in soils about the amount of heat they will absorb.

Mr. McCallem: I want to indorse what Mr. Morrill has said in regard to fertilizers. Strawberries do not want too much nitrogen. I have kept my teams busy drawing manure. Now, I am satisfied that the two chief ingredients which are usually deficient are potash and phosphoric acid. I do not think we need so much nitrogen as we do for most any other crop. You put commercial fertilizer on your ground, and not get a rain until fall, and you will get no results from it. I am satisfied that if growers will spend a little more money in ground bone and potash they will get better results from it. I am just as careful about adjusting my cultivators in cultivating as I am about adjusting a clock. If you will stir your ground and keep it cultivated about three inches deep, the roots will strike deeper. They will not do that unless the soil is stirred. They must have air. If the plants do not get it the crops are in bad shape. I believe that proper cultivation is all right, but the great difficulty is, you take these wide cultivators such as we used to use and bad results follow. They tear the roots all to pieces, and they have no time to establish themselves. That is, assuming you do not mulch heavily. I believe that proper cultivation is the thing in the spring.

Mr. Morrill: What do you consider the best method for cultivation?

Mr. McCallem: I believe that has been pretty well demonstrated at the experiment station. There are two crops that we are after when we are growing strawberries, one crop of berries and the other crop of dollars. When I am after dollars I prefer to have the berries in hills. I am satisfied that we can not get, with most varieties, so large a crop nor so good, under a good hill cultivation even, as we can under the narrow matted row system. Mr. Taft, if you were going to set out strawberries in hills, what distance would you put them apart?

Mr. Taft: I have given that no particular thought. I think perhaps as near as three feet, and perhaps a foot and a half in the row. I would say, regarding fertilizers, no one can speak more highly than I regarding wood ashes and ground bone.

Mr. Gunson: Those who reported failure of certain kinds to develop after they had reached certain stages, I would like to ask if these were two-year-old plants or simply one-year-old. It would be almost impossible for plants to develop before winter. I would like to ask what age the plants were. That great observer, S. S. Bailey, says that the fruit one year depends entirely upon the vitality of the bud. If we do not have a bud, where are we going to get the fruit? It seems to me from that that we would have to keep a growing bud through the summer. I would like to say that in dry seasons (not at all the seasons we are having now, by any means), but in ordinarily dry seasons, especially during the months of July and August, with proper care, the strawberry often is likely to grow its best, simply by using street sprinklers or tanks of that kind, if it had to be done in order to get plants in good condition before winter.

Mr. Brown: I am glad to see this point brought out. Those who wish plants for greenhouse culture always have to select the crowns. I wouldn't let a man select strawberry plants for me, because I should want to see that the crown was well developed.

The Chairman: I think Mr. Gunson asked whether it was the two-year-old or the one-year-old plants, where the berries failed.

Mr. Palmer: Mine were one-year-old plants, set last spring.

Q. Did you have a satisfactory-looking field when winter set in? A. Yes, sir. I was the only one who had a good set of Jessie and Bubach.

Q. Did you have them on both sides of the road? A. Where I cultivated the most I got the worst berries.

Q. Didn't you think the extreme heat had its effect upon the berries? A. That is just the thing I think was the matter. I believe that heat had much to do with it.

Q. Why would not water cool the soil? A. It was the atmosphere. The fruit was really stunted then. It was all small fruit.

Q. You found dry, heavy mulch there. A. This whole thing was mulched through the winter. That might have dried it. Perhaps that excluded moisture from the roots. I think it was due almost entirely to the excessively high temperature. They seemed to be growing and doing nicely, but then the thermometer ran up to almost a hundred. Then they turned to dark yellow.

Mr. Lowell: My experience is something similar to Mr. Palmer's. We live in the same locality. Last fall we had a good crop. We kept the weeds all down, and after we planted our strawberries we cultivated

during the season right up to late in the fall; but to our surprise, after mulching it during the winter, our growth was chickweed as thick as it could possibly grow. We were left in a dilemma. We did not know what to do. We thought probably it wouldn't be so bad after a while, but it kept getting worse all the time. We kept pulling it out toward the road, we thought it would check the growth of the weeds. But the frost overtook us. We had covered them previous to the frost and though it would protect them. Beder Wood failed to blossom. Jessies were killed in blossom. But after they blossomed out again they set very heavily with berries, and we thought we were going to have a full crop; but the best of them wilted right down and we laid it to the heat. Our berries were all mulched and had particular care, and yet they failed to produce.

Q. I would like to ask if you recommend street sweepings? A. Yes, sir.

Q. We don't regard them in Port Huron as good for anything. A. It was nothing but clear horse manure. Our pavement sweepings won't produce weeds. Ordinary street sweepings are not good.

Mr. Arthur Green: I would like to ask about Muskingum. Mr. Gunson, have you ever noticed some varieties that grow and turn over from the frost?

Mr. Gunson: I have noticed that, but my experience in strawberry culture has been but limited. Some of these varieties I have never harvested before. I should think that was a point well taken.

Mr. Green: Muskingums were nearly all killed, but Aftons and some of those short-stemmed varieties came through. Leroy, I consider a very good berry—very fine plant, and stood the drought about the best of anything. Warfield has that advantage, and Afton is almost like it.

Mr. Lawton: I would like to ask if any one has practiced thinning out strawberry plants. Do you thin out any?

Prof. Taft: Some kinds do, of course, make great numbers of plants. Take the old Pacific—of course they should be thinned out, by cutting the runners in the beginning, and then, perhaps, arranging them in a narrow row.

Mr. Little: Does it pay to grow plants and fruit for commerce? Let every plant grow? A. I should say not.

Mr. Morrill: I should say that would be the poorest kind of practice. I grow strawberries for plants, but never for plants and fruit both, and I think people in the future will insist upon having specially grown plants. I think the man who attempts to grow his own plants and set them by simply taking the tips off, certainly can not expect the best results. That is my own private opinion. I don't think the fourth plant, and hardly the third plant, on the runner is worth setting.

CHERRIES.

Mr. Lawton: I grow Early Richmond somewhat. I find they are very profitable. I never saw where Early Richmonds grow any better than in Michigan. I grow them on sand—don't want the ground heavy nor very rich. They are as profitable as anything you can have.

Q. On a good large tree, how many cherries will they raise? A. I have neighbors who will harvest as high as a thousand bushels per year.

Q. Where is the profit when it is worth two cents per quart to pick them? Does he make money growing them? A. Yes, sir.

A Member: Do I understand you to ask if there is a profit in cherries at \$1.50 per bushel? If anyone will guarantee me a dollar per bushel I will set my farm with them. I think with Richmond and a large crop you can get them picked for a cent per quart.

Mr. Morrill: I don't think we can grow sweet cherries in Michigan. When the people want a nice sweet cherry they will take it from California. For a sweet cherry, California is so far ahead that we can not do anything in competition with it. But when it comes to sour cherries, Michigan holds the mark.

Q. Then if you are going to set cherries today the great majority would be the old kinds? A. The Mayduke is doing just about as well as anything we grow. A trifle darker color, but larger and better.

Prof. Taft: We have two or three trees of Montmorency. Suda is a good one. Then we have the Bessarabian, and a long list of others. Most of our sweet cherry trees are as yet too small to bear.

Q. What distance do you plant? A. Well—a rod or more apart; I plant twenty feet anyway.

Q. Is Montmorency as good a grower as Early Richmond? A. It is.

Mr. Morrill: I have had the advantage of watching a neighbor's orchard, who has a great variety of cherries. I have dismissed the sweet cherries rather peremptorily. Gov. Wood seems to be a nice cherry, but it rots very early. But the finest sweet cherry I have noticed is Napoleon Bigarreau. I think what you say about the sweet cherries coming from California is right, but they can't get a sour cherry that will compare with ours.

Prof. Taft: I wouldn't plant the sweet cherries to any great extent but I have had some sent in from the lake shore. I have had some very fine samples of Napoleon, and I think, perhaps, a few of those varieties might be grown. Napoleon Bigarreau and the common Bigarreau might be grown with success. This year we had little injury to our sour cherries.

Mr. Morrill: Right to the contrary, our sour cherries were badly killed and sweet cherries, standing alongside, entirely uninjured.

Mr. Reid: The same is the case in Allegan county, generally, as Mr. Morrill mentions as to Benton Harbor. Certainly we have as nice sweet cherries, both the light-colored and the dark ones, as I have seen from California. This year the sweet cherries with us are very large and fine.

Mr. Arthur Green: We have a tree of Coe's Transparent that is at least eight inches through, and this year it is just loaded with fruit, and finer cherries I never saw.

Q. I would like to ask about the cultivation of cherries. I set out an orchard this year and I should like to know about the cultivation. A. I have been cultivating the sweet cherries more or less about forty years. My observation is that the great difficulty in growing sweet cherries is allowing them to grow too rapidly while they are young and bearing, and in heading the trees so high that the sun has a chance at the trunks. They are likely to burst, to rupture the bark. If that can be

avoided I think we will find the sweet cherry is nearly or quite as hardy as the sour. There is no use, according to my idea, in attempting to grow them, if we allow them to grow too rapidly while they are young, or allow them to grow up high where the sun has a chance at the trunk.

Q. How would it do to sod them down? A. Last year, without any expectation, any anticipation of such a drought, I had some cherries that were growing too thriftily, and I sodded the ground; and surely I had no expectation of two such years, and this year they do not look very promising. It is true that if they are neglected or laid down to grass you won't get as much fruit from them.

Mr. Rice: Some fifteen or sixteen years ago I put out around the house several varieties of cherry. My experience with Early Richmonds has been rather against them. I have been handling trees about forty years. I do not know of an Early Richmond tree that is bearing good fruit. When they got about as big as peas they began to turn red; they got a little larger, but they seemed to be so bitter we couldn't eat them at all. The trees soon died out. Those that didn't die I chopped down. But I planted Maydukes at the same time and they never have failed a crop. I planted two Empress Eugenie and they are the most healthy trees I have ever seen. This year the frost got them and they had no cherries on at all. Mayduke is of course a very late cherry, very sour, and a little bitter. You see your tree loaded with a ripe crop, and about three weeks later you see your tree loaded with a green crop—another crop.

Mr. Morrill: The characteristics you described as of Empress Eugenie is a Mayduke characteristic. I think anybody can raise Early Richmond trees anywhere in Michigan, on high, dry ground. You will see them loaded with perfect fruit.

IRRIGATION AT THE COLLEGE.

Mr. Brown: We have noticed a great thing on these grounds—their system of spreading water. Let us have Prof. Taft tell us whether it will pay or not.

Prof. Taft: I can give my opinion regarding the question as asked in a very few words. I think it will pay if water can be readily obtained. There are many sections of the state where you can get water from a lake or stream, and if the lift is not too great we can afford to pump water for vegetables and small fruits, while, if it can be distributed by gravity, it will pay to use it for many of the farm crops.

The system we have here, as many of you have observed, has a number of hydrants located upon the higher points in the garden, to which a steam-pump forces the water from the river through a three-inch iron pipe, the smaller distributing pipes being two-and-one-half inch. By means of a fire hose we can reach all points of the garden. We have tried various methods of distributing the water, and are of the opinion that where the amount of water available is sufficient to supply a two-inch stream, surface irrigation in furrows is preferable for most garden and fruit crops.

For subirrigation we used two-and-one-half-inch drain tiles, laid at a depth of fifteen to eighteen inches, placing them so there will be small

cracks between them, with a slope of not over one foot in one hundred. This system seems of value for crops grown in close drills, and where one has only a small supply of water, or only a small pipe to carry the water, as one only needs to turn the water into the tiles and can go off and leave it running for the proper length of time. On the other hand, surface watering requires some attention. We use, to distribute the water, a series of wooden troughs, each sixteen feet long and eight inches square, that can be taken up and moved from point to point. At intervals of three feet along one side, these have two-inch holes that can be closed with zinc slides. At the end of each section of the troughs there is a wooden gate, by means of which the water can be held back as desired. With three troughs we can water a strip fifty feet wide, running down each of the fifteen rows a stream of water about as large as would be supplied by a three-fourths-inch hose, which is about as fast as it can be applied without washing the soil. If one hundred gallons per minute, which is the capacity of a two-and-one-half-inch pipe, is applied, it will require about one and one half hours to water rows three hundred feet in length. This amount of water over an acre would cover it to the depth of an inch, and would amount to 27,000 gallons. With a stream of this size running from a single hydrant, a man can water two acres per day, while the amount of water that can be supplied by the pump is such that, with two hydrants running, two men can easily cover four acres and put on each nearly a thousand barrels of water, which will be sufficient to wet down to the depth of a foot in ordinary soil. We applied this amount of water a week ago to the potatoes. The soil was then cultivated, to retain the moisture, and today the soil seems to be quite moist. Some advise withholding water from potatoes after they blossom, while others grow them without water until that time. We shall have a plot treated in each way, a third watered both before and after blooming, and a fourth plot that will receive no water at any time.

Although not yet complete, an experiment with garden peas shows a marked effect from the use of water. As with the potatoes, a portion were grown without water, while the remainder received two applications.

The irrigated section is drier and lighter land than the unirrigated, so that it is at a disadvantage, but from present appearances we shall have three times the yield of pods that will be gathered from the unirrigated section. This will mean a gain of nearly a ton per acre in the crop of peas, at an expense for applying the water of about two dollars per acre.

One of the hydrants stands in a small piece of timothy, and when not using the water for the garden the water has on three occasions been allowed to run upon the timothy. There the heads stand perhaps three feet high, while upon the portion without water the grass is drying up and the crop will hardly be worth gathering. On one occasion it was allowed to run for an hour or so upon another section, and within a few hours a marked difference in the appearance of the two plots was observable, and the section that has received the water will probably yield threetimes the amount of hay that the one without water will cut. This indicates that one can afford to go to a considerable expense to obtain water for meadow land. If a stream or pond can be tapped at a point above the

level of the land to be irrigated, the water can be carried in a ditch a foot or so in width and depth, which can be excavated at a very small expense. This was the method formerly employed throughout the west, and is still quite generally used in some sections. In some places they have large steam-pumps that are used for pumping water for irrigating purposes, and find that they pay. In some sections they have extensive pipe systems, of iron, wood, or cement, in which they carry the water to their orchards, from long distances. A hydrant is located at the highest point of each tract and they can often distribute the water over ten acres or more. Where they are thus able to irrigate they grow enormous crops on land that, without water, would produce only sage brush and cactus.

Of the various methods of pumping water, where the lift is not more than twenty feet, the centrifugal pumps have many advantages. They can be worked by an ordinary traction engine and will raise from 100 to several thousand gallons per minute, according to the size of the pump and the distance the water is raised. Where there is a greater lift a gasoline engine can be used with an ordinary lifting pump, while the same source for the power may be used with the centrifugal pumps where the lift is not too great. When the water does not have to be raised over forty or fifty feet, it will repay pumping for garden and fruit crops.

Even with irrigation, cultivation should be kept up throughout the growing season, as it will not only reduce the amount of water that will need to be applied, but it will be of advantage to the growth of the crops. In some parts of the west, fair results are obtained with orchards, in sections where the rainfall is not more than twelve inches, and without irrigation, by frequent shallow cultivation. Where neither system of cultivation is used the land is almost a desert, but by working the soil every week with a smoothing harrow they are able to conserve enough of the water to secure good results.

A windmill could be used for areas of an acre or so, if a reservoir of sufficient size is provided to hold 2,000 barrels for each acre. The mill could then be set to work in the spring, whenever there is wind, and could pump into the reservoir where the water could be stored until needed for irrigating purposes.

In California they have greatly reduced the amount required by combining cultivation with irrigation.

I have only taken up a few of the points in the matter, but if information upon any other points is desired, I shall be glad to give it, if in my power.

Mr. Rice: I would ask if caution is not necessary in irrigation, to prevent the baking of the surface in heavy soil. A. Not if you cultivate as soon as the ground is sufficiently dry.

Mr. Rice: In transplanting a large white birch, some years ago, from land where they used the lawn sprinkler a great deal, I found the roots had not gone down more than a foot or two. The whole tree seemed to be spread out on the surface. If you irrigate the orchards largely will not the roots spread out on the surface?

Mr. Taft: He is talking about sprinkling the surface, and I am talking about irrigating and allowing the water to soak into the soil. You can be sure that sprinkling will give surface-rooting plants. You put it

on for a half or three quarters of an hour each day, and the result is the grass is nearly killed with surface wetting. If they would allow it to wet down a foot or two, and then withhold the water until the soil becomes dry, better results would be obtained. When a lawn is watered it should be done thoroughly. Let it soak down—don't sprinkle the land.

The system practiced in California is to irrigate once every month, and when they do, to give enough. I think the rain in general was from three to four inches throughout the state. But we would not have had as good results with two or three small rains.

Dr. Beal: It is likely every enterprising man here is going to irrigate. Many a man will undertake this who does not understand it very well. It occurs to me if some conscientious man could go around, a man who does understand this, and put in two or three sample irrigating plants, it would be a good thing. This subject of irrigation is of the utmost importance to the people of the state of Michigan, to the fruitgrowers and the farmers.

Mr. Morrill: I would like to ask Prof. Taft a question. A great many people who need irrigation have not a lake nor body of water anywhere near them. Can we depend upon water from wells, if we have to pump it sixty or a hundred feet?

Prof. Taft: I think I should want to draw the line at forty or fifty feet. Of course, the deeper it is the more it would cost to pump it. If you have some garden crops and must remain where you are, can not move, be sure you have an ample water supply, before you go to a large expense for an irrigating plant. Many of the irrigating pumps in use today have six-eight and even ten-inch cylinders, and will lift much more water than the ordinary pumps. If one driven well will not furnish an ample supply, several may be driven and connected with the bottom of the cylinder.

Mr. Gunson: I question very much whether crops are worth growing if we have to keep continually watering; it certainly increases the cost. I question whether this irrigation ever becomes practical or remains a question of great state importance. If I or anyone else has a piece of land in Michigan and must depend upon irrigation to raise the necessities of life, we may as well go out of business. If we could get a market for the produce at prices that would compensate us for this extra labor and extra outlay, it is very possible we might be able to use it. If we wish to irrigate, why wouldn't it be better to go into a land that is adapted to it? It seems to me that on sandy lands there is no limit to the water that can be distributed. Possibly on a clay soil you may be able to use the water better. At present this subject of irrigation is not well understood, as Dr. Beal has said, and a great many people would go to work at a considerable expense. By the way, Mr. Morrill said he would plant a thousand acres of cherries if someone would give him a dollar and a half per bushel. I would like to ask him how much it would cost him to grow this thousand acres of cherries, if he had to irrigate. I expect to hear more of it. There was a California land agent in this town a year ago, getting people to go to Redlands, and he was bragging about irrigation. In the fall he was back here again getting up a party to go a little further north, where they didn't have to irrigate. On the first trip he claimed that while the crops were good at the north, the

quality was not as good as where they were irrigated. The second time he claimed that the climate of the north was more healthy than it was in sections where they had to irrigate, being more like our climate in Michigan.

Prof. Taft: I think you can account for those two statements. In Southern California they have found that irrigation is necessary for most crops. There are sections in California where they have malaria. That soil is completely filled with moisture, and you find there swamps in which cat-tails are growing, but it is due to an excessive use of water. As he says, the irrigation has done this, but had the water been used in proper amounts there would have been no trouble.

Mr. Brown: It has been my pleasure to visit this place described. The yield of corn to the acre was simply marvelous. We could walk between rows three feet apart, and there were ears on every stalk. It was just barely a swamp of cornstalks. They knocked against your head and knocked your hat off. The cabbages were simply a sight. I thought before I saw them there could not be such a sight in nature. Perhaps you have seen such in Maule's catalogues. If someone had told me there could be such a thing I should have thought they were "stretching it." This pond where Mr. Bailey gets water is a beautiful sight; about the size of this room and about three feet deep, and he has it so that he can turn it on such places as should be watered.

Mr. Morrill: Since Mr. Rice speaks about irrigating by barrels of water, there are a number who have visited Mr. Stearns, at South Haven, and he has done precisely that thing—brought water in barrels and had two men scoop out the dirt about the trees and empty two barrels of water about each tree and immediately scrape the dry dirt over it; and the difference between these trees and those which were not irrigated in that way was very marked indeed. Mr. Stearns got very large crops of pears as a result. I was at the meeting where he gave that testimony and we conceived that the reason was that he scooped the dirt back and the water soaked in nicely.

Mr. Green: We did that same thing last year; got the water all from the well by windmill, and saved the life of the pear trees, one hundred trees in two days' time.

Mr. Gunson: Please do not understand me that I oppose irrigation, by any means. My reasons for stating my views was simply to bring up some discussion on the other side. I hope it will be a success. I think it will.

Mr. Morrill: Complete, absolutely perfect cultivation is the next best thing to irrigation. The same people who are lacking means for irrigation forget that they can cultivate. It would surprise a man to know how far he can make his tools go.

Mr. Kellogg: Irrigation is a good scheme where you can make it work, but to say that irrigation can be made general or practical in Michigan is out of the question. This is God's country and he has made ample provision for it. As a rule, we only have a few weeks of dry weather. My people sat on the fence and laughed at me last spring, and I am doing the laughing now. The way I did it is simply this: I said to my foreman, "Now, you want to understand it isn't going to rain again in three months. There is water; you want to use it." Then we plowed

- that ten by ten inches. When we first started in we ran the plow down twenty inches. We stored the water up in the ground and held it there. We commenced working the ground before it began to dry up. We set out our plants and immediately ran a weeder over. We go right through the plants, and we have kept that thing up. We have simply kept the water from running away. It is snow water that came there last winter and we don't let it get away. Most of you that cultivate will understand this about next century. People will roll up their ground and let the air circulate through it. I have a cultivator of which I think everything. It cuts the dirt all up and leaves it fine and friable. I don't think we have cultivated those strawberries over fifteen times this spring so far! We have taken the surface ground and put it down cellar, and kept it cool as we could, and yet it will dry right up. Farmers should wake up to the idea that stirring the ground does not make it moist, but it lets the air in and out. Whenever you get air through the cultivated ground it becomes moist earth. With a proper weeder you can run through any crop. If you will do that thing, I think you will dispense with a great deal of irrigation. Give me good, rich soil, where I can manipulate it, and put it down in proper shape, and in Michigan we can get along without irrigation. We must learn to get the ground so it will hold several times the amount of water, and then keep it there.

AMENDMENT TO THE CONSTITUTION.

Prof. Taft gave notice that at the next regular meeting would be presented an amendment to Article IV of the constitution of the Society, relative to the time of holding the annual meeting, and changing that time from the present regulation.

BENEFITS OF A BOTANIC GARDEN TO HORTICULTURE.

BY DR. W. J. BEAL, MICHIGAN AGRICULTURAL COLLEGE.

In a very modest way a beginning was made in 1877, along a shady bank near the brook and not far from the greenhouses.

The garden now under consideration consists of three acres lying on the north bank of the Cedar river and extending to the northeast on both sides of a small brook. This area does not include the arboretum, nor the greenhouses, nor the adjoining lawn and flower beds and plats of shrubbery with their numerous varieties and races. The space of which I now speak consists largely of the higher portion of the river flats, mostly above high-water mark. On the banks are a variety of shrubs and small trees of nature's own planting. The artificial portion of this garden, then, consists mainly of hardy herbs with a few shrubs—1,200 to 1,500 species.

At first considerable pains was taken to make, by means of boulder stones, small pockets a foot or two in diameter for each species, but in

dry times the small plants wilted, while the woody growth, rooting deeper, absorbed the moisture, and thrived. At present, the sloping banks are devoted almost exclusively to the families containing many woody plants, while the herbs have "slid" down to the low flat land, which most of them seem to like very well.

In this new state and in this utilitarian age at the oldest Agricultural college in America, we are still occasionally called on to rise and explain the uses of a botanic garden. I am happy to state, however, that this question has never been asked by people who visited the garden. Inquiries have frequently been made by visitors from the country, the village, and the city; comments without end have been overheard, and with scarcely an exception this "novel sort of garden" awakens their interest at once.

We aim to grow (by no means always successfully) a plat of each species, two to six feet in diameter, large enough to fill the eye, that the botanist, the artist, the florist, may see how he likes it. Where the piece is rather large there is much less danger of losing the whole than where but little is grown. The farmer can compare some of the newer untried sorts of grasses or other forage plants by the side of his old favorites, or he can see behind a label containing the name some weed pest that has lately found its way into his neighborhood. The bee-keeper looks for the plants and their names where honey is gathered in most abundance. The entomologist learns to look for certain insects on the plants of a certain family or species. At a farmers' institute last winter, no topic attracted greater attention than the mention of a family of mints represented by some fifty or more species in our botanic garden. Several present expressed a determination to pay the garden a visit for the purpose of looking for something new and promising for distillation. They hoped we would extend the list by introductions from other countries.

Many kinds of pretty wild plants are not well known by people in general, especially since the woods have been cut away or pastured and the swamps drained and placed under cultivation and frequently burned over. Even along the roadside, in many places, the fences have been removed, and grasses, grains, and potatoes come nearly to the tracks made by the wheels.

In the vicinity of college or high-school, the herbarium fiend ransacks the wild places for choice plants which he removes root and branch in large numbers. Sometimes the roots are removed to supply the eastern market. By these methods the choicer plants are driven further and further over the hills or back into remote swamps and small patches of forest.

A botanic garden of some extent is now becoming almost a necessity for supplying students of school or college with suitable materials for illustration and study. At this college, where the academic year includes the summer months, a garden is especially valuable. Here each student may find suitable plants for the study of fertilization by insects; or a comparison of the tendrils, the runners, rootstocks, a study of various twining plants or almost anything needed for a thesis in botany, or for making notes to present to the botany club or natural history society.

Every little while the amateur or the professional florist has his attention called to the peculiar value of some aquatic vine, shrub, or what he

supposed was nothing but a weed. He adds it to his garden. These benefits of a botanic garden are not yet fully appreciated, though ours is a favorite place for young students from neighboring schools. Until seen in their prime, no one can imagine the different shades of color, the various forms in general outline and in detail, and the endless number of positions assumed by stem, leaf, inflorescence, bud, and flower.

No one learns so much from the garden as the person who selects, arranges, and cares for the plants. He is both student and experimenter, and the more he learns the better it will be for his pupils. At one time he is nearly outwitted by the moles that undermine his favorites of the dry, sandy knoll; at another it is the plant lice on the wild asters or water lilies, the blister beetles coming in great swarms to strip the lupines or coffee trees; or again it is the muskrats which devour the rootstocks of the aquatics, or the striped squirrels which feast on the putty root. June freshets decimate plants not accustomed to long inundations in time of growth. Among such spikenard, ginseng, adder's tongue, burdock, dandelion, catnip, motherwort, wild lettuce, May-weed, mallow, plantain, and many more.

Some fifteen years ago plants of *Marsilia quadrifolia* were introduced into one of the ponds and soon spread all around it and sent forth long stems into the water where it was two feet deep or more. For some few feet near the shore the surface of the water was covered with these beautiful leaves. Then water snails, finding plenty of suitable food, multiplied and the *Marsilia* retreated to the shore in a few spots in the grass awaiting better times. We still grew it well in the mud a few inches above the water. Last winter the thick ice during a long cold two months or more, killed the snails, as well as the fish, and this summer the *Marsilia* has again invaded the water. Wild rice in like manner was kept in check by the snails, but this year it grows in water two feet or more in depth.

When first excavated the ponds were supplied with water through pipes from a slow brook which was mainly fed by marshes. In this we found no trouble in covering the water with *Lemnas* and in growing certain other aquatics, such as *Zygnema*, *Spirogyra*, *Oedogonium*, *Spirochæta*. After a few years a little sewage got into the pipes, and the last four genera disappeared, while *Oscillaria* and *Elodea* came in abundance. For the past three years the ponds have been fed by the overflow of an artesian well, and for the first time we have been able to grow *Myriophyllum* and *Chara* and *Potamogeton*, while *Elodea* is retiring and no *Spirogyra* can be found.

To grow certain plants, the manager is constantly thwarted in his efforts by drouth, excessive rains, cold, sunshine, shade, or by unsuitable soil, and is constantly sent back to marsh, ravine, sand, loam, or clay bank to study well the favorite spot for each species, and with each such effort a few more plants are made to thrive in the garden. In this way we have learned to grow well many ferns, hepaticas, cohosh, violets, some of the mints, sedges, and grasses, while golden seal we grow to perfection, as well as many others. We are still experimenting on Columbo, dwarf thistle, harbinger of spring, some gentians, *Houstonia* and many more.

Perhaps it was fifteen years ago that we received *Solanum tuberosum* from Harvard botanic garden. It is said to be a fresh arrival from Mex-

ico. After a few years, instead of tubers an inch or less in diameter, we grew some three inches long. Maybe for ten years we have been growing *Solanum Jamesii* from Arizona. For the past three years more especially some of the tubers have nearly doubled in size, while the outside has changed from the brown, warty surface to a clear color resembling our smoothest potatoes in general cultivation.

In most cases, by selecting the spot of suitable size, especially favorable for the plants of a family, we are enabled to keep them near each other, but no attempt is made to plant allied families near to each other or to arrange species in an artistic manner. In case of the calla or arum family, the sweet flag, golden-club, wild calla, arrow arum, are grown in the mud in shallow water, and just on the adjacent bank are grown Indian turnip, green dragon, and skunk cabbage. On a small, inaccessible island we grow poison sumach and poison ivy, while on the neighboring bank are six other species of *Rhus* or sumachs. The ferns are on the north side of a moist bank and at the base of it more or less shaded by trees and protected from winds. A large space sunk a foot into the black soil of the creek bottom grows cardinal flowers to perfection, while a mound near by is well covered by a group of harebells. Among the geraniums, a depression is made extending to a soil perpetually wet, and their blossoms find a congenial home. So with the marsh marigold, some of the sedges, a patch of holly grass, and some species of *Glyceria*; and for the health of the family, a depression in the muck grows two sorts of cranberry, several sorts of huckleberry, leather-leaf, a species of *Kalmia*, and Labrador tea; while those needing dryer soil are near at hand.

Near one of the ponds and on a bog about twenty-five by forty feet, we are experimenting. The space is nearly inclosed by arbor vitæ or a temporary artificial screen to prevent any sweep of air and to keep out the sun, while raised on posts ten feet high is a screen of slats to check the force of the sun from above. Here we are growing mosses from the swamp, including other things found in such places. *Calypso borealis* has flowered here for two years in succession. It is too soon to pronounce it a success in every particular.

Some plants, like violets and euphorbias, shoot their seeds in every direction as the pistils ripen, often three to eight feet. On this account we scatter the roots of violets around among the crucifers, and must scatter the euphorbias to prevent hopeless confusion of seedling plants. Rootstocks of arrowhead, *juncus*, burreed, cattail flag, scouring-rush, and others spread so rapidly in the ponds and bogs that they soon become mixed. I am planning to give each species of plant with this habit a small bog to itself where nothing can intrude and where it can hold full sway. In the fall of the year the large terminal buds of *Myriophyllum* and bladderwort sever themselves from the parent plant and sink to the bottom to rise the next spring and drift away from home, starting many new colonies.

In the place where we wished to grow the mints, pulse family, and a few others, the ground was rather too hard. We covered the soil with about six inches of sand, which serves as a mulch and works easily.

All weeds of much size, if any are found, are carried away to the rubbish pile. In this way, after about three years, all those which are

troublesome come from seeds of plants in cultivation. We have a dry sand bank sloping to the south which grows species of *Sedum*, cacti, *Tanacetum*, *Huronense*, *Solidago rigida*, and a few other things, to perfection.

In the older portion of the garden the paths consist of a little gravel and loam with borders of small field stones; in the newer portion the paths consist of well-mown grass.

Like every other gardener, we are still not quite satisfied with any label we ever saw and are continually experimenting.

We are doing pretty well in species of gooseberry and currant, sedge, viburnum, hawthorn, willow, honeysuckle, compositæ, grass and weed. We grow the last two lots in a formal way, each occupying about five or six feet with a narrow grass path between.

By doing much of the spring work the fall previous, such as transplanting, weeding, etc., one man with a little help tends the whole three acres alone, and this without any opportunity to use a horse cultivator.

PROCEEDINGS OF THE AUTUMN MEETING.

HELD AT TRAVERSE CITY, SEPTEMBER 25 AND 26.

Not so large a number of fruitgrowers assembled at the meeting of the State Horticultural Society at this time, as had been expected, especially from the immediate vicinity. Those from abroad compared much more favorably in numbers. It was at the time of the county fair, and assurances had been given that that was the best of times to get Traverse horticulturists together. While the sessions held at the fair ground were lightly attended, those at Library hall, in the evenings, were quite otherwise. On each occasion the hall was full of people, not all being able to get seats the second evening.

While the displays of fruit were made at the fairground, as is usual, those of flowers were removed to the hall, no admission fee being charged persons holding tickets to the fair. The flowers and plants were arranged across one end of the hall and partly down two sides, while in the center was a broad table covered with potted plants from the Northern Michigan asylum for the insane, these having been arranged by Mr. C. L. Whitney, the steward. To the liberal aid thus extended by Supt. Munson of the asylum, the public were much indebted for the success and beauty of the floral show. Large collections of both plants and cut flowers were shown by the Traverse City Floral company and Mr. Frank M. Paine, to whom premiums were awarded by the society. In addition to these was a considerable display of cut flowers from the Agricultural College, taken by Prof. Taft, and some fine contributions were made from the homes of the city.

The show of fruit at the fair was one doing credit to Grand Traverse county, but it of necessity consisted chiefly of apples, though pears were in good supply, with a few peaches and grapes. The apple crop in that vicinity is rather better than elsewhere in the state, which is saying but little for it, because Michigan is nearly without apples this year, especially winter fruit. There were hundreds of plates of apples, embracing nearly or quite all the varieties common to the state, and they were in good condition, the season considered, though the exhibitors were somewhat at fault in nomenclature and had not exercised due care in selection of perfect specimens. No doubt was left in the minds of any, however, of the

justness of the claim of the Grand Traverse country to being a first-class apple region.

Very notable were the exhibits brought from abroad, more particularly that from the experiment station at South Haven. This pleased Judge Ramsdell so that, at one of the evening sessions, he asked the people to give it special attention, saying it had been prepared by Mr. Lyon, "The most capable pomologist in Michigan, one of the most accurate of men in his work." He further said that to see it was worth a journey from any part of the state, and it should be carefully studied by any man contemplating the setting of an orchard.

The first day was given up to examination of the exhibits and arrangement of them, the first session occurring at the hall in the evening. At this time, Mr. C. J. Monroe presiding, the committees were named as follows:

Resolutions.—Messrs. R. M. Kellogg of Ionia, Wm. S. Moffit of Rockford, E. C. Lewis of Cadillac.

Fruits.—Messrs. C. W. Garfield and Robert Graham of Grand Rapids, Smith Hawley of Ludington.

Flowers.—Profs. L. R. Taft and W. J. Beal of Agricultural College, Mrs. A. D. McRae of Traverse City.

At the close of the first session at the fairground, Mr. C. W. Garfield presented the following resolution, amending the constitution of the society, relative to the annual meeting, and it was adopted:

Previous notice having been given at the June meeting of the society, I move an amendment to Article IV of the constitution of the Society, so it shall read as follows: "The annual meeting of the Society, for the election of officers specified in Article II, shall occur upon the first Wednesday of December in each year."

The whole of the session of the second evening was devoted to consideration of the topic, "City and Village Improvements along Horticultural Lines," and Dr. Beal's paper on "Forest Fires." It called out a very large audience, and deep interest was shown by each attendant. Traverse City had just a day or two before become a city in fact, as well as in name, its famous pioneer and well-known citizen, Hon. Perry Hannah, having been chosen its first mayor. He, with the entire board of aldermen, and the boards of education and public works, attended and occupied seats upon the rostrum.

Vice-President Monroe again was in the chair, and each of the persons assigned to divisions of the subject presented his paper. At the close were presented the committee reports which are here subjoined. Previous to presentation of these, at conclusion of his paper upon "Forest Fires," Dr. Beal presented the following resolution, which was unanimously adopted:

Resolved, By the members of the Michigan State Horticultural Society, that we are earnestly favorable to a law similar to the one enacted in 1887, providing for a state forestry commission, and that we hereby pledge ourselves to see that the next legislature carry out our views on that important subject.

RESOLUTIONS.

The records of the Michigan State Pomological Society show that very early in its history a very instructive, enthusiastic, and entertaining meeting was held with the Grand Traverse Agricultural Society. Now again, upon invitation of the same people, we come, with only a little change of name, to accept the hospitality of this beautiful city, and the kind services of our friends in this land of pure air, clear water, and bountiful productions.

We have had a grand time, and desire to express in a brief way our obligation for the pleasing conditions which have rendered this convention a success. Therefore, *Resolved*, That our heartfelt thanks are hereby tendered to the Grand Traverse County Agricultural Society for all the pleasing accompaniments of this meeting, which have aided in making its sessions interesting and valuable; to the florists of the city, who have decorated the hall in such excellent taste with the products of their art; to the authorities of the asylum, who have, in addition to generously contributing to the decorations of the session hall with the beautiful things from their greenhouse, entertained us so pleasantly in showing the attractions of the asylum premises; to the newspapers which have given so generously of their space for our announcements, and have so faithfully reported the doings of the convention; to the Michigan Experiment Station for the ideal exhibit of named fruits placed before us, as a means of educating us all in correct nomenclature and a knowledge of the latest and most promising varieties; and lastly, to the ladies and gentlemen of this new-born city, who have enlivened our sessions by appropriate recitations, music, and other delightfully chosen accompaniments.

WM. S. MOFFITT.

R. M. KELLOGG.

REPORT ON FRUIT EXHIBITS.

Your committee charged with the duty of reviewing such exhibits of fruit as are brought to the notice of the State Horticultural Society, beg leave to submit the following notes that may be of interest:

1. A collection of fruits from Allegan county, gathered by Mr. E. C. Reid, contains, of peaches, Granger and late Crawford; of pears, Angouleme, Sheldon, Seckel, Anjou, Louise, and Kieffer; of apples, King, Fall Pippin, R. I. Greening, Peck's Pleasant, Northern Spy, Golden Russet, Fameuse, and Lowell. All are very fine, large specimens. With this collection was shown a fancy package for delicate fruits, made and used by Mr. C. N. Triviss of Gibson, Allegan county.

2. Mr. Smith Hawley of Ludington, exhibits seven plates of very fine apples, to-wit: Red Canada, Spitzenberg, Golden Russet, Rhode Island Greening, Baldwin, Wagener, and King.

3. The State Agricultural College shows a very instructive display of fruits from the sub-experiment station at South Haven, carefully and distinctly labeled. With this collection we find some varieties gathered by J. G. Ramsdell of South Haven, and some magnificent specimens of the Stark apple from the orchard of Mr. L. H. Bailey of the same place. This whole collection contains eighteen varieties of apple, eight of plum, nine of pear, and forty-eight of peach, a list of which we make, as follows:

APPLES.	PEARS.	PEACHES.	PEACHES.
R. I. Greening, English Sweet, Flower of Genesee, Roxbury Russet, Bunker Hill, Northern Spy, Maiden's Blush, Fall Pippin, Spitzenberg, Golden Russet, Twenty Ounce, Green Sweet, Baldwin, Stark, King, Shiawassee, Wagener, Cabashea.	Winter Nelis, Dr. Reeder, Dana's Hovey, Ogereau, Pound, Seckel. PLUMS. Bavay, Shropshire, Grand Duke, Kingston, Forest Rose, Maquoketa, Wyant, Weaver. GRAPES. Two plates of Black Hamburg.	Stevens' Rareripe, Lovell, Princess of Wales, Mammoth Heath, Jacques Late, Mammoth Coolidge, Lemon Cling, Crothers, Beers' Smock, Williamson, Stump, Hance Smock, Druid Hill, Bequett Free, Brandywine, Gold Drop Seedling, Pickett, Allbright, Switzerland, Late White, Lovett, Wager, Kalamazoo, Hill's Chili No. 3,	Chinese Cling, Bell Favorite, Walker, Corner, Elberta, Ford, Shipley, Late Barnard, Boyle, Geary, Red Cheek, Gem Cling, Scott, Columbia, Palmerston, Prize No. 1, Muir, Crosby, Minot, Brunson, Grant, Kalula, Hill's Chili, Prize No. 2 (Engle).
PEARS.			
Angouleme, Lawrence, Mount Vernon,			

This collection is of great value, as furnishing models for aid in the identification of fruits, and we heartily commend the plan of the state experiment station in making these exhibits in prominent places in the state for the education of fruitgrowers. By means of them many errors may be corrected, and would-be purchasers of trees can be aided in the choice of varieties to plant.

Most of the peaches shown in this collection are too late for this Traverse country, but we would specially commend Kalamazoo and Brunson to supplant Late Crawford, and Engle's two numbers of seedlings from Chili are certainly an improvement upon the parent. Switzerland is rather late, but hardy and very beautiful. Stevens' Rareripe should also do well in this north country.

The Stark apple certainly has many qualities to commend it as a market sort.

The Black Hamburg grapes were grown in the College greenhouses and are very fine clusters of the variety.

4. The committee found a collection of market apples shown by Mr. H. K. Brinkman of Old Mission, and entered for the Society's premium. It contains all the prominent market apples of this vicinity, several pears, and two sorts of peach. The most notable plates are Alexander, Baldwin, Spy, Wagener, King, Twenty Ounce, Fallawater, Chenango, and Shiawassee. We recommend a first premium.

5. The committee was also requested to pass upon the merits of a display of kitchen vegetables by M. Henry Brodhagen of Traverse City. We found a very fine display, covering a wide range of products. We were greatly pleased with the exhibit and recommend the society's first premium.

Our attention was called to the general display of fruit and fruit products at the Grand Traverse fair, and we were struck by the beauty and

solidity of the specimens and the taste of their display. There seemed to be a good many sorts wrongly named, which shows the necessity of just such tuition as our society was organized to give.

CHAS. W. GARFIELD,
R. D. GRAHAM,
SMITH HAWLEY.

REPORT OF COMMITTEE ON PLANTS AND FLOWERS.

Your committee on plants and floral decorations would present the following report:

We find that the public spirit of the florists and flower lovers of Traverse City, and of the superintendent and steward of the Northern asylum, had led to the decoration of the hall in which our evening sessions have been held.

The vases and flowers and smilax upon the president's desk and about the stage have done much to brighten that part of the hall.

In the rear, where the principal display is made, we find a bank of stove and greenhouse plants, and others arranged upon a series of shelves around three sides of the alcove.

The bank of plants in the center, occupying a space ten by sixteen feet, is from the greenhouses of the Northern Asylum for the Insane. They are healthy, well-grown, and present a pleasing appearance. The collection consists of bananas, six varieties of palm, fifteen of begonia, ten of fern, geranium, selaginellas, dracænas, rubber plants, and a variety of others. They also show forty varieties of cut flowers from the greenhouse and gardens, including cannas, gladiolus, zinnias, phlox, carnations, roses, mignonette, tuberoses, dahlia, and swainsonia.

The largest display by a florist was supplied by the Traverse City Floral Co. It was tastefully arranged and was set off with an abundance of well-grown smilax. In the collection were palms, begonias (tuberous), foliage, and flowering), fuchsias, coleus, callas, roses, verbenas, petunias, phlox, zinnias, salpiglossis, geraniums, and carnations, besides a well-arranged pillow of roses, carnations, asparagus, and smilax, with "Traverse City Floral Co." in immortelles. Two crosses of scarlet geraniums and smilax were also exhibited by them.

F. M. Paine of the South Side greenhouses, shelved a collection of clean, well-grown ferns, palms, geraniums, coleus, stocks, fuchsias, rubber plants, azaleas, primroses, genista, grevillea, saxifrage, cypress, dracænas, and Empress candytuft. He also exhibited eight vases of stocks, asters, verbenas, petunias, ageratum, candytuft, geraniums, and penstemons.

In the exhibit, and adding materially to the effect, were fine plants of begonia metallica and velvet-leaf, shown by John Devendorph; a large coleus from Peter Boudreau; a plant of *Sanseceria zealanica*, from W. B. Thacker, and a fine rex begonia shown by W. H. Umlor of Oak Park. We also find pans of verbenas, phlox, pansies, and sweet peas that have been thoughtfully brought in by parties whose names we could not learn.

The State Agricultural College has sent for exhibition vases of roses, allamanda, gladiolus, stephanotis, and ferns.

The society offers premiums for the most complete, well-grown, and tastefully arranged collection of ornamental plants and cut flowers, and we award the first premium of five dollars to the Traverse City Floral Co.; the second premium, three dollars, to Frank M. Paine of the South Side greenhouses. The fine collection from the asylum was not entered in competition and of course was not considered in making the above awards.

L. R. TAFT.

W. J. BEAL.

PAPERS AND DISCUSSIONS.

STREET ORNAMENTATION.

BY DR. W. J. BEAL, MICHIGAN AGRICULTURAL COLLEGE.

To get enjoyment from views on the streets, one must walk on good sidewalks or ride on a well-made street or in a car. In the business portion of a village there is not much opportunity for growing trees successfully, but there are a number of things which go to make a favorable or unfavorable impression on a citizen or a visitor.

The condition of the roadway and sidewalks has been referred to. Neat arrangements for hitching teams attract country people who drive into town. The best device, to my notion, that I have ever seen was in the city of Hudson in Lenawee county. The merchants combined, when the main streets were paved, and put in three-inch gas pipes of uniform heights, for posts, and the same kind of pipe passed horizontally from post to post. In the pipe, rings were occasionally found for tying. This was neat and durable at the start, and remained so for many years.

In most cases the signs of the stores and offices are a monotonous lot, as they are home designs made by a few of the common painters of the village. A real gem of a sign is a rarity in a village.

Modern plate-glass windows of generous size help give to a town an enterprising air. Cleanliness and freedom from all sorts of rubbish are pleasant to contemplate, and are good advertisements.

In a village, usually, little attention is devoted to tasteful arrangements of goods in the stores. Often a mixed variety is allowed to remain in a window for some months, with little attention from the proprietor. Occasionally, some one with taste and enterprise returns from a city and experiments on a few designs in his front window. This sometimes proves to be catching, and the whole town begins to make attempts at improved arrangement of goods.

Before passing up the principal streets, where lots are larger and where the finest houses are located, let us observe some points in the ornamentation of country highways. I will speak of some that are near

where I have lived the past twenty-five years, as they have been subjects for study and observation. About twenty years ago, a double row of American elms, (over a mile in extent,) was ordered to be planted along the entire front of the Agricultural College farm. Those in the street were forty feet apart and ten feet from the fence, while alternating with this the trees were forty feet apart and inside the fence four feet. In all such designs for planting, the idea seems to prevail that long, straight rows of one kind of tree, with distance uniform, must make in time a grand display; but such results are rarely realized—probably never. In the case now under consideration, the ground is far from uniform in fertility. The trees are very uneven in size, some now having a diameter of trunk five times that of others of the same age, not far away. The shapes of the tops differ a good deal. Some trees are near native trees along the road and crowded; others are near trees in the orchard. Occasionally a tree has broken off or has been split down. In several instances, one or more trees died, and others set in their places died also, and this leaves unpleasant breaks in the rows. This season some of the trees were much damaged by two or three kinds of insect, while others were much less molested. In these rows, to use a common expression, we venture too many eggs in one basket. Now, let us pass to the west, over a gently rolling country, on the same road, and see what nature has done and what the orderly old-fashioned pathmaster has done. The native trees and shrubs and perennial herbs in great variety have taken possession of the road on either side, excepting a track of suitable width for the passing of teams. The fences are hidden from sight for much of the distance. Here is a great variety of woody growth, and some views such as an artist would select for his sketching. I noticed within half a mile, five or six kinds of oak, three of poplar, two of elm, two of ash, three sorts of hickory, eight of willow, three of dogwood, several kinds of viburnum, one kind of hazel, a sumach, three kinds of maple, a blue beech, ironwood, basswood, wild plum, wild crab-apple, sassafras, butternut, black walnut, grape vines, Virginia creeper, button-bushes, two sorts of wild rose, raspberries, several sorts of hawthorn, asters, and golden-rod in variety. Here are bunches of second-growth called sprouts, where some trees or shrubs have been cut down—very pretty; here groups of hawthorns, beautiful when in flower, beautiful in autumn when full of fruit; and there are bunches of willows, beyond a bog of sedges, and over the willows are festoons of Virginia creeper now clothed in scarlet and crimson, as are our sumachs and red maples and some of the oaks and dogwoods. The highway is in excellent condition for most of the year, and I know from observation and hearsay that city people and others especially enjoy such roads where they can see nature dressed in her neatest robe. On the knolls certain sorts prevail; in the lowlands others are found, while the wet places have still a different combination.

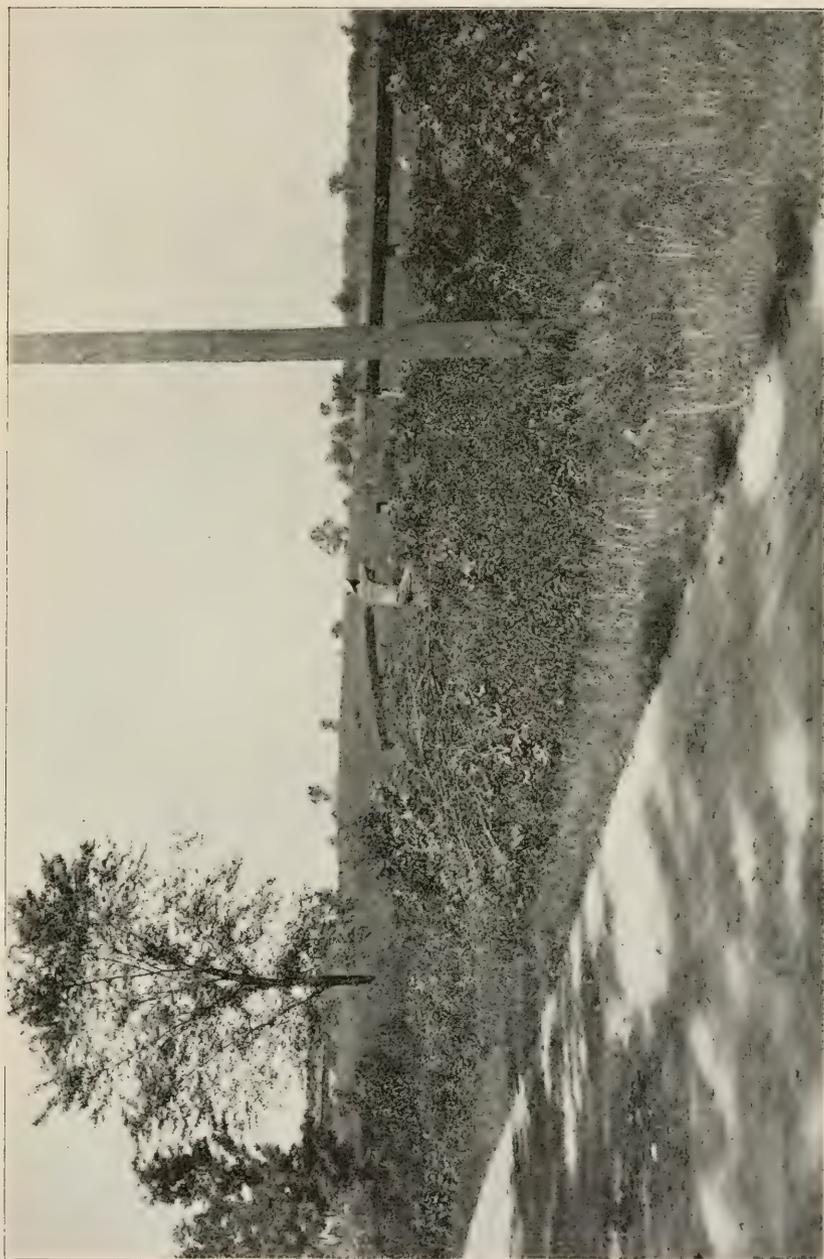
I must say, that, to my way of thinking, there is much more to admire along this highway of half a mile, where nature has made her mixed planting, than there is along the highway where stand the double rows of American elms. But, a few of those present will say that this is not new; that I told much of the same story last winter or the year before at a meeting of this society. I repeat it here for its especial application to village planting. I would plant or leave, if already there, some haw-

thorns, dogwoods, Virginia creepers, grape vines, and a mixed lot of native trees and shrubs. Of course, they should not remain so thickly as in the highway referred to, but choice selections could be placed or left in certain suitable spots. To a considerable extent, the same general rule would apply to planting of roadsides in the country and streets in the village. But no! The owner must do as others have done, cut away all of these things, seed to grass, and plant maples thirty feet apart, just one foot or ten feet from the fence. Along the road above referred to, I recently sold an acre apiece to two Germans, and made the request, which they seemed to assent to, that I might suggest some of the wild shrubbery that should be left. They built houses and began improvements (?) by cutting out all wild shrubs and trees, leaving only a few trees which they trimmed up from the ground. Still further west, on the road under consideration, a pathmaster has several times cut all of the young trees and shrubbery, excepting a few nearly in line by the fence. He even cut down some of the largest and finest trees, a foot or more in diameter, because they were not near enough to the line to suit him.

In planting trees for streets, I should first seek a variety, of which Michigan has sixty or seventy good native species, taking care to place each in soil suited for its best development. Once in a while some stubborn man will persist in his straight row of sugar maples; all right; by so doing the streets will become an object lesson, as they should. It is well enough to plant trees thickly along the street, but the trouble comes when half or two thirds of them should be removed to give the others room to make fine specimens. Not one man in a thousand has the foresight and the nerve to take out some of the pretty young trees before all become crowded, slim, and unsightly. Then it is usually too late, and all are left to themselves.

I have said nothing about the care of trees and shrubs on the street.

[Accompanying this paper, were exhibited seven photographs illustrating the points discussed, four of which are here reproduced by engravings.]



ROADSIDE IMPROVEMENT (?) BY CUTTING AWAY THE TREES.

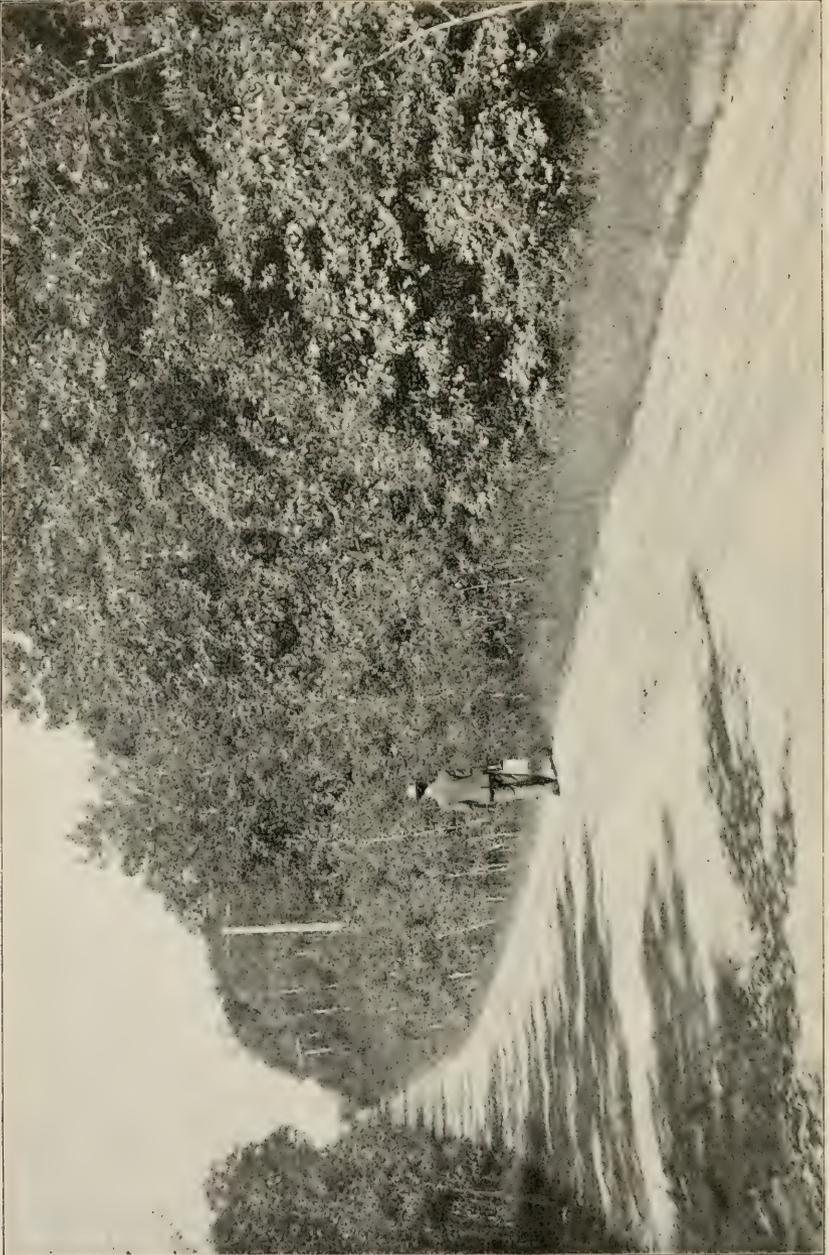


ROADSIDE LEFT TO NATURE.



A WELL-GRADED ROAD WITH TREES AND SHRUBS ON EITHER SIDE.

Reserve Photo



NO STRAIGHT ROWS OF TREES HERE.

TREATMENT OF PARK AREAS.

BY DR. W. J. BEAL, MICHIGAN AGRICULTURAL COLLEGE.

In many cases a park costs more than it ought to, or, in other words, if different plans had been adopted, from those usually made, the park could be made less expensive, and afford just as much pleasure and satisfaction. In making plans the eye should be kept on the expense of executing them. Too often some florist or nurseryman manages the park in his own interest. He makes plans or gets plans adopted in such a way that carrying them out gives him a job. There is no objection to this, certainly, provided everything is done for the best interests of the people of the village.

One nurseryman, within my knowledge, had a quantity of balsam firs, arbor vitæ, and other stock which were overgrown. The trees had been sheared so as to grow very narrow and tall. The plan adopted was to sell the trees by the height, so much per foot, and the refuse balsam firs went in to ornament the park.

At one time, one of the officers of a cemetery said to me something like this: "There are three of us on the board in charge of the cemetery. We are business men and know little of the best and most economical methods of managing a cemetery. There is a move on foot to have a lot of bedding plants placed in the cemetery. What do you think about it?" By the way, the sentiment was very likely worked up by the man who had the stock of bedding plants. I replied, "It may be well enough to do something of this kind, but it is expensive. Your plants, if well selected, well planted, and well cared for, will make a fine display for about three months of the year, and during the rest of the time there will be bare, unsightly spots; besides, at the close of each year you have nothing left by way of permanent improvements to show for your labor and expenditure of money. It would be better to give more attention to shrubbery, because it is cheaper, and agreeable the year round, and shrubbery improves for a long time after planting. Suppose you divide the work, putting in some hardy flowering shrubs and a few bedding plants. While I have my views on this subject, as I am no longer professor of landscape gardening, I think you would do well to consult Professor Taft, who, no doubt, would give you advice after visiting the grounds, without expense." I did not follow the matter any further, but I saw later that the bedding plants went in.

Judging by the appearance of things, I presume Belle Isle park in the Detroit river is managed in a similar manner. There is an expensive series of canals, and costly bridges, and a lot of geraniums, cannas, coleus, echeverias, and the like to look at. Nice roads have been built, and this part is all right. The native trees and shrubs and perennial herbs are the most interesting things to be seen, but thickets were taken out and the woody area is being improved too much to suit me. How the city people can become so enthusiastic over Belle Isle park I was unable to see.

Every village, before it becomes a city, with land occupied and enormously high in price, should secure liberal areas for parks, and fortunately most of them do this very thing.

As a rule, all the knolls and undulations should be left as they are found, only smoothing down the little irregularities which are the size of a wheelbarrow and smaller. And here I can do no better than to refer you to A. J. Dowing, that genial and eloquent instructor on landscape art, concerning "The Beautiful in Group." He said:

"Many have never thought of looking for beauty in the mere surface of the earth. There is a great and enduring interest, to a refined and artistic eye, in the mere surface of the ground. We believe artists and men of taste have agreed that all forms of acknowledged beauty are composed of curved lines. The most beautiful shape in ground is that where one undulation melts gradually and insensibly into another; and every landscape gardener well knows that no grassy surface is so captivating to the eye as one where these gentle swells and undulations rise and melt away gradually into another. A plot or level surface is considered beautiful by many persons, though it has no beauty in itself. We see all ignorant persons who set about embellishing their pleasure-grounds, or even the site for a home, immediately commence levelling the surface. This is a fearful fallacy, however; fearful, oftentimes, to both the eye and the purse. We have often seen in this country a finely varied outline of ground utterly spoiled by being graded."

If the right man could be selected, money would be saved in the long run by employing him to lay out and plant the park. Around the straight sides of a park we can do no better than plant in rows; but, further than this, geometrical figures should usually be avoided.

Most of the paths or drives across the park should be made in curves more or less pronounced, according to the lay of the land, size and shape of the park. I should never wriggle a path nor drive about just for the sake of wriggling, as I have sometimes seen.

No, I should not think it imperative, the first thing, to remove every native tree and shrub or old apple tree, because it did not stand just where I thought it ought to stand; on the contrary, I should strive to adapt my plans so as to preserve the best of these old woody plants. Neither should I take off all the lower limbs of the evergreens, to a height of five feet; nor should I shave the tops of the Norway spruces.

Grade the land as I have suggested, plant almost at random, in preference to straight lines, a great variety of trees and shrubs adapted to the soil and elevation of the park; have some spaces of considerable size free from trees, shrubs, or bedding plants, and here strive to have a good lawn. Grass, as well kept lawns, and trees are the best of nature's ornaments.

A fountain may be desired by many, but it is expensive, requires much care to keep it in order, and may not prove to be a success.

Not every one can make a good plan for a park; and even those who think they can, may greatly overestimate their own ability in this direction.

Other things being equal, the man who has had the longest training and most extended experience; he who has had a good course in horticult-

ure, botany, landscape gardening, architecture, and civil engineering will be the best man to select.

A few excellent examples of well-planned and well-managed parks in the villages of this state would be of priceless value to her citizens, of far greater worth than lectures or contributions to journals of agriculture.

I cannot close this paper without relating a little incident which should interest all members of this society. Some one, long a member of this society,—not a lay member, but an earnest worker—by some good management induced the board of state auditors to employ O. C. Simons of Chicago to visit the grounds of the state capitol and prepare designs for their improvement. The improvements were not prepared in time for execution in the year of their preparation. The work was delayed for some reason. I have studied the plans carefully, and believe them to be excellent. The planting of shrubbery is the main feature, chiefly along the borders of the square and in a few other places, with a few choice trees here and there, preserving the open areas as now for a beautiful lawn. Our excellent Governor Rich, not knowing himself just what was the best thing to do, feared that Mr. Simons might not know what he was about, and so told me frankly that he “sat down on it”—in other words, he vetoed the execution of this excellent plan. I hope the members interested in the subject will make themselves familiar with this design, and, if approved, unite with each other to help secure its execution.

Many citizens visit the capital at one time or another; and, if carried out, this design of Mr. Simons would do more than any other one thing to cultivate a correct taste for the improvement of public squares and village parks.

USE OF FLOWERS.

BY EDWY C. REID OF ALLEGAN.

A man may engage in the culture of flowers for sake of dollars, and yet be reckoned a man of business, and therefore one of shrewdness and common-sense, for everybody has respect for all who are grubbing for money, without much care for the means employed to gain it. But the man who grows flowers simply for the delight of it, for their beauty, fragrance, cheerfulness, and refining influences—risks being set down by his neighbors as a dilettant and a weakling. He may spend his leisure time on the dry-goods boxes discussing politics, and perhaps be sent to congress; or he may talk “hoss” and worry to death a ten-minute beast by trying to make him go in two, and be reckoned a practical man of business and a friend and promoter of noble sport. But let him spend a few minutes each day among the posies, he is regarded as having a soft spot in his head, and there is a feeling that a meek and gentle woman was somehow unsexed by the mysterious forces of creation.

But for this curious state of affairs, I believe, very many more men would give attention to amateur floriculture. They do not dare do it,

and therefore are themselves lacking in the virility of which they deem the flower-lover destitute.

Yet, I think, men generally like flowers, though in an indefinite sort of way. They may not be able to tell which is a daisy and which a holly-hock, yet like to see them about the premises if only someone else will do the puttering work, as they view it, of caring for them.

I shall address myself solely to men in this paper, for I much desire to see a reform in this regard; for men really have more time than have their wives, which may be devoted to care of their premises. I ardently wish that every householder in Traverse City could be induced to begin next spring, and devote a few minutes each morning and after supper, one or both, to the floral adornment of his front yard and back garden. There is more satisfaction in it than in grumbling because breakfast is not ready, and more health than in any other way he can pass the hours of twilight. The wife has enough to do within doors, both of practical household duties and in making that part of the home comfortable and pretty. If she can also find time, and has the inclination, to help in the out-door work, very well. It will do her both physical and mental good, and you can find no better help. But when a man takes upon himself the maintenance of a home, it is as much his duty to make its outside pleasant as it is to make himself pleasant when inside of it.

I regret to say that most dwelling places of men are scars, more or less hideous, upon the face of the earth. Poor, insulted nature strives constantly to repair the defacement, but her struggles are mainly in vain. This is no less true of the country than of the village home.

Now, gentlemen of Traverse City, perhaps you think you have no taste for, nor interest in, such things; but in this I am sure most of you are quite mistaken. If you but make a beginning, you will be surprised to find that you really have taste and liking for such work, but have resolutely suppressed it. What I desire is that you give it a chance for development.

I presume that others will tell of the use of flowers in parks. I know but little of that, and so I would better have nothing to say. I can not refrain, however, from remarking that much of the floral adornment of parks and public grounds is coarse and shocking, producing much the same effect as we get from "Hundred doses for a dollar" in ten-foot yellow letters upon barns, roofs, and walls.

Not every man in town and country can have a lawn which will look well all summer, for lawns must have much water; but every man may have shrubs and flowers. Have the lawn, by all means, and do the best you can with it, but have the flowers anyhow. They do not require much time. To presume that they do is a great mistake. I am often asked, by friends to whom with pleasure I am showing my garden of flowers and vegetables, "Where do you get the time? It must take lots of it." But it does not. If it did, though, I would still have the flowers. And sometimes they assure me, "You ought to have been a woman!" and I am left in doubt as to whether they mean it in compliment.

If you know enough to use a spade, a hoe, and a rake, you can have flowers the season through, and make your grounds, even if but a single village lot, a spot of beauty instead of a sight of offense to the passer by,

a place of peaceful enjoyment to yourself, a place of rest and comfort to your wife, a center of fond memories to your children.

Do not be afraid of failure. You will fail sometimes, but your very failures may become a source of amusement afterward.

I shall not undertake to give minute directions for cultivation. Any good seedsman's catalogue will give you enough of these for a beginning, and the rest you must mainly learn by experience, even though I should try to instruct you.

But where should you plant the flowers? Anywhere rather than nowhere. In the back yard, if there is really no room in front. If your lot is small, place them in a border next the side fence, or along the house, or even in rows beside the vegetables.

If you adopt the side of the lot for your border, get your neighbor to agree to removal of the line fence, if you can, even if you have to agree to cultivate his border as well. If this can not be done, try to hide the unpleasant object with climbing plants or the taller of the flowers, which should always, for this reason in part, be placed back of the others.

Some kinds of flowers may be found which will flourish anywhere. But better not anywhere in the lawn, unless the latter is of considerable extent. In the ordinary lot there is no better place than in a border on one side or both. In such case, establish some perennials. They will come up each spring without trouble to you. Include a few shrubs, like lilac, snowball, mock-orange, etc., but place them some distance apart, so other kinds may have room between; or, place such shrubs in odd corners about the house or elsewhere. By all means, have a few hardy roses. If you can have but two, you can not do better than to set *Madame Plantier* and *Jacqueminot*. Either is as hardy as an oak. In the border may be pæonies, the large white and purple *fleur-de-lis*, some of the lilies, and be sure to have some of the perennial phloxes. Among these set the spring-flowering bulbs, to be succeeded by annuals like asters, pansies, poppies, nasturtiums, sweet-williams, petunias, *mignonette*, a clump or two of hollyhocks, some gladioli, the pinks (the best of which are the *Marguerite carnations*), and some sweet peas, though the latter will do better on a wire trellis by themselves. There is a long list of flowers adapted to such a border. Many will come up each year, being self-sown. Others will require starting in boxes in the house, if you can not buy the plants.

A few cents will buy a large number of packets of seeds, while you can get roots and slips of many sorts from neighbors. Such a border, three or four feet wide and as long as you choose to make it, will afford a supply of flowers the whole season through.

Do not be afraid to pluck the blossoms. Gather a bunch every morning to adorn the breakfast table. Let the children carry them to school. Give them to your neighbors. Flowers encourage generosity, for, as to most of them, the more you gather the more they bloom. There are a score more, both of annuals and perennials, which I have not mentioned, most of them obtainable for very little money. The costliest are not always the prettiest, while the oldest and plainest are not to be despised. More or less of them will grow in any soil that is rich enough. As a rule, the soil can not be made too rich, though, as if to suit all possible conditions, some flourish best in the very poorest of earth.

Such a border is easily watered with a sprinkling-pot, if you are not fortunate enough to have hose and water works, while the waste water from the kitchen is to the flowers both meat and drink.

With larger grounds may come beds of geraniums, coleus, cannas, and the other large plants, though a few geraniums would be at home in our border; but a lawn must be quite extensive before these will be admissible at or near its center.

But I am not concerning myself with such conditions. I am urging the beginnings of such things. I am pleading with the average man, and I want him to put sunflowers about his premises, as a beginning, if he can have nothing better. Sunflowers are infinitely better than burdocks and heaps of old boots and despoiled tomato cans.

Of the moral and esthetic influences of flowers I shall leave my friend Garfield to speak, for he can tell of them so eloquently. I urge the cultivation of flowers for sake of their loveliness and the limitless measure of satisfaction they will give the cultivator, his family, his friends, and the public.

If at first you can only train a morning-glory up some strings tacked to the house, or break the ground next the fence and let some marigolds grow there, do at least these things. You will be so pleased with your success and its results that the next season you will undertake more. As years pass, the spring will not come soon enough, the morning dawn early enough, nor the soothing twilight last long enough, to gratify your pure and elevating and holy liking for your flowers and their companionship.

This, I must sorrowfully admit, can not be the happy lot of every man; for a few men there are whose natures are too obtuse for such refined pleasures. But they are as rare as are those unfortunates who have no music in their souls, and like these they are not fit for noble deeds nor for the unreserved confidence of their fellows.

FOREST FIRES.

BY DR. W. J. BEAL, MICHIGAN AGRICULTURAL COLLEGE.

I presume there is not a topic to be discussed at this meeting in which the people of this locality take less interest than the one concerning forest fires, and it requires some courage to make such a selection, especially here in the woods so recently inhabited by Indians, where the great problem has been how best to get rid of trees, and if possible in the meantime to get a little something for a portion of the best. But times are changing; I notice it even here at one of the remote corners of the state. I wish to tell you that southern Michigan is importing a good deal of whitewood and pine from the southern states. At the house I live in, at the Agricultural College, there has just been put down a floor to a porch, made of southern pine. What is the matter up here? Why do you not send in some of your surplus Norway pine or oak, and thus keep down competition?

Let me read from a letter written by F. E. Skeels of Grand Rapids, who has been recently examining the lands of the Agricultural College in Wexford county, less than a hundred miles from this place. He says:

"I send my report of Wexford county, some portions of which are very hilly. These hills make lumbering expensive. The present system of clearing the land is the worst that could possibly be followed. Usually the bark-peelers come first. The hemlock is cut from June 1 to September 1; the logs are peeled, cut, and skidded in the fall, and hauled away when snow comes. Often the logs are left in the tree, to be dug out of the snow when cut. The brush is never piled except when in the way of the 'bark toads' which collect the small piles of bark and haul out to truck-roads. If cut at all, the hard wood is taken in the winter, and now only the cream is taken. There are thousands of cords of wood going to waste on almost every clearing. The poorer trees are never cut. When the land is left in this way, one might as well say good-bye to the surrounding timber or to the village surrounded by such clearings. Yet this is just the condition in which the speculators are leaving the land every month in this locality. These 'clearings' form one of the most desolate pictures the eye can rest upon. The dry hemlock tops need but the faintest spark from the pipe of the careless fisherman or laborer, or passing engine, to become a glowing furnace, to be directed by the wind as far as there is anything dry enough to burn. These fires seem to be confined to the vicinity of villages and railroads, and no new territory has been burned over in Wexford and Manistee counties.

"The matter of trespass is one which has heretofore done more damage than fire. The stumps are all that are now left as evidence of the pine cut twenty or more years ago by trespassers. Recent trespassing is confined to isolated trees. Last year and two years ago much stealing was done in Wexford county, but prompt detection and settlement has apparently stopped it. Mill-owners are at fault in this work, and often encourage the cutting."

Last winter, Hon. A. T. Linderman introduced a bill in the legislature, in which provisions were made to care for state lands. It failed to pass, for some reasons unknown to me, but apparently the strongest objections came from men who wished to be let alone in their present wasteful management of the lumbering industry. Michigan has some good laws on the subject of forest fires, but in many places they are not enforced. The state needs a Parkhurst or a Roosevelt to set people to thinking and acting on the subject of forest fires. Our state needs one or more active men working with the advice of a commission, to keep moving on this subject. It would save to the state many times its cost. Information concerning various branches of forestry, should be freely disseminated among the people—not information of a trashy or sentimental or impracticable nature, but information of practical value. In timber, in lumber, in young living trees, in fertility of the soil, in buildings, fences, and farm crops, to say nothing of human lives, the state is devastated almost every year to the extent of many thousands, and perhaps millions, of dollars. To some extent, at least, experiments in other states and countries have demonstrated that much of this loss can be prevented. Long ago Europe passed through the period through which our state is now passing. Maine, New Hampshire, Massachusetts, Connecticut, New York,

New Jersey, Pennsylvania, North Carolina, Wisconsin, and Minnesota are apparently accomplishing more than we are in forest reform.

Our forests are still considered in many places in the nature of mines, to be worked till exhausted, instead of a crop which should be perpetual, at least on some portions of the roughest and least valuable of our lands. In Europe they plant seeds and grow timber. It may be too soon to talk of that here, but we can and should move at once, before it is too late, and save considerable young timber from destruction. This has already a fine start of five to thirty years, and with care would soon be valuable. Posterity should not be expected to look entirely after this matter. We should give our descendants a start. It may not pay us very good interest, but the state at least can afford to wait, and wait long, provided the land increase in value.

It looks to reason that notwithstanding the increased use of iron and steel and stone, that lumber should increase in value as the country grows older. The main point I wish to make now is this: Strive to save the young groves of timber for the future instead of allowing them to be destroyed by fires fed by tree tops and other refuse left by the careless or reckless lumberman. If it will not pay a man to look out for the young saplings and seedlings, much can be saved by purposely firing the rubbish as soon as it can be burned, before the weather becomes so very dry. In this simple and inexpensive way a considerable portion of inflammable material is removed, and much less damage is likely to accrue in a dry time. Strips in certain places can be kept, like clean roads, by back-firing at the right times of year. This will help prevent the spread of fire.

Everyone knows the advantages of our railroads, and he knows also, by views from the car window, that the engine sends forth sparks to spread fire in a most reckless manner up and down the roadside. If these roads can not be controlled, more attention should be given to back-firing along the line of the road, before the weather becomes very dry. It seems to me none too soon to advocate more attention to enforcing a rule for clearing up the tree-tops and other debris by the men who take away the logs and tanbark.

Years ago, the fruitgrowers of Benton Harbor and St. Joseph did not believe it was of any use to remove peach trees affected by yellows. They wanted to be let alone, and they had their own way, and we know the result. The growers in Allegan and Van Buren counties showed more enterprise. The fruitgrowers removed and destroyed diseased trees at considerable cost, and, almost to their surprise, saved the peach industry. This was a good lesson for others in various portions of our state. And now these enterprising men are willing to go a few steps further and enforce certain laws regarding the destruction of insect enemies and parasitic fungi, and this time Benton Harbor and St. Joseph and vicinity are not to be outdone in any such enterprise.

Here are good lessons that may apply to forestry. If a man can be compelled to remove diseased peach trees, and to spray his apple trees to protect his neighbors, why should not a lumberman as well be compelled to clean up or burn his rubbish in such a manner as not to endanger property and life in the surrounding country?

As before intimated, the state needs interested and patriotic men to keep firing away at this important subject, until a reform is well under

way. Articles for the press, posting notices, bulletins containing valuable instruction, discussions at such gatherings as the present one, the passage of resolutions, attempts to find and punish offenders, whether they be poor men or rich railway corporations, are all needed. We have some good laws now pertaining to this subject, but they are in much the condition that Tammany or New York would like the liquor laws—well enough to have on the books, but better not to be enforced.

From *Garden and Forest*, page 369, 1895, I take the following, to show that a few at least are taking some interest in this live subject of forest fires and their prevention so far as is practicable:

“At the meeting of the American Forestry Association, held September, 1895, Hon. G. F. Talbot of Maine argued that all worthless lands forfeited by tax sales be permanently held by the state and devoted to the purpose of the production of trees, to which end they are admirably adapted. He spoke of the fire laws of Maine, and stated that the adverse interests of forest owners was the great obstacle to any reform in controlling forest fires. Under a sharp competition the land is stripped of everything salable, and the refuse left where it happens to fall, and this ultimately becomes, through its inflammability, a menace to all neighboring property. Joseph B. Walker of New Hampshire said large areas are owned by individuals whose sole object is to make the most money in the shortest period, and who have no interest in obtaining a future crop of trees. Everything is cut which can be sold either for lumber or matches. Vast sections are denuded, one after the other, and fires in the ‘slashings’ sweep the ground clean after the lumbermen have left. Fire wardens are now appointed to look after fires. The farmers are beginning to appreciate the necessity of the forests. Secretary Morton, president of the association, called attention to the necessity of state legislation to compel the proper care of waste from timber cutting, in order to prevent forest fires.”

THE FUTURE OF FRUIT TRANSPORTATION IN MICHIGAN.

BY HON. R. D. GRAHAM OF GRAND RAPIDS.

The question of fruit transportation is one in which not only fruit-growers are interested, but which, from its vital bearing on one of the chief industries of the state, makes it a matter of concern to all who desire the prosperity and well-being of our people. That Michigan as a fruitgrowing state stands second to none in her natural advantages is becoming more and more apparent as the years go by and the country is developed.

Only a few years ago we heard of the fruit belt as a narrow strip of land in the vicinity of South Haven and St. Joseph, and it was generally supposed that the so-called belt comprised about all the peach land in the state. Now, however, the peach belt means practically all of western Michigan, from the fruitful county of Berrien to historic Old Mission, including the various islands of the defunct county of Manitou, and

extending eastward from twenty to sixty miles; and the adaptability of our soil and climate for the production of fruit in all this vast territory is not a matter of theory, but is being demonstrated every year by the thrifty and progressive farmers in every county and nearly every township in the region named, who have planted and are now planting extensive orchards and vineyards, many of which are yielding bountiful crops of fine fruit.

With the knowledge of these facts, the question presents itself with a good deal of force, what shall we do with all this great amount of perishable fruit—where is it wanted at a profitable price, and how shall we get it there? A few years ago the answer would have been, Chicago by boat; but this is a thing of the past. Chicago can do nearly everything, but she can not consume one tenth part of our fruit. We must seek a more direct market, and in so doing we get beyond the reach of water transportation. There may be, and I am of the opinion that there is, a difference in the keeping qualities of our fruits and the fruits of California, a difference in favor of the latter; but, so far as I have observed, its keeping qualities is all there is to recommend it, as it is usually dry and tasteless, while the Michigan fruit is of the finest flavor and full of juice, and for that very reason does not “hold up” as well. So, what we lack in one respect is more than made up in the other. On the other hand, the California fruit is picked and packed with greater care than ours, and the whole process conducted in a more business-like manner, and I believe our growers and dealers could with profit take lessons from our western brothers in this matter.

At the same time, there is a very large proportion of our fruit (and I speak now more particularly of peaches), that is not what could be called fancy, but just good, common stock, which it would not pay to put up in fancy packages, and I think perhaps this is also true of apples, pears, and plums. This class of fruit must be put in the hands of the consumers with as little expense as possible, be they near or distant, and I believe the demand is increasing for larger packages; for, as fruit becomes more plentiful, the demand increases—every family uses more of it, consequently buys in large quantities. As to the package, a bushel basket costs very little if any more than one half its size, while the same quantity of fruit can be handled much cheaper and easier in bushels than in smaller packages.

Now, as to the means of transportation, where very large quantities of fruit are marketed. As is now and will be to a much greater extent the case in nearly all towns in western Michigan, it is a question not of barrels, bushels, or baskets, but of carloads; and this I believe to be the future method of fruit transportation. The refrigerator car, built with an icing capacity of four or five tons, when properly packed, will, in any ordinary weather, carry our most tender and perishable fruit in good condition for from three to five days without re-icing. Of course, where fruit is shipped south in very warm weather, it is often necessary to refill the ice chests. I believe the fruit should be placed in the car in open packages, so far as possible, using a shelved car, which insures a free and perfect circulation of cold air over every package. Our Michigan fruit, properly picked and packed in this manner, can be placed upon any market in the United States east of the Rocky mountains, in good condition,

providing the railway companies will give them the same time given to the express and passenger business, and I believe there is a marked improvement this year in the shipping facilities offered by the various roads. Fruit carrying is to them a matter of large importance, and it will be strange indeed if some substantial improvement is not made in the construction of cars and other means of carrying, in the near future, as the growing of fruit in Michigan is in its infancy, and that which is of special interest to either individual or corporation is usually looked after with special care.

However, we need never look for improved methods in transportation for any product until there is a sufficient supply to warrant the extra outlay, for it costs money to run fast through-freight trains. Just so, we can never expect to have a good outside demand for our products, over and above a very limited amount, until we have a supply equal to any demand. In other words, buyers will go where there is an adequate supply.

MEETING OF THE INDIANA STATE SOCIETY.

BY HON. CHARLES W. GARFIELD OF GRAND RAPIDS.

For some years the Michigan State Horticultural Society has had a standing, urgent invitation to send a delegation to a convention of the Indiana Horticultural Society. Inasmuch as Secretary Ragan of Indiana has on two occasions consented to come to our meetings, and has contributed valuable papers for our transactions, and as the summer meeting of 1895 was to convene within six miles of the Michigan line, we could hardly do less than be represented there. Hon. C. J. Monroe of South Haven was chosen as the official delegate, but his inability to attend led to the selection of Mr. R. M. Kellogg of Ionia and myself to be present and represent Michigan horticulture.

We were warmly received by President Hobbs and Secretary Wm. H. Ragan, and were greatly honored in many ways. The local society at South Bend provided for our entertainment, and carriages were in waiting to show us the city and the two great schools of St. Mary and Notre Dame. We were astonished at the dimensions of the great wagon, carriage, and agricultural implement industries, and agreeably surprised to find so many beautiful homes and such fine examples of ornamental gardening. The grounds at Notre Dame were especially attractive, and contained some rare trees and shrubs, and gorgeous beds of flowers.

The members of the state society were the guests of the local society, and leading citizens of South Bend had joined with the state society in offering quite liberal premiums for exhibits of fruits, flowers, and vegetables. The hall for the meeting belonged to a German society and was admirably adapted to a gathering of this kind. A side room was conveniently located for the exhibit, and the sessions for the second day were held in a lovely grove which was an accompaniment of the building. There were no evening sessions, and I quite liked this plan, for it gave us

a fine opportunity to visit and become acquainted with each other. The last day an elaborate lunch was prepared at the hall by the ladies, and furnished occasion for a good deal of pleasantry.

The Michigan delegates were associated with Prof. Jarvis Troop of Purdue University as a committee to make the awards. I was delighted with the completeness of the arrangements for the committee work. The secretray furnished the committee with an efficient clerk, Mr. Ernest Welch, who knew just what to do to expedite our work. With his list of entries and his knowledge of the position of each exhibit, we were enabled to make all the awards in twenty or more classes in less than an hour. I mention this matter because it is quite customary for all our state societies to utilize the visiting delegates for work of this character, and to have the details well looked after takes the drudgery all out of the labor and does not draw too largely upon the time of the visiting friends.

There were some varieties of apple shown, not common with us; and others, that we consider of little value, were quite prominent in the competitive exhibits. The Golden Sweet was used in nearly all the collections and was even on the list of entries for "the best single plate of apples." The first and second awards in this class went to Chenango and Hubbardston. The committee was quite amused to learn, after deciding with unanimity upon the best basket of potatoes, that upon turning out the tubers small and inferior ones were found hidden in the bottom of the basket, and the report had to be amended.

A very fine display of cut flowers ornamented the hall, and the general exhibit of vegetables covered a wide range of varieties.

There were no long papers nor tiresome speeches, and the discussions were prompt and entertaining. One of the most entertaining papers, to me, was contributed by a very elderly gentleman, J. W. Swaim of South Bend, on "Our Wild Flowers." It showed a keen observation among our beautiful wildlings, and a zest connected with hunting them in their native haunts that was refreshing.

An unique address was given at just the close of the convention by Isham Sedgwick of Richmond, who is engaged in growing coffee in Central America. The capital descriptions of the habits of the coffee tree, the character of the fruit, and the details of the manufacture of the seeds into merchantable coffee, were all wonderfully instructive and delightfully entertaining.

Mr. Kellogg, my associate, read a very attractive paper on "Improved Management of Small Fruit," which brought about him many querists at the close of the session who were loth to let him go. His address was replete with valuable instruction concerning the conservation of the vitality of plants by restricting the exhaustive process of shedding pollen and forming seeds. He urged upon the audience the importance of thorough and continued cultivation, as a method of circumventing drouth, and emphasized the importance of shallow culture to produce and maintain an earth mulch which would prevent a waste by evaporation of the soil moisture.

Mr. J. C. Grossman of Wolcottville gave figures to show the income from an acre of strawberries which were very alluring. We who listened did not for a moment doubt his facts, but recalled some other acres of

strawberries, just as carefully managed, which, because of circumstances over which the grower had no control, were unprofitable. It is well to have before us the possibilities, but not to bank upon them too implicitly.

The local attendance was very light, and I have often wondered if societies pay enough attention to the immediate needs of the community in which meetings are held. In every town there are matters touching a large part of the community, which are distinctively horticultural in their character. If these were discussed and the fact of their consideration by the meeting well advertised, it seems as if the local attendance upon all such meetings might be greatly augmented.

The meeting was a treat to us, and the Michigan delegates were made honorary members of the society. We extended to the Indiana society a cordial invitation to have a delegation at our annual meeting in Adrian, and returned to our homes quite satisfied with the trip and greatly pleased with the generous treatment we had received from the Indiana people.

REVIVAL OF APPLE CULTURE IN MICHIGAN.

BY MR. SMITH HAWLEY OF LUDINGTON.

The apple as a money crop has never received the attention from the average farmer and fruitgrower that it deserves. The orchard is too often neglected. Men will plant orchards, cultivate them well for a few years, till they begin to bear, and think they have then done their whole duty, and expect the trees to go on bearing indefinitely. But soon a change comes. Their trees cease to bear to any extent, and what they do produce are scabby, worthless culls. They begin then to realize that something is wrong, but what it is they do not always know. Their trees become mossgrown and covered with bark-lice, fungous growths, etc. The thoughtful grower will turn over a new leaf and begin to hunt for causes and remedies, and right here comes in the benefit of spraying for all these diseases, for diseases they are.

It would seem at this late day that there could be no necessity for any one to say anything about the benefits of spraying; but there will always be doubters and sceptics in regard to that as to all other innovations, and it is with the hope of converting sceptics that I write this article. I hope to see the day when the northwestern Michigan apple will have the reputation that the apples of western New York have enjoyed so long. Then we will no longer be obliged to seek a market for our fruit, as buyers will be only too anxious to get it. It is well, therefore, to give heed to what is being done by scientists in the way of investigating diseases of fruit trees, and the remedies therefor.

Being a practical rather than a theoretical horticulturist, you will not expect from me a long dissertation upon the subject under discussion. Theoretical knowledge is all right, but not good unless put into practice. Experience, you know, is always the best teacher, although sometimes an expensive one. But spraying is no longer an experiment. It is a most

pronounced success, and has come to stay. It is a necessity, if we wish to raise good fruit. As said before, I have no new theories to advance, but prefer to give you my own actual experience, knowing that most men would far rather have one man's actual experience for their guide than anything they might read upon the subject.

For years previous to 1894 I had scarcely a sound apple in my orchard. Some years it was difficult to get enough sound specimens to take to the county fair. They were a lot of scabby, gnarly, wormy, worthless fruit. I was so utterly disgusted with it that I was tempted to cut the orchard down. But, having read a good deal about the benefits of spraying, I determined to give it a fair trial. I will confess that it was with a strong distrust in my mind, as a good deal that I had read came from the manufacturers of spraying outfits, and I made considerable allowance for the claims made for the benefits of spraying. I now beg to apologize to the aforesaid manufacturers, as they are far more of a blessing to the country than I was willing to give them credit for.

In my experiment I used Bordeaux mixture altogether, using it at the rate of eight pounds of vitriol and eight pounds of lime to fifty gallons of water, for the first spraying, which was done in April, before the buds had started. This was for scab. The work was done very thoroughly, care being taken to wet the whole tree from the ground to the outermost limb. The second spraying was done just after the blossoms were gone and the little apples were formed. The third application was made ten days later, with material just half the strength of the first spraying, and with three ounces of Paris green added to each 50 gallons, for the last two treatments. This was for the benefit of the codlin moth, and it proved most effectual.

In order to determine for a certainty whether it was the spraying, or good cultivation, or good luck, that was to get the credit, if I had a good crop, I left one tree of each variety (taking a row crosswise of the orchard) without spraying. The result was simply astonishing; for, while the

Another result of spraying was that, while the unsprayed trees kept only a small portion of the fruit set, and that was scarcely fit for hog feed, being small, scabby, and utterly worthless.

I sold my crop in the orchard to an apple buyer at \$1.50 per barrel, he furnishing the barrels and doing his own packing. There were no seconds in the lot—all firsts—and there were not culled out to exceed one bushel in fifteen, and they were left because they were too small, some of the trees being greatly overloaded and not properly thinned.

So it is perfectly apparent that every dollar I received from my apples was clearly to the credit of spraying.

Another result of the spraying was that, while the unsprayed trees dropped their foliage early in October, and appeared dead, the sprayed trees retained their foliage till snow fell; and while the untreated trees were mossgrown and scurfy, the sprayed trees were as clean and bright and healthy-looking as young trees just from the nursery. The same difference could be noticed last spring, and was the wonder of all who saw it.

Another result, and to me the most important of all, is in the fact that I have an abundant crop this year, 1895, on the same trees that bore so heavily last year.

One more valuable result is the keeping quality of sprayed fruit, my apples last year having kept better than for years, or ever, in fact.

You may be sure I did not neglect a single tree this year. I have not a large apple orchard, but have thought it was too large till now. After my recent experience I almost wish my whole farm covered with apple trees. I have quite a large peach orchard, having marketed this year over a thousand bushels of peaches, but I believe there is more clear profit in a good apple orchard, if properly cultivated and cared for, than in a peach orchard; for, while a peach orchard will yield returns sooner than an apple orchard, it will be about worthless at fifteen or sixteen years of age, while an apple tree, if set out by a young man just starting in life, will bear him fruit his whole lifetime, a continual source of profit and pleasure and comfort.

But I wish to impress more thoroughly upon your minds the old adage, that whatever is worth doing is worth doing well. In no work in life does it more aptly apply than in spraying fruit trees. The pictures so often seen in advertisements in agricultural papers, of a man standing on a wagon and driving through the orchard, throwing a little spray upon his trees as he passes them, is a delusion and a snare. In order to do thorough work you must go all around your trees, and throw spray from every direction, and not depend upon just throwing a little on the tops of the trees, as the foliage will keep spray from reaching the apples, and consequently will do no good in destroying the codlin moth.

TWENTY FIFTH ANNUAL MEETING.

HELD AT ADRIAN, DECEMBER 3, 4, AND 5, 1895.

The twenty fifth annual meeting of the Michigan State Horticultural Society was held in Adrian, December 3, 4, and 5, occupying three full days and evenings. It was held in the large and comfortable room of the Lenawee circuit court, which was at all times well filled, and sometimes crowded, with deeply interested auditors and participants. The local attendance was not quite as it should have been, but this was compensated for by the very large number of fruitgrowers from about the state, as well as from each of the neighboring states of New York, Ohio, Indiana, and Illinois. Many of these gentlemen, some of them familiar with such meetings in other states, pronounced this one among the very best of their experience. In all respects the occasion was one of rare pleasure to the participants, nothing occurring to make the least dissatisfaction in any respect.

There was, the lateness of the season considered, a large display of apples, pears, grapes, a few other fruits, with vegetables and some grains. Most of these were offered in competition for the society's premiums, but some were furnished solely for sake of instruction. The same was true of flowers, chiefly of chrysanthemums. Prof. Taft brought some of these, with roses, orchids, and others, from the houses of Michigan Agricultural College, but the chrysanthemums were mainly from the establishment of Nathan Smith & Son, of which Mr. Elmer D. Smith is the manager. The flowers of this kind, from each place, were of high merit, but those of Mr. Smith, having been grown to secure the highest development, were of surpassing size and perfection. The lateness of the season prevented Mr. Smith from showing more than about twenty varieties from among the many he produces. His "crop" this year was between 14,000 and 15,000 blooms, all but a couple hundred of which had been disposed of. The firm is one of the largest producers of chrysanthemums in the country. They have produced nine of the thirty-two varieties originated in this country, this having been done, of course, by cross-fertilization. They have won many first prizes at the flower shows in the United States, this fall, and hope to make still greater achievements in the future. They also are engaged in originating new carnations, as well as growing these flowers for the market.

The programme was substantially completed as printed, though time was not sufficient for the reading of two or three papers whose authors were not in attendance.

A change was made in constitution of the society, previous notice having been given, by which the office of honorary president was created, to be bestowed, when the society may see fit, upon any member on account of long and faithful service. Its term is for life, and the beloved ex-president of the society, Hon. T. T. Lyon of South Haven, was unanimously tendered the position, which he accepted.

The annual election of officers resulted in choice of Roland Morrill for president, Edwy C. Reid secretary, Asa W. Slayton treasurer, and Elmer D. Smith, L. R. Taft, and W. W. Tracy members of executive board, Mr. Tracy taking the place of Mr. Lyon, supplying vacancy.

The usual committee found the financial affairs of the society in satisfactory condition.

A telegram of congratulation was received from the Ohio state society, in session at Canton, and response was made.

An interesting incident of the meeting was a visit, one afternoon, after adjournment, to the works of the Page Wire Fence Co., where the curious processes of manufacture of this fence were shown to a large number of fruitgrowers.

A pleasing feature of the sessions was the excellent music provided by people of Adrian and vicinity, which included several quartets as well as soloists, all of more than usual quality; but it is only fair to speak specially in praise of the Acme quartet of Adrian, four gentlemen whose voices were not only of great power, but showed careful and highly successful culture, and the solos of Mr. G. Roscoe Swift of the same city. Thursday evening the Jackson quartet (three guitars and a mandolin) delighted a very large audience.

Those present from other states were, in part, Prof. L. H. Bailey and S. D. Willard of New York; Prof. F. M. Webster and C. F. Yeslin of Ohio; Prof. G. W. McClure of Champaign, Ills., and H. F. Thurston of the Farmer's Review, Chicago.

REPORT ON EXHIBITS.

The committee on flower and vegetable exhibit would report that they find on exhibition a collection of twenty-six varieties of chrysanthemum from Nathan Smith & Son of Adrian. This exhibit, both in selection of varieties and the quality of the flowers, would command attention in any exhibition and is well worthy of the first premium as the best display of chrysanthemums as cut flowers.

The Agricultural college made an exhibit of rare tropical flowers, orchids, etc., together with vases of roses, chrysanthemums, etc., which is most meritorious, and the thanks of the society should be extended to Prof. Taft for placing them on our tables.

Of the other exhibits of potted plants, made by M. J. Pierce, and of vegetables by Squire Johnson, also a collection of seed corn, watermelons, and potatoes, by parties unknown to us, we find in each case that the exhibitor has failed to follow the necessary qualifications for a premium, and so we are unable to award any. We desire to thank all those, however, who have taken the trouble to bring the flowers, and especially Squire Johnson for the exhibit of vegetables, on their neat arrangement and good quality, and we recognize that they have added materially to the interest of this meeting.

Supplementary report.—Your committee find that they have been misinformed, and that the entire collection of vegetables was shown by the Adrian society, thus entitling them to the first premium for collection of vegetables, including potatoes.

WILL W. TRACY,
O. E. FIFIELD.

Your committee on fruit display would report as follows: There were three lots of fruit entered as collection of the best grown and most reliable fruits of the various classes and varieties, strictly for market, special adaptation to such purpose to rule. On these we awarded first premium to the Lenawee County Horticultural Society, second to Robert L. Vahue of Allegan, third to the Lenawee County Horticultural Society.

There were three entries for a collection of the best grown and most desirable fruits of the various classes and varieties, adapted strictly to dessert and culinary uses, quality to rule. All the entries were made by the Lenawee County Horticultural Society. The first, second, and third premiums were awarded to the society.

There were two varieties of seedling grape shown by Mr. C. P. Chidester of Battle Creek. One of these is said to be two weeks earlier than Moore's Early. A good grape, so early as this, should be of great value. This grape has one good characteristic, that of hanging tenaciously to the bunch.

Mr. S. D. Willard of Geneva, N. Y., had some fruits on exhibition, but not in competition. Among these was Sutton Beauty, one of the newer apples but with an old name. It is a handsome apple, of medium size, very good quality, and is certainly promising; and Pride of the Hudson, of which one specimen was shown. It was a beautiful apple. We tested it, and some one remarked, "beauty is only skin deep."

Greening Bros., Monroe, Mich., had on exhibition the Winter Banana apple. It is a very handsome apple and of very good quality.

G. W. M'CLEUR.

RESOLUTIONS.

We recommend a vote of thanks for the admirable music by Mr. Swift, Mrs. Winship, members of the Acme quartet, the Jackson family, the Western Glee Club, and Cadmus Glee Club; for the entertainment of the officials of the society; to Mr. Smith for a fine exhibit of chrysanthemums, and Mr. Pierce for other flowers and plants.

Resolved, That the members in attendance at this meeting are unanimous in agreeing to endorse a resolution passed at the Grand Traverse meeting, which in effect was that we shall unite to urge the members of the next legislature to re-enact a law similar to the one passed in 1887, established a state forestry commission.

We recommend tendering a vote of thanks to the members and committees of the Lenawee County Horticultural Society, who have done so much to make this meeting a success.

We thank the mayor and common council for the courtesies of the city, the sheriff and other officers for the free use of the court house, the press for attention and full reports.

We congratulate the officers of the society on the successful carrying out of so fine a programme in the presence of such a full house.

S. D. WILLARD.
L. D. WATKINS,
W. J. BEAL.

SOME OF THE COURTESIES.

WELCOMING ADDRESS OF MAYOR KIRKPATRICK—RESPONSES BY MESSRS.

MONROE AND REID.

Several weeks ago I was requested by my friend, Mr. Helme, to welcome you to our city, and he supplemented his request by the observation that it would be as fine a body of men and women as had ever assembled in Adrian, and there would not be a bad man or woman among you.

While some might be tempted to accept the last part of that statement *cum grano salis*, yet there can certainly be no good reason that it should not be absolutely true. I believe that Drummond lays it down as a fundamental law, that the great intention of environment is not to modify, but to sustain; and yet it is a matter of every-day observation that our lives are being continually modified by our environment. With such an hypothesis established, the deduction of Mr. Helme would be tenable. You are living in one of the best states in the Union, you are now in one of its very best counties, and surely you are in one of the nicest cities in the state. While no man has any adequate reason to offer for being other than a good man, it is possibly true that a horticulturist has less barriers behind which to shield himself than any man in the world. I presume you have your trials, like other persons; but, at the same time, the beneficent influences of your calling should be manifest in your every-day life. It has often been a habit of mine to take up an apple, turn it over and over, look at it carefully, and note its characteristics; look at its size and contour; note its beautiful blending of color and outward attractiveness; speculate upon its kind or family, if you choose to call it so; think of its flavor and palatability, and then compare it to the human family. Blood and education will tell in the human family, and just so surely will judgment in selection, and care, tell in the development of this, one of our great industries.

As there are certain races and families of men that can always be relied upon, so there are certain kinds of fruit that can best be depended on. Some are pleasing to the eye, but are poor keepers, like friends who please you with their surface friendship but can not stand the winter of trial. Some are more hardy, though not so pleasing at first, like friends who have summered and wintered with us. Sometimes, again, the beautiful colorings will remind you of a beautiful acquaintance. They may be fair to look upon, but at heart altogether rotten.

It is the same with flowers. It is hardly comprehensible that any man or woman can work any length of time among flowers and not feel their refining influence. The beautiful tints and fragrance must permeate their whole lives. There are none of us but have a special liking for some one kind of flower, and the sight of or aroma from it will arouse some past and pleasant episode of our life. It has often been my privilege to witness the joy brought to a sick room of a friend, by the gift of

flowers--the flush of joy on the cheek, as the eyes rest on the token, proves that their office is to bring peace and joy to mankind.

Knowing how the refining, gentle influence of these pursuits must have made itself manifest in your lives, it affords me great pleasure to welcome you to our city. I know that your deliberations will be productive of good, and my only regret is that it will be impossible for me to attend all of your meetings and listen to your feast of reason and flow of soul.

RESPONSE BY MR. MONROE.

When I came here tonight the president said he would call upon me for a response, or to furnish a substitute, and I do not believe he had any more difficulty during the war to get a substitute than I have had tonight, and I am not surprised, if they knew this mayor. I assure you that I feel considerably embarrassed to undertake, on the spur of the moment, a fitting response to such cordial words of greeting and such pleasant words of welcome, and this supplemented by the flags which decorate this hall, stirring our patriotism and pride of country; supplemented, too, by the flowers, and the music we have listened to, and this handsome room, furnished for our gathering—I wish that I might find words to more fittingly respond and thank the people of Adrian and their mayor for this cordial greeting.

But as I can not, on behalf of the state society I sincerely thank you for these many courtesies, evidences of your thought and care, all about us, trusting that during this meeting we may give you some little items of information that will prove helpful to you in the raising of fruits and flowers.

RESPONSE BY MR. REID.

Our president has an unpleasant way, to amateur speakers like myself (Mr. Monroe is an old hand at it), of drafting us into such service as this, and insisting upon it; and, knowing he would do it anyway, I just a moment ago said I would undertake to say a word, inasmuch as I can do so with a little better grace than if I were forced into it.

We have had quite a time getting to Adrian. It is many years since we have held a meeting in this part of the state. We were at Ann Arbor two years ago, and at Port Huron before that; but we had tearful entreaties from Mr. Allis to hold the meeting here, and you would have thought from those letters that the local society was famishing for a sight of the state organization, which he led me to believe possessed a peculiar vitalizing charm. There may be a little in that, but it is very evident that the Adrian society, so far as keeping it alive is concerned, does not need our presence. But finally we have gotten around, and that we are glad to be here you may feel assured by the pleasure we must show in our faces inasmuch as we feel it in our hearts. As to our all being so good, I really hoped your mayor would leave that untouched, and when he spoke of having to take it *cum grano solis*, I thought, "He also has 'got on to' us." I did not suppose he had heard of me, or the president either, but some way he has found us out.

They say Adrian is a pretty city. I trust it is. I think in the summer time it must be. I never heard of it as a bad city, but as one of

the oldest in the state and one of the most intelligent and enterprising. I think its material prosperity has not been so great as in former times, but you know we are not enjoying very good times anywhere at present; but we all sincerely hope that, when things change, Adrian will get a full measure of the benefits of it.

We have known of Adrian in our horticultural circles, more particularly, because it has been the seat of one of the oldest horticultural societies in the state. I know of no other organization so old, nor one so constant in its meetings. In season and out of season, you seem to have met and kept up interest. You have had many brave souls, some here still and some gone to a better abode; and year after year we have read the proceedings of this association. They have gathered a library, have met monthly, and as the years come and go and the seasons change, they discuss and inform one another concerning their proceedings. That it has been of great benefit, goes without saying.

The mayor spoke of examples of endeavor in the line of improvement of things horticultural. Now, that goes on to a very much greater extent, perhaps, than Adrian people who are not within horticultural circles are aware. There are members of this society who have done much toward it. Our worthy president has produced, solely by his knowledge of science and intuition of the ways of Nature, the very best muskmelon ever grown on earth. Mr. Tracy, one of our members, is constantly engaged in the elaboration of new vegetables and flowers, and conducting experiments along that line, for the great seed house with which he is connected, and he has himself produced or introduced a considerable number of vegetables and flowers. In your own city is Mr. E. D. Smith; perhaps you do not appreciate him; sometimes a prophet has more honor outside his own immediate locality, but your Mr. Smith is one of the most eminent chrysanthemum-growers in the world. He is secretary of the Chrysanthemum Society of America. You are not perhaps aware of the large number of improved varieties he has originated. He showed me tonight, with a keen pleasure which no one but a lover of flowers can feel, some returns he has received from his exhibit in Boston. If you go up to his greenhouse, I am sure he will show you the inside process of the crossing and recrossing of flowers until a new one is given birth, receives a name, and goes forth to give pleasure to those who behold it. He has exhibited at five of the principal flower shows this fall, and his exhibits have been of such high character that he has been given diplomas for the standard quality of these flowers, and they have passed in all of the exhibitions. They make a scale of points of merit in each flower, and require eighty-five points for admission as a recognized variety. His exhibits have all passed, and most have stood 100. It is a grand work, and, while Mr. Morrill did not lose anything on his melon, much work is going on that is not recompensed. Of all men we place first our most esteemed and honored ex-president, Mr. Lyon, who has devoted a whole lifetime to precisely this class of work, and he has not done it for the sake of money. If he had, and had directed himself wisely within certain channels, he might have enriched himself; but he has devoted his whole life to the good of the people of the state of Michigan. That life is coming to a close; we must some day lose him, and it will call tears to many an eye. A more unselfish life was never spent, and only those in touch with

the horticultural life of this country can understand how much he has done.

There is a great blessing in connection with the growing of flowers. Your mayor has seen the pleasure of the invalid in the gift of a flower, and there is oftentimes afforded a pleasure equally great to the giver. We grow fruits for profit, but we mainly grow flowers for the beauty and pleasure they give to the world and the blessings they shower upon all who receive them. They encourage the generosity of giving. The more you pluck from a plant, the more bounteous its bloom.

That we are glad to be in Adrian, that we are thankful for the warm reception we have had, for the most entrancing music we have listened to—that we are grateful for these, I am sure, must go without saying, and I can not tell you how much pleasure we anticipate within the next two days.

ANNUAL MESSAGE.

BY PRESIDENT ROLAND MORRILL OF BENTON HARBOR.

Sometime in the past, someone without the fear of the future in his heart, and without the fear of ever holding the office of president of this society, provided the president should deliver an annual message. What it shall be, what it is for, I do not know. It is, I suppose, whatever comes to the president's mind, and this year it is expected of me. It is a year that is to me not very fruitful of themes. There is nothing very new, so I will simply speak along lines and of facts that it seems to me we should gather from the lessons of the past year, and perhaps some suggestions that occur to me as being pertinent for future work.

The state society, as you all understand, is a traveling institution. We have no fixed place of abode. We hold our meetings where it seems best and where we are invited. We generally have invitations ahead. The object of our society's meeting in this manner is to encourage, or improve, if possible, the horticulture of the locality in which we meet.

We generally have some bright men with us, we usually bring some bright men in from other states, who hold advanced ideas and bring them to you. In the past this has been very difficult. We have been compelled sometimes to strain our treasury to meet the expenses that are naturally incident to such work. At present, as our secretary intimated to you today, the state, seeing the work we are doing, looking upon it as educational, has provided a small amount as an appropriation for conducting this work. It can be drawn out of the state treasury for actual expenses only. This is the second meeting we have held under that new regulation. We hope that our efficiency will be greater from now on, from the fact that in the past we have been compelled to use every effort to get money into our treasury in order to meet these expenses, and many a time our members have had to assist with not only their time and expenses, but something else. However, that is gone by, and we feel that the future is much brighter for us.

Now, what have been the lessons of the past year? We will touch upon that a little first. I think that the spring of 1895 dawned with fully the largest promise of fruit from ocean to ocean and from the gulf to the great lakes, that any of us ever saw, and the commercial horticulturist was placed in a position where he did not know exactly how the thing was going to turn out. It looked as if there was going to be a deluge of fruit, and the market swamped. Everything passed along favorably until about the 20th of May, when the situation changed in a day and the cry went over the land that everything was lost. We know everything was not lost, but an immense amount of fruit was indeed destroyed. Had this not been the case it would have been the worst year for horticulture we have ever seen. But there is good in these things. They are not unmixed evils. They may be a little hard on some people, they *are* hard on some people, but there are opportunities in connection with them whereby a trained horticulturist, one who posts himself, attends meetings, reads the literature of the day on that subject, may in such a time save himself by properly locating, cultivating, and protecting, by such means as are at his command, his fruits and vegetables, in these trying times. Then he comes out with flying colors—that is, with a bank account, perhaps. Those who fail to avail themselves of these expedients, unless extremely fortunate, are generally losers.

We learned something by that extreme of cold; that is, we learned it if our eyes were open. We learned many things of value. For instance, we learned that it was not an unmixed evil. While it was destroying the fruit, it very nearly destroyed some of our worst insects—reduced them to such an extent that we have gotten along very well this season without fighting them, particularly the currant worm. The codlin moth, the first crop, did not amount to much in this state. Later on, they did some damage, but no man should argue from that that they will not be plentiful again, with a favorable season.

Following that, we had an extreme drouth, probably the worst ever seen in Michigan; that had its lessons. Irrigation has become a prominent topic at our meetings, fills the mind of each fruitgrower, more or less. There is a wonder in his mind, if there is not some way he can irrigate. Some never can, some may; much depends on location, the available water supply, and the question of capital. It is an experiment yet in this state.

But there is one thing all men may do. I say "all men" because I think there is no one here who has done all he can, and that is, given more thorough culture; and as an offset to drouth I believe that today it is the only thing that can save us. I do not believe that in Michigan irrigation is generally practicable. There may be isolated places where it is possible, but not generally. The question of thorough cultivation has certainly forced itself upon our notice this year, and those who cultivated well reaped a reward. The market and transportation problem was a prominent question this year. The large markets for a time were overstocked, while many small markets did not have their proper share. I will not attempt to suggest much in regard to that, but it is essential that we find means to equalize the supply in the hands of the consumer. We must do it. Grand Rapids felt that for many years; they held meeting after meeting, and finally they did effect an organization there, that

seems now to be working harmoniously. They pull together for a common purpose. The railroads, when they made up their minds these people had joined for business, met them. Today I feel that Grand Rapids has secured more in the way of market facilities than any other city in the state. That is, they have accomplished more, because they have combined and done a good business on their own ground.

I live in a good market town, but we ship everything. In Grand Rapids they sell everything. When they drive in with a load of peaches, they are brought in the most economical manner, they are delivered quickly, and the producer finds the money in his vest pocket. That is the perfection of marketing, when you can secure good prices. They have succeeded in bringing the buyers there, and they certainly get good prices.

There was another lesson we learned from this drouth. We learned that the various fungi did not spread rapidly. Many people say that the apple scab is leaving us. I presume Prof. Taft will tell you the conditions were not present this year for its rapid propagation. But that does not mean that there is not seed left sufficient to go around in case the conditions were right.

Curl-leaf theories—we have had many of them, and they were all upset. The conditions under which most of us supposed curl-leaf occurred, existed on the 22d of last May, as perfectly as I ever saw; after a rapid growth of the leaf, there was a rapid turn of the weather, that froze ice in many instances, and we expected it to rupture the sap cells, and that curl-leaf would follow; but I did not see a single curled leaf, so I have no more theories on that point.

There are a few suggestions I can make in regard to this winter. It is a time of preparation—the only leisure time we have; the time we must read and attend meetings, and possess ourselves of every valuable improvement, if we expect to keep up with the procession. The man who does not keep up will be far behind in a short time.

There has been great advance in many things—tools and implements, methods of working and cultivation, little economies; by a little study you can get at what they are.

I don't know as the spirit of organization is very general in the state this winter. Perhaps we are not far enough along into the winter to know, but it is quite common to hear that local horticultural societies are dying out. There is always something wrong where that occurs. There is certainly a weakening of knowledge and intelligence connected with the business at that point. I hope that Adrian will maintain its society, take good care of it, assist it in every way, and so assist itself.

When I get through with this meeting, we will have probably two more meetings before we get together for an annual meeting again, and I suppose considerable good will come of it. In all probability the next meeting will go to Oceana county. That is a center of enthusiastic peach-growers; they grow principally peaches and plums. Where we may be a year from now we can not tell. We hope, however, to see there a good many Adrian people, and we hope that when we come together a year from now that every section can report some advancement in some particular line or in all lines.

LECTURES.

THE VALUE OF PRACTICAL HORTICULTURE TO THE PROFESSIONAL MAN.

BY DR. DENISON C. THOMAS OF ADRIAN COLLEGE.

Horticulture represents the most perfect method of tilling the soil so as to produce the best results in the form of flowers, fruits, and vegetables. Gardening has been pursued from the earliest times of civilization and refinement. Pliny tells us that the Romans delighted in beautiful gardens. Some of the rarest and choicest plants and flowers which we cherish today were cultivated in the gardens of the Greeks.

Agriculture before the time of Virgil began to decline, and for this reason he devoted the *Georgics*, the most finished of his productions, to the cause of husbandry. The first book treats of the proper cultivation of the soil; the second, of the management of fruit trees; the third, of horses and cattle; and the fourth, of bees. The story is told that Virgil wrote these four books at the request of Mæcenas, to revive the languishing agriculture of Italy, and that in consequence the country soon assumed a flourishing appearance. The various departments of agriculture have always received considerable attention, and at no time has horticulture been entirely neglected.

After the conquests of Alexander the Great, he desired to Hellenize the whole world. Not only were the inhabitants of Asia and Europe to be blended by means of colonies, but even the floras of the two continents were to be intermingled by establishing parks and gardens and by transplanting fruits and trees from one continent to the other. Common laws, common customs, common gardens, and a common language were to unite the world in one great family. Charlemagne established gardens by royal edict, directing the kind of plants that were to be grown.

Beautiful pleasure gardens may be found all over Europe. In Germany, France, and England, gardens with fountains, hedges, and shady walks are abundant. But no really permanent success was attained until they began to protect the tender plants in houses. It was not until 1717 that buildings with glass roofs were used for garden purposes.

Horticulture as an art stands far above agriculture, and when thoroughly practiced shows what wonders can be produced when the soil is properly handled and fertilized. Horticulture is receiving due attention. The best methods of growing flowers, fruits, and vegetables are being adopted, and the various topics of the science are being thoroughly presented and discussed in these your annual meetings. The "bread and butter" side of the question will most invariably receive first attention. Will the garden pay? is the question. This is the information most of us come to get. We want to know how to raise peas, potatoes, beans,

corn, cabbages, and the tomato—how to grow the apple, peach, plum, quince, and pear, and the various small fruits, with profit. We want to know, also, how to protect these from the effects of insects and blight. These problems will be settled here no doubt. But market gardening for profit needs no special encouragement. In the vicinity of every town and city there are numerous gardens which are being carried on with the highest perfection of the art, and with the very best improved appliances and implements.

Our markets are supplied in abundance with the best flowers, fruits, and vegetables that the progress of the age can suggest. These things can be had at a fair price, so that men burdened with professional care do not feel that practical gardening is needful for either comfort or health.

I am to call your attention for a few moments to a particular phase of the subject—"The value of practical horticulture to the professional man." As a rule, professional men give no attention to horticulture, neither for profit nor pleasure. They feel that it does not pay, or that the business is incompatible with the dignity of their profession, or in some way unfitted for their line in life. The professional man who cultivates a garden is an exception. How many lawyers, doctors, teachers, or preachers do you know who raise all the fruit and vegetables they consume in their families? How many cultivate flowers to beautify their homes? A few words of encouragement to such may not be out of place.

Now, I desire to maintain that a garden and orchard will pay the professional man. Every man should seek to have a home of his own with a large lot—the large lot for many reasons: (1) because, with good management and industry, it will pay in dollars and cents to grow his own fruits and vegetables; (2) because he can have that out-door exercise which he so much needs; (3) because he can cultivate those domestic virtues so desirable in every home; (4) because he can have such practical and scientific enjoyment in the products of his own labor as he can get nowhere else.

A good garden goes a long way toward living. Except bread and meat, a large part of the provisions for the table may be taken from the garden; and where the lot is large enough, a portion of the meat bill may be paid from the garden; and if we were to eat more vegetables and less meat, the fact above stated would be easily realized and we should feel enough better for the exchange.

A man may in his garden grow all the ordinary vegetables. He may grow in this climate his own peas, potatoes and parsnips; his own corn, cucumbers, and cabbages; his celery, carrots, and cauliflowers; and then there is the lettuce, the radish, and the melon, the potato, the turnip, and the onion, the beets, beans, and the squashes, and many more vegetable luxuries too numerous to mention.

Among the small fruits, one may raise the strawberry, gooseberry, currant, and the luscious grape.

In the orchard we may have the cherry, peach, and plum, the apple, quince, and pear. These and many more good things may be had in their season fresh from earth, tree, and vine. And oh! how much more delicious and palatable are vegetables and fruits fresh from our gardens, as

compared with the too often stale articles of food to be had in the markets and from hucksters' wagons.

The vegetables and fruits which an average family may consume can be grown on an ordinary suburban lot in Adrian. Where skill is exercised, from two to three crops can be raised from the same ground in a season. With proper management, and with sufficient fertilization, surprising results may be obtained.

Peter Henderson, one of the most successful gardeners of this country, is the author of nine volumes on the various branches of horticulture. In his work on "Gardening for Profit" we may learn how to make our gardens yield large returns. The writer of this paper once tried an experiment on a vacant lot, 80 feet wide by 150 feet deep. This lot was thoroughly prepared and planted to White Star potatoes. An accurate account was kept of the expense of seed, cultivation, and marketing, which net sum was \$40.50. There were raised on this lot 112 bushels of extra-fine potatoes, which were sold at 65 cents per bushel, amounting to \$72.80, leaving a net profit of \$32.30. The season was favorable, the market good, an exceptional year. But the cost of labor and material was nearly twice what it should have been. It might have been done by personal attention for half that amount. The work was done in this case by proxy, which seldom pays.

The writer has been engaged in professional life for at least a quarter of a century, and he has never been without a garden where it was possible to have one, to which he has given more or less personal attention, and he can say that, after these years of observation and experience, a garden pays. A good garden takes care and labor. No good thing is accomplished without great labor. A poor, neglected garden never pays, and this is true of a farm. To be a successful gardener requires study and thought. There is as much need of the exercise of cerebral tissue here as in anything else.

The excuses for gardens that we too often behold along the highway, don't pay for the plowing. There is not enough raised in some such gardens to keep the sun from bleaching the soil. There would be more money in good pasture, a crop of rye or buckwheat. Good returns may be had from a garden, after it has once been thoroughly plowed and fertilized. With two hours' work per day for six weeks, say from the middle of May to the last of June, a few hours' work in April with the hot-bed may also be added. An hour per day may be put in during most of the early summer. But the most of the work in a family garden will be done from the middle of May to the middle of June, for Michigan latitude. These hours will prove a great blessing to any professional man, especially if put in during the time of early morning.

What professional men need is a change of work from mental to physical exercise. This change is restful. Exercise before breakfast is recuperative. An hour's labor on a May morning, until the perspiration starts freely, when followed with the ordinary sponge bath, is better than any expensive Turkish or Russian bath. This morning exercise will prove a luxury to any man who is not too lazy to enjoy it. No one has experienced the full fruition of life until he has tried the health-giving elixir of the morning hour in his garden. The teacher, the lawyer, and the minister each will find labor a true friend and a blessing in disguise. But

there are other benefits to be derived from the cultivation of a garden, besides the profit and the health which the work brings. It will cultivate the domestic virtues. One of the chief duties of man is to provide a home and to provide for the home. The growing of products for his table with his own hands stimulates the domestic feelings. The man who sits in his office or study from morning until night, day in and day out, allowing his wife or domestics to have all the care of providing for the home, even at his expense, loses his opportunity and fails to cultivate that home attachment and care essential to his domestic happiness. In this way, many a man's love of home has degenerated into cold indifference, unnatural relations, and finally into misery.

How blessed that home where, when the autumn leaves indicate the coming winter, ample provisions have been made—where the cellar is full of vegetables and fruit, with potatoes, turnips and cabbages; apples, preserves, and pickles; shelves full of canned goods, and the bin full of coal, and everything in readiness for the coming severity! How much better this than where everything is provided only from hand to mouth! And this is most likely the case with many homes where there is no garden or orchard. In which of these homes is happiness most likely to dwell?

Horticulture furnishes a wide field for observation and experiment. Both in the theory and practice of the art there is sufficient opportunity to engage every power of the mind. The study of nature, and especially the mysteries of plant life, are sufficiently interesting to combine pleasure with labor. Horticulture is both a science and an art. A science, because its principles are well established and its facts are thoroughly classified; an art, because its practice has reached a very high state of perfection. As a science it deals with the nature and composition of the various soils and the nature and growth of plants. It involves a knowledge of the adaptability of the various plants to the different soils. To be successful in horticulture, it is highly essential that one should understand how and when to plant, how to graft, bud, and transplant. There seems to be no limit to what can be accomplished by means of forcing and fertilization:

Hybridization is a very interesting process. Some of the most important results, and many of the gardener's greatest triumphs, have been obtained by hybridization. The object of this process is to obtain varieties exhibiting improvements in vigor, size, shape, color, hardihood, and fruitfulness. Some gardeners have obtained phenomenal results in this line. Our townsman, Mr. Smith, has gained a world-wide fame in producing the finest varieties of the Japanese national flower, the chrysanthemum. He has not only acquired a reputation for himself, but we, as citizens of Adrian, all take pride in sharing the glory of his triumphs.

Pruning is another very important operation. Its object is to improve form and size and increase productiveness. Pruning and dwarfing for ornamentation afford a wide scope for the exercise of taste in the art of developing symmetry and forms of beauty. What is more attractive than a fine lawn, with trees, shrubs, and hedges artistically trimmed? A man of taste can certainly find no greater source of enjoyment than in spending his leisure hours recreating amid the beautiful foliage of his own planting and pruning. This blessed privilege is open to every man.

Many more interesting operations in horticulture might be named, such as irrigation, fertilization, and cultivation of the soil and preparing it for the seed. But time will not permit. Enough has been said to emphasize the importance of our subject along the lines already mentioned.

We believe that every professional man will find it to his advantage to have something to engage him in his leisure hours, or furnish pastime for his weary soul and body. Every man should have something else to do, some "side issue" to relieve the strain of professional requirements, something for a change which will furnish recreation and rest. Many a literary man has been tempted to resort to some narcotic or stimulant to relieve his weary brain when overburdened with professional care. There are times when the lawyer should cast aside his brief, the doctor forget his patients, the minister lay down his pen, and the teacher get the schoolhouse off his back, and each unbend himself. What we all need is a new sensation, a fresh inspiration. That is just the time when we should spend an hour in our gardens among the plants and flowers.

The writer has often, when tired of the dull routine of the class-room and the vexations of discipline, found the "balm of Gilead" in his garden. On many an occasion, while in his garden, with coat off and perspiration running down his face, he has been approached by a stranger who inquired, "Can you tell me where I could find the president of the college?" You can imagine his surprise and disappointment when he found the dignity he was searching for so near by.

Perhaps no better example of our theory could be cited, where it has been thoroughly practiced, than in the case of the great English premier, the Right Honorable William E. Gladstone. His invariable custom is to resort to manual labor for a change after his long periods of hard mental strain. Felling trees, and exercise in his gardens and parks, are his favorite occupations, in the interim of his public duties. This fact will abundantly account for his vigor and his long, active life of usefulness. His example is no exception among the English and German nobility. Bismarck, Von Moltke, and the Emperor himself turned to manual labor for a period of rest.

It was the privilege of the writer, at one time, back in the sixties, to visit the estate of the Lord of Rosse of Parsonstown, Ireland. The object of this visit was to see the great reflecting telescope. When we were ushered into those beautiful grounds, we found Lord Rosse, like other men at work, common and approachable as a child. He made our visit exceedingly pleasant and profitable. We were shown his great reflector, the speculum of which he made himself in his own shop in the basement of his castle. He showed us also a large overshot water-wheel which he constructed to raise water for irrigating purposes and for the fountains in his park. Here we found a man of the nobility, of scientific and public distinction, who found his greatest enjoyment while at work on his home estate.

Finally, we believe there is no branch of industry that presents that variety of exercise suited to the different sides of our nature like horticulture. The man of sedentary habits can find here both profit and pleasure. He will realize in his garden the exhilarating influence of work in the open air, and that recreation which brings to him renewed enjoyment of life. The moral and esthetic sides will also be satisfied as he

communes with nature. Here he can come in touch with Mother Earth, and draw from her again both strength and vigor. The trees he plants in orchard, garden, or lawn, are more than for profit. They challenge more than the carnal eye, and awaken sentiments of the soul deeper than those of merely material gain. They are the homes of birds and flowers. Songs mingle with the rustle of their leaves, and thousands of bright-hued blossoms smile beneath the protection of their shade. What a delight, also, their varying aspects of light and shade and color give, as the seasons come and go! Now just dawning into green when the blue-birds come and the daffodils bloom; now with innumerable leaves wooing the odorous winds, when

"The year grows lush with juicy stalks,"

and now, when autumn sheaves are culled for Ceres, making the hillsides and valleys glow as though a thousand sunsets had left the skies and spread themselves over the earth! What tender chords of feeling they touch, the loss of which would make silent large spaces of the soul!

How often in our youth, beneath their shades, have we watched the Nymphs, and heard the pipes of Pan! How often in their dewy silence have we heard mysterious whisperings within our souls!

Who would miss, therefore, to look upon this side of life and glory, to gain a fresh emotional sympathy with nature in her forms of beauty? for

"Vain is the glory of the sky,
The beauty vain of field and grove,
Unless, while with admiring eye
We gaze, we also learn to love."

THE EVOLUTION OF THE PLANT WORLD.

BY PROF. L. H. BAILEY OF CORNELL UNIVERSITY.

[Stenographer's Notes of an Extemporaneous Address.]

I was exceedingly interested in what Dr. Thomas said about the boys of the farming communities, and the necessity for their having the advantages of education.

To me the education of farmers' sons and daughters looks somewhat different than to others, engaged in the same occupation, but I think I have quite outgrown the desire to place the burden of my effort upon the mere information I can give them concerning their pursuits. I said to a body of young men a few days ago, who came for instruction, that I hoped they did not feel as though I were going to tell them how to hoe turnips; that there were plenty of farmers to whom I could refer them for this information, but if they wanted to know why to hoe turnips, or of some other fundamental principle, I would try to teach them the best I could.

In other words, what we want is not only training, which they can get at home, but fundamental principles; and I will guarantee that when the young fellow knows why he hoes turnips, he can hoe better than I.

What we need to teach the sons and daughters of our farmers, is the principles of rural occupations, and in addition to that, a general broadening of the horizon, which will interest them in all the great movements of the time and make them better citizens, and, at the same time, they become better farmers.

One of the means I take in order to broaden out the horizon of a young man off the farm, is to talk to him about evolution. It is probably the greatest question before the human mind at the present time. It is one of the milestones in the progress of the world. It ranks along with those three or four other great landmarks which, since the introduction of the Christian faith, will always be the landmarks of time: the reformation, the promulgation of inductive logic, and the law of gravitation, the hypothesis of evolution. All of these will forever stand as landmarks in the progress of our civilization. I ought to say that there is not one famous naturalist in all the world today who is not in some degree an evolutionist. Our teachers of the languages, philology, literature—all now call themselves scientific men, because, like the natural scientists, they endeavor to discover the origin of their subject, and trace its actual unfolding and growth, or its evolution.

So, when our young men are taught Latin today, they are taught the relation of the Latin language to other languages, and they try to find out not only how to read Cæsar, but how the language ever came to be and how it has grown and how it died. And so the teacher of English philology, today, teaches not only what the language is that was used by Milton and Shakespeare and others, but he teaches how it came to be, how it has grown up, what it is, and how it is growing at the present time. Everything we study is contemplated with reference to its origin, its present condition, progress, and destiny, and everyone is in that sense an evolutionist.

Evolution means the unfolding of life, or change of one form into some other form of life or existence. Every one of us here today is an evolutionist, because we deal with plants and animals, and we have practical evidence that evolution is true because we know that one tomato is produced from another, one breed of cow from another, and one kind of hen from another kind. Now, when I say that every scientist is an evolutionist, I do not mean to say that all scientists agree as to how this evolution has taken place. I suppose no two writers are fully agreed as to all of the details, as to how it has all come about. I might say also that probably no two are agreed as to what the ultimate origin of all forms was. I may be an evolutionist and still believe in special creation. I may believe there were certain stages of creation, and yet I know that certain forms of plants have come from others. So, while I say that all are evolutionists, I do not say that all believe that life has come from one original thing, though the drift of all opinion in the scientific world is toward the hypothesis that life has come from one point. What the origin of that life is, is beyond our ken, and perhaps always will be.

If, then, every one believes in evolution, it would be pertinent to inquire what the general hypotheses are as to how it transpired and how all the varied forms of nature have come to be.

There is no one conception before the human mind that gives us such a broad survey of the whole theory of human endeavor, as the hypothesis

of evolution. We are ourselves the culmination of the whole process; we look back over the whole story, gleaning a little here and a little there; and, putting together all the details we can glean, we draw our generalization. It is a swift process of mind that looks over such an area of thought, and it is one of the very best studies we can present to young men at the present time for broadening them out and bringing them into sympathy with the world. It is therefore of practical and intrinsic educational advantage.

I shall not attempt to trace one half or one tenth of the theories of evolution, nor even any of them in its details, but for a few moments I should like to present a few of the notions that scientific men hold. I may say that it is the general opinion that all the vegetable world is a retrogression from the starting point of the animal, so that while there are certain philosophies and theories which will apply to the evolution of the animal world, it does not necessarily follow that they will apply to the vegetable world. We often hear it said, that because men breed animals with a certain degree of definiteness, we can breed plants with the same exactness.

All the forms of life that we know today were originally from amphibian life. All life was once aquatic, and all the plants and animals have been derived from the old plants and animals of the sea. It would be useless to attempt to convince you, if that were necessary, of the general truth of evolution, unless I tell you how it may have taken place and some of the reasons why evolution must be true. It is difficult to believe in it from an abstract proposition.

In the first place, let us consider that there is a struggle for existence, and that some organisms must die and some live. If you once get that thought fixed, you will see that there must be either evolution or extinction. The world is full of life and plants; no more can grow next year than grow this year, unless some die, or unless they take on different forms. The world is full of animal life. It is not big enough for as many more animals as will be born next year.

Half of the plants are annuals; a small percentage are biennial, and live two years, like the turnip. Forest trees sometimes die; these leave vacant places. In these places the new generation must grow. Every plant and animal which lived on the earth today has the power of perpetuating itself wholly beyond the means of finding a place in which to live.

Take the microbe, so small that we can not see it. One of our best authorities says that if one of these microbes were to break in two, and each of these two, again, and this operation took place every hour, and none of these should die and nothing interfere with them—that, starting with this one ten-thousandth of an inch, in five days they would fill the oceans of the earth! If one pair of the rabbits which live in our woods were allowed to multiply without let or hindrance, the earth would soon be a rabbit farm, and we could grow nothing on it.

Every plant and animal, then, attempts to propagate itself far beyond the possibility of its finding a place to live. Therefore, there is a struggle. Some must live and some die. If any one tree in Adrian were to produce its full crop of seeds in one year, and they all grew into trees, Adrian would be a forest. But a large part of the seed falls on "stony

ground" where it has no chance to germinate. Many fall on the sod, where they are crowded out or cut off from the lawns, and we rarely see them. Here and there one lives and grows into a tree. I suppose that not one plant in 1,000, perhaps not in 5,000, of all the possible plants, counting seeds as possible plants, ever rear themselves into maturity. Therefore, there must be a constant change and a struggle for position and for life, and the survivors of this struggle will be those individuals which are best fitted to perpetuate their kind. All philosophers since La Marck concede that there is this struggle for life. The outcome must be progress.

Another reason for belief in evolution is that we know, as a matter of fact, geologically, that the earth has changed in its physical characteristics. It has grown colder and warmer; there has been a great glacial age in which ice came down over our hemisphere and the plants were driven to the south, probably not more than ten or fifteen thousand years ago; and other changes are constantly taking place. The whole physical contour of the earth is undergoing a series of transitions and changes. The animals and plants living on the earth are adapted and fitted into the conditions in which they grow, and we know that their forms fit into chinks in Nature, and their forms therefore must be constantly changing in order to be adapted to their changing environment. The second great reason, therefore, for believing in evolution, is that the earth has changed, and plants and animals must change to fit themselves into the revolving cycles of time.

Also, in the curious distribution of plants and animals over the world, we find reasons for belief in evolution. Our own Asa Gray was the first man, so far as I know, to enunciate the theory that the distribution of animals and plants over the earth has been brought about by physical changes. Agassiz, who held out against the theory of evolution, supposed that all animals and plants were created where they are now, and created in about equal numbers as at the present time. During the early treaties with Japan, various embassies were sent there and certain scientists attached. They collected specimens of the animals and plants, especially of the Japanese plants, but also those of China and Kamtschatka, and many of the islands of the Pacific. These plants were largely sent to Asa Gray for study. He was much surprised when he brought these plants together to find that they were remarkably like those which grow upon our own Atlantic coast. The plants of the Alleghany mountains of Japan are more alike than those of any other two regions so widely separated. The plants of Japan are more like the plants of our Appalachian mountains than they are like those of California. This at once set Gray to speculating. Up to this time, 1858, Darwin had not written his "Origin of Species," and nearly all the world was lying in blissful ignorance of La Marck's speculations, and people supposed that species were created where they were found. They thought at that time that the origin of all natural forms was beyond the business of man. Considering the geological history of the world, Gray found that at one time the land ran all the way around the north pole, and that this land at that time was warm, and that plants of the temperate climes once grew there, about the north pole; elephants and lions and animals of temperate or warmer

zones roamed the world around, in circumpolar regions. He supposed that our plants thus had their origin somewhere about the pole. After awhile, the land became cold, ice began to form in a great sheet like that which occupies the interior portion of Greenland and Alaska, and this began to push down toward the south, and the glacial epoch was on.

Now, this did not take place suddenly. It extended over several thousand years, perhaps. These plants were driven to the south; driven down upon all sides of the globe, and driven further in some places than others—driven for down on our Appalachian chain, because the glacial ice went far south here. The glacial ice probably also went for down on the Japanese side, and these plants were driven down before the ice. After a time came the return to a warmer climate, and the plants went back. In the meantime, certain plants had lodged in the high mountains, and, these mountains being cooler, there they remained. And that explains the fact that on the top of Mt. Washington there are plants that are truly inhabitants of Alaska and Labrador. The plants then returned toward polar regions. After a while the circumpolar regions again became cold, and a second glacial time came (in which we are perhaps living), and the glaciers cap the northern ends of the earth. As I said, these plants were forced down, and in similar climates they persisted. While they went down, perhaps on all sides of the earth, they afterward died out in those regions, unlike their original condition, and persisted in those regions which, though on opposite sides of the globe, were similar in climate. We know that Japan and America, in geological formation and in climate, are similar; and we have here the explanation of the curious fact that the plants of eastern North America and Japan are alike.

A Danish philosopher wrote, in 1834, that nearly all species were created in one place, and at one time, but he supposed that some species must have been created in two or three different places, because they grow so far apart, and with barriers so great that one can not account for their distribution. He cites a case of plants that grew in Iceland, the Shetland islands, and the Pyrenees, and he supposed that these plants must have originated two or three times—a theory of the multiple origin of species. De Candolle also thought that certain species must have originated two or three times, and cites the cases of a curious and frail little plant that grows in America, and nowhere else in the world but the Himalaya mountains. How could this plant grow in these two remote places? Gray solved the mystery. It was driven down from the north pole, and has persisted in the Himalaya mountains and here. We now know of many similar instances. So Gray was really one of the first to propose that all species of plants had one origin, and that all distribution of plants and animals over the surface of the earth has been due to change in the physical environment.

I shall not attempt to bring to your minds any other reasons why the doctrine of evolution should be accepted, save the record of the rocks. Palæontology shows us the broken pages of the Book of Life (with more missing links than anything else), but once in awhile it shows how forms of life existed in past time.

But the most important reason for belief in evolution is that we see it every day, because we know the plant-breeder has the power to produce one variety out of another, and that all the breeds of animals came from

one original form, and yet are as unlike each other in their general characteristics as possible. We must forever overcome the idea that like produces like. It does not do so. There is no instance in the world where like produces like. There is no child like its parent, no two things in the world exactly alike, no two blades of grass which can not be distinguished one from the other.

A very important reason, therefore, for belief in evolution, is the fact before our very eyes. Looking at any two trees in our orchard, we see that they are unlike each other, and they might be still more unlike, and they might be so unlike that they would not be even similar, although grown in the same soil, from the same seed.

I can tell every person here in the room, when I have become acquainted. Every chrysanthemum, even though of the same variety, is unlike every other one. Out of a hundred Baldwin trees, every tree is unlike every other one. Here, then, is variation, difference, to begin with, and all we need is some hypothesis to explain how it is that these differences could have been enlarged and widened until they became what we call distinct varieties and species.

The first theory of evolution was that of La Marek, who wrote of animals. He supposed that the reason why animals became modified is the effects of the use and disuse of their parts. I can not enter into the discussion of it, but will illustrate this way: He saw that every animal lives in a different way from its neighbor; has different food, a different amount, and a different atmosphere in which to live. These environments or circumstances, being unlike, call for new functions or new needs to satisfy the unlikenesses. When an animal finds himself with less food, he must do more, travel further, and faster; when he is among enemies, he must have some means of protection. So, gradually, all those parts that it needs to exercise, grow, and others fall away, and so a divergence sets in. Those animals originally like each other become unlike. This philosophy remained hidden, until the promulgation of Darwin "Origin of Species," a book which "came into the theological world like a plow into an ant hill," as Andrew D. White says. Darwin's theory was built upon a study of plants and animals. Darwin was a horticulturist, and I suppose no man that ever lived has done so much for plant-breeding as he.

He considered that the gardener gets cabbages out of other cabbages; that he makes one kind of turnip out of another. Darwin tried to study out how these things were brought. It is simply by the careful selection which the gardener practices. He simply "selects" those best for him, or which please him best, and all the rest are discarded. Darwin says that Nature does just this thing. Here is struggle for life. All can not live. Nature certainly keeps those which are best. "The survival of the fittest," the result of the "struggle for existence," "natural selection."—this is "Darwinism." It is not synonymous with evolution. That was taught by the Greeks and Arabs.

It is now found by those who study animals that this hypothesis of Darwin is not sufficient to account for the evolution of the animal world, and they are reviving at the present time the theories of La Marek, and those apply more particularly to the animal world, as did Darwin's to the vegetable. If we suppose that one form grows into another because of

the effect of use or disuse or its parts, we are Lamarekians; if we believe that these forms are the result of natural selection, then we are Darwinians.

Before I go further, I wish to say that all this doctrine of evolution has no relation to religion. It does have a good deal of relation to what has been called "theology," but not to religion. We wonder how the world has been created, and we are all anxious to know. You say, "God made it so." That does not satisfy me. I want to know why. If I believe in the doctrine of evolution, it offers me an explanation of how God did make the world, and it gives me an immensely grander explanation of the creation than I ever could have had by believing in the doctrine of special creation. Everything outside of one's self used to be incomprehensible, but now everything is created for the niche which it fills in the general evolutionary progress of nature and the race.

I wanted to say something tonight about the practical matters of evolution as they touch the philosophy of the breeding of plants; but as my time is rapidly going, I will not say more about the theories of evolution, except to call to your minds the philosophy of Weissman.

These differences which I have pointed out to you as existing everywhere arise through sexual union. Weissman has proposed the theory that the only reason why sex ever came into the world at all is that the offspring might be different from the parents; for, if you take a bud of a chrysanthemum plant, you get the same variety; but, if you practice sexual propagation, all the seedlings, or nearly all, which you get, will be new varieties; and thereby we are introducing a greater variety into the world than we had before. That is probably the only reason why sex was developed. Weissman, starting on this foundation, has advanced a curious philosophy. He supposes, in the first place, all the differences arose from the amalgamation of sex; that the differences which arise after the individuals are born are not perpetuated, but are lost with the death of the individual. Darwin supposes that these differences in the individual plants and animals may arise from sex, but that they arise chiefly from the influences or conditions in which the plant grows. The plant may become smaller because it grew in a dry climate, or where there was a shorter season. He supposes that these are some of the reasons why individual differences arise. Whilst Mr. Weissman knows that these differences do occur because of the effects of the surroundings, he thinks they are of little account, and that all the permanent progress of the race has been made from the differences which arise from sexual union.

Now, before I take up for ten or fifteen minutes the subject of plant-breeding, I want to bring to your minds the differences between animals and plants. We say that animals can be bred with more or less definiteness, and we know that plants have not been bred with any great degree of definiteness. We say, if it can be done in one, it can in the other. That does not follow. Let us see. You cut off a sheep's leg and stick it in the ground, and it does not make a sheep. The Baldwin apple tree has a thousand flower buds, and every one of those has both sexes, and we cut off one limb of that Baldwin and set it into another, and we have another tree. So that a plant is not an individuality, a personality, and every one of these flowers is subjected to a different influence from every

other, and every one may have a different sexual union from every other. Sheep's legs are alike; they are pairs. No two branches of a Baldwin tree are alike. You know, when you send your boy into the orchard to get scions, you say, "Get the scions from the strong, thrifty branches, exposed to the sun." Why did you do that? Because you feel that if he gets scions from the inside of the tree, you will have a different type of Baldwin apple than from the top of the tree. That means that every branch in that tree is different from every other one.

People say we should not prune our apple trees, because nature does not prune. Nature is an indefatigable pruner. Our forest trees are tall because she has lopped off the side branches, and this she does at all times of year, without reference to sun or moon or shine. And she prunes off those that are weakest, those that lie in the shade and at the bottom, and all these trees are tall and strong because of the struggle for existence. So the whole philosophy of pruning rests on the fact that there are differences in every tree. You do not begin at the outside of the tree and take off every limb. Why not lop off the whole thing? You practice selection. You could not practice selection if all the branches were alike. It is because they are unlike that you do practice selection, and you take out the weakest or those which grow in the wrong place. If, then, every limb and joint on a tree is unlike every other limb and joint, and if every one of these limbs has a flower with two sexes of its own, you can see that it is a very different problem to breed that plant than to breed a sheep, and general rules that apply to one may not apply to the other.

Now, I wish to say that the greater part of all the vegetable productions we have at the present day are like those crops of apples I mentioned—they are discoveries. The farmer wakes up in the morning and is energetic, and he goes out into the orchard, and discovers there is a crop of apples. It was not his merit that they were there; and the greater part of the varieties are discoveries by someone who finds a tree where someone had thrown an apple or some bird dropped a seed. Still, we can breed plants, and the first thing to do is to fix in our minds a definite idea or aim of what we want to do. Now, a man can never make a successful farmer, with any credit to himself, unless he steps out in the first place, with the idea that he is going to work along definite lines; he must have theories to work by, he must first of all fix in his mind certain ideals which he wants to produce, and then he must know that these ideals are true.

I wish to indicate two or three rules which we might follow, to find out whether our ideals are true, when we are attempting to breed plants. In the first place, we should work along the line which nature has pointed out in one particular direction. There are people who would like to produce tomatoes on the potato vine, and potatoes on the tomato plant, so as to have tomatoes on top and potatoes on the bottom. Some persons have grafted them, and you have as a result a few tomatoes on top and a few potatoes on the bottom. Now, if a man wants more potatoes, he would better work with the potato vine, and so, too, with tomatoes. It is certainly more sensible, and he will be more likely to obtain results in the future. That is a very homely illustration, and yet I presume most of you have not thought of it. People are always asking for the production of some

impossible plant, while the proper thing to do is to make the best out of the opportunities at hand.

In the second place, we should breed for one thing at a time. When a man says, "I want a new bean," he will probably think of a certain size of bean or shape of color, and he bends all his energies toward that one thing, paying just sufficient attention to all the other things to keep them up to the standard; for, when he attempts to get better flavor and greater size at the same time, he will probably fail in both. Darwin speaks of breeders of pigeons trying to increase length of feathers and number of feathers at the same time, and that they have failed, while the man starting with the bird having the largest number of feathers will succeed, by selecting those with the longest feathers. We must breed, therefore, for one thing, at a time.

Another important thing is this: The character of the entire plant is more important than the character of any single specimen of fruit. Mr. Livingston, who has improved our tomato until he has given us the Acme and Perfection, says that he tried several years to produce larger tomatoes by going into his patch and selecting the largest tomatoes for seed. But, when finally he conceived the idea that he should select the plant which produced the biggest tomatoes, then he obtained the results he was after. There is sometimes a plant which produces small tomatoes ordinarily, but will perhaps produce one unusually large one; but the seed from the unusually large one may not produce others of great size. So that the practice of selecting corn from the crib, wheat from the bin, beans from the bag, is not the way to improve your crops. Bear in mind, if you will, that the garden beans have been improved more rapidly than the field beans, because the persons breeding them deal with individual beans more. There they thresh all the beans and throw them into a bin and select promiscuously. One reason why wheat and oats and rye and corn have not been improved so much as garden vegetables, is owing very largely to the same thing. They are simply selections from big ears and plump seed, which may have come from plants which did not habitually produce that character of product.

Now, the whole object of the horticulturist should be to produce new and better trees by change of soil and treatment and what not; and after that, attempt by careful selection, year by year, to breed up the varieties he wants.

I have always heard it said that crossing plants produces new varieties. It is simply a means of producing a new starting point, and when this has arisen, the process of selection should begin, and go forward so long as you desire. The different varieties of tomato rarely last more than eight or ten years (the old names remain), but we select, and the product is unlike the original production. In 1890, I introduced a new variety of tomato into commerce, and one year thereafter I got seeds from all the seedsmen of this variety, and less than half of them had the proper characteristics of that tomato. One man wanted a big plant, another early fruit; and while I introduced that plant in 1890, I do not believe it now exists anywhere as I introduced it. When I compare it with the seeds of which I had the original stock, I can not find the tomato which I introduced. Some are better; they have been improved because people have been selecting. The old Trophy, as introduced years ago, I do not believe

exists at the present time, like the old one, but probably it is greatly improved.

Therefore, so long as men cultivate will these things change. No doubt there are a dozen kinds of Wilson Albany strawberry, and I do not believe there are any of the original type. One man wants an early Wilson, and he selects his plants from the end of his patch which is early. Another man wants a late Wilson, and he selects his plants from the late end; and you will find, if you compare carefully, that almost any of these fruits, after awhile, become unlike each other, because every man who propagates them has a different idea.

The philosophy of plant-breeding rests not so much in the plant itself as in the mind of the person who sits down by his fireside and thinks out a new bean or watermelon, and is sure that he does not conflict with any of the points of the evolution of plants, and then goes into the garden and works patiently until he obtains his ideal.

PAPERS AND DISCUSSIONS.

IMPORTED AND NATIVE PESTS.

BY PROF. F. M. WEBSTER OF WOOSTER, OHIO.

America is a free country, too free, in some respects, for the perfect welfare of her people. Yet, an American may travel anywhere over the world, and find no cause to feel in the least ashamed of his country. We are a progressive people, and by all nations acknowledged to be the most enterprising, pushing, and ingenious in the world. We are all "Yankees" so soon as we leave the shores of our own country, and it is said of us that "if anyone else has anything that we can make any money out of, we are after it and bound to secure it." Nothing is too expensive for a "Yankee," provided he can swap or sell so as to make more out of his purchase than he put into it, and we are touching shoulders, so to speak, with every civilized nation on the face of the globe.

We do, though, sometimes, get more than we bargain for, or wish to receive, when we reach out over the world for the fruits, flowers, trees, plants, and shrubs of other countries, for we usually forget that with these are likely to come their natural enemies, such as destroy them in their native homes. Nor is this all, for we accord to these natural enemies full privilege to go where they please and to do pretty much as they please after getting established among us. Of all the different foreign insect pests that have gained a foothold in this country, not one has been exterminated, and but two that I can now recall have been dealt with in a manner to seriously check their spread over the country.

These pests of our orchards, gardens, and farms, fare equally well with the German, Italian, Hungarian, or other immigrants who land in New York, and better by far than the Chinaman who attempts to break into the country via San Francisco.

On the first day of next April, it will be possible for one to remove a tree from the ground in the nursery of Mr. Lipscombe of Hobart Town, Tasmania, and within the period of less than five weeks plant it out here in Michigan. April in Tasmania corresponds with our October, so that your tree would be removed from the ground in the fall, on one side of the earth, and planted out in May, spring, on the other. It will also be possible to take up a tree at Cape Town, South Africa, and within four weeks' time plant it out in Michigan, whereas, fifty years ago, it would have required months in both cases.

Now, these are two of about the most distant points accessible to transoceanic steamers, and what has been said of them may with equal truth be stated of many other localities situated far inland in Europe and Asia. Four to six weeks is not long for an insect to live in transit, or to pass in the dormant stage during which they require no food to sustain life. Furthermore, on January 29, 1889, I myself collected, in the vicinity of Hobart Town, Tasmania, a large number of twigs and small limbs of a species of eucalyptus, on which were clustered myriads of a native scale insect, probably *Ericoccus eucalypti* Crawford, which were being eaten by the caterpillars of some moth, probably *Thalpocharis*, and probably *T. coccophaga* Meyrick. As carnivorous caterpillars are rare objects in any country, I wished to secure the adults. Placing the sections of twigs and limbs with their varied inhabitants in a tight box, I took them with me to Melbourne, left them at my hotel while I visited South Australia, and on March 16, in San Francisco, California, turned them over to another agent of the entomological division of the United States department of agriculture, in good condition, so that he was able to secure the moths from them, though I could as well have brought them on home with me.

This simply illustrates the ease with which insects can, in these days of rapid transit, be transported from the furthestmost quarters of the globe to the Mississippi valley, and not be seriously inconvenienced by the journey. As a matter of fact, only a few will be likely to survive after reaching this country, but nevertheless the number of imported species of insects in the United States is now very large and continually increasing; and, what is still worse for us, when they are brought to our country their natural enemies, by which they are to a greater or less extent held in check at home, are seldom brought with them. This often more than counter balances the difficulty in becoming acclimated here, and it frequently occurs that an insect that is little if at all destructive in its native country becomes extremely so when brought over to ours. Again, an insect may reach us from a foreign shore and not be recognized by entomologists of this country, especially by such as are afflicted with a mania for describing new species, and sometimes an old offender in another country, on its discovery here, is re-christened, not only once but very often several times.

An apt illustration of this may be found in a very small thrips that has for several years seriously damaged the onion crop in many localities. It has not only been described two or three times, but placed in two dis-

unct genera, and finally turns out to have been first properly recognized and described in Russia, as a tobacco insect, so that we can not now say whether it is European or American. As it now stands, it is *Thrips tabaci* Lindeman.

A repetition of descriptions is not always, however, to the discredit of entomologists, as there are cases on record where an insect chooses one food plant in one country and another and quite different food plant in another, and the change of food occasionally, with other influences, so changes the general appearance as to render scientific recognition difficult. In other parts of the world, as well as our own country, insects transfer their attention from forest to fruit trees, or from grasses to grains, so that, as you will readily see, it is not by any means an easy matter to detect a foreign insect as soon as it lands, and the most of them are like scandals—the further they stray from home the worse they get, unless you can blot them out of existence by prompt action.

Now, this reaching out over the world for better fruits, flowers, plants, or grains is not only a legitimate business, but one that deserves every encouragement as well. If a nurseryman can find a better plum in Japan than we have in America, by all means let him introduce it into this country. But remember, please, that the United States custom-house officers will examine trees only for Chinamen and opium, and not finding such will pass them, though they may harbor all of the fruit pests of the empire among their roots and branches. However, the Pacific coast is so largely devoted to fruitgrowing, and the fruit interests are so general, it is kept pretty well guarded by local governments from lower California to Alaska. But how about the insect and fungus pests that are already established there?

What protection have you against such as now occur west of the Rocky mountains? More than that, what protection have you against those that are established on the Atlantic coast, or in Mexico. Absolutely none whatever. Let me give you some illustrations. The pear midge, *Diplosis pyrivora*, Figs. 1, 2, 3, a near relative of the wheat midge or red weevil as it is sometimes called (*Diplosis tritici*), was introduced into this country at Meridian, Connecticut, in 1877, on pear stocks from France. It was not discovered for two years, and it was four more before any attempt was made to exterminate it, and then only by individual effort; and you know as well as I how much this will amount to. It was not stamped out, but has now spread south to New Jersey and north to Albany, New York, and it is only a question of a very few years before it will probably overrun the country west of the Alleghany mountains. Gentlemen, what are you going to do about it? What indeed can you do? The United States entomologists used every effort to have this pest stamped out as soon as discovered, as would have been done in England and under many of the European governments. At the expense of a few hundred dollars at the start, our government might have stamped out a pest that will in all probability cost us millions, and still be with us.

In 1894, another enemy of the pear was discovered in New Jersey, a borer, *Agrilus sinuatus* Oliv., Figs 4, 5, 6, 7, a relative of our raspberry cane borer, that has likewise come over from France, probably having been introduced in pear stocks. This, too, is spreading out over the country so fast as it can and without restriction. While examining the parks

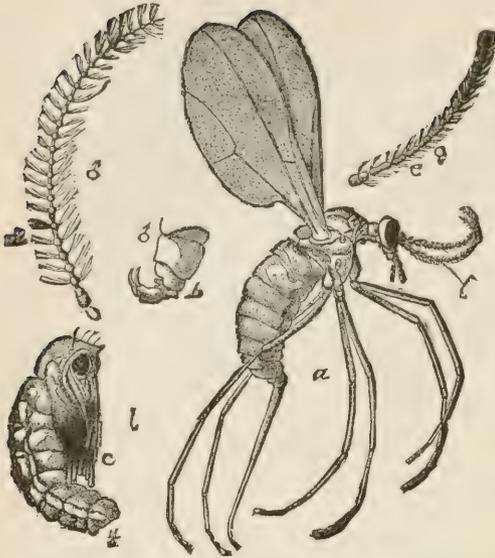


Fig. 1.—The Pear Midge, *Diplosis pyrivori*, Riley; *a*, female, side view; *b*, genitalia of male, from side; *c*, pupa, all enlarged; *d*, antenna of male and *e*, antenna of female, still more enlarged.—After *Lintner*.

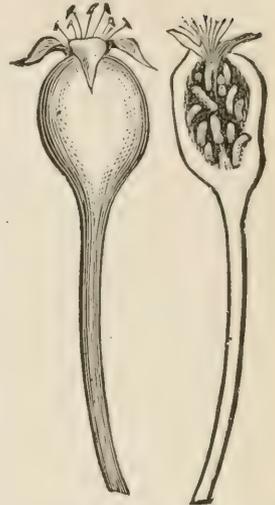


Fig. 2. Section of young pear showing larvæ; a healthy pear for comparison.—After *Lintner*.

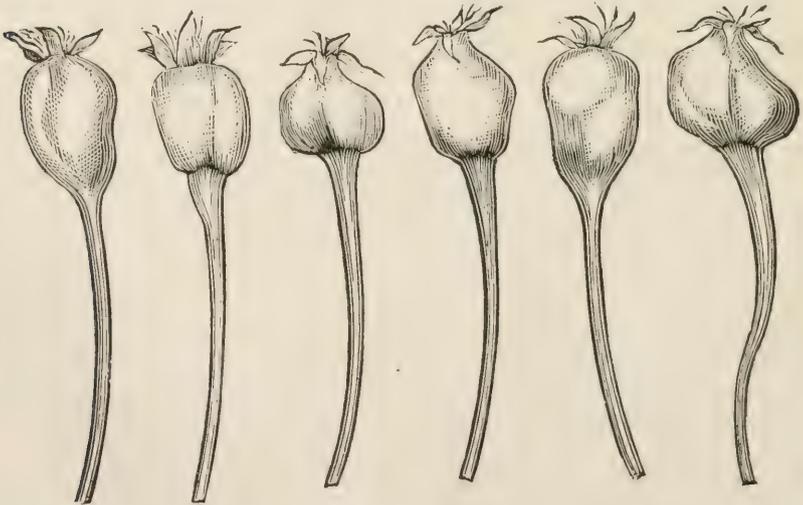


Fig. 3.—Young pears deformed by Pear Midge.—After *Lintner*.

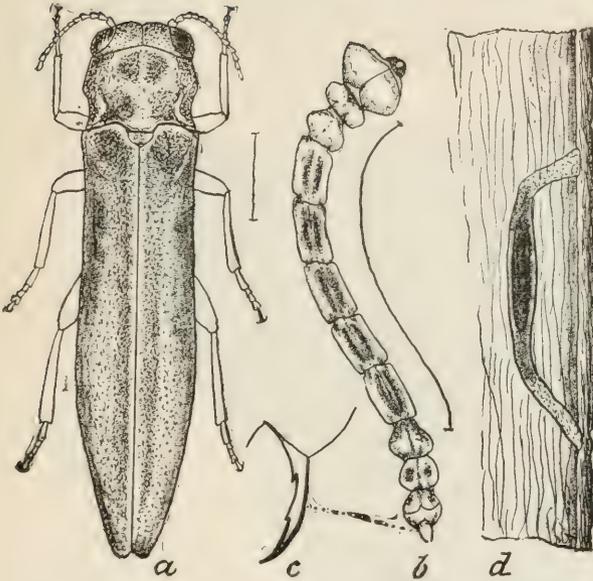


Fig. 4.—The Sinuate Pear Borer, *Agrilus sinuatus*, Oliv. a, adult; b, larva; c, anal fork of larva; d, pupal cell in solid wood.—After Smith.



Fig. 5.—Galleries of Sinuate Pear Borer in trunk of young tree. Natural size.—After Smith.

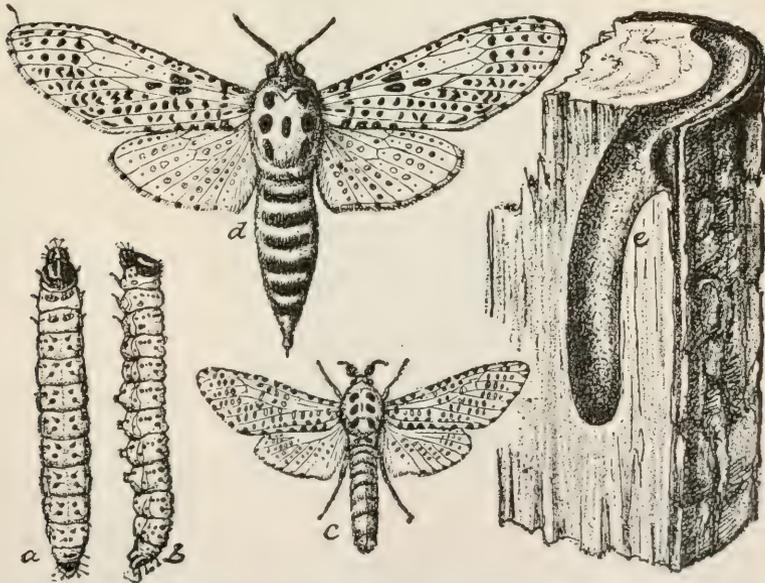


Fig. 8.—The Leopard Moth, *Zenzera pyrina* Linn. a, larva dorsal view; b, same, side view; c, male moth; d, female; e, larval burrow.—After Riley and Howard.

of New York city, in company with the entomologist of the department of public works, last September, I found that the worst enemy to the shade trees was a foreign insect, *Zeuzera pyrina*, Fig. 8, whose native home is Europe, and even yet is not known to occur in this country except in the vicinity of New York city. It is supposed to have been introduced in the cargo of some European



Fig. 6.—Sinate Pear Borer in Seckel pear tree. Bark showing burrows of larva one fourth natural size.—After Smith.

steamer, about 1880, at Hoboken, New Jersey. It is known to attack eighty three kinds of tree and shrub and the most of our fruit trees are included in the number. Eastern entomologists last summer assured me that, so far as they were aware, there was nothing to prevent this pest, also a borer, from being sent out over the country in nursery stock. The

eggs are deposited by a large miller, white with black spots, being placed in the crevices of the bark, and on hatching the young eat through into the sap-wood and then around the tree or limb, girdling it wholly or in part. In old trees the limbs are attacked, but in younger ones the main branches and trunk are preferred.



Fig. 7.—Gallery made by Sinuata Pear Borer in nursery tree; *a*, point at which stock was budded just above surface; *b*, the down burrow coming up at *c*. Enlarged.—After Smith.

The foregoing includes but three recent introductions of foreign insect pests (I could have added others) while of the older ones there are a score or more that affect our fruit and grain crops every year. There is, besides, every reason to suppose that others, that we as yet know not of, are continually being brought to us. Will the states along the Atlantic take measures to stamp out these importations? Most assuredly not! Nor, in fact, will any other states. The most of these westward bound species find in the Alleghany mountains an insurmountable barrier, and, instead

of crossing them, make their way around the northern extremity, along the south shore of lake Erie. This causes them to push their way into the Mississippi basin by the way of extreme northeastern Ohio. The asparagus beetle, *Crioceris asparagi*, has seemingly just passed through this gateway, and is beginning to spread out to the south and west. At present it covers a comparatively limited area, and if properly handled could be stamped out and kept out. But I am powerless to do anything myself, as all my time is required to carry on the work necessary to my department, such as replying to correspondents, looking after more destructive and more widely disseminated pests, etc., and assistance is positively denied me. States, individually, will do nothing. The only really serious attempt that is being made in this direction is in Massachusetts, where the gipsy moth, *Oenocera dispar*, is being fought by the state exclusively—and let me add successfully; but we have the discouraging spectacle of not only the general government but all of the state governments looking languidly on with the disinterestedness that amounts well-nigh to total indifference. You let this pest once escape from within the boundaries of the commonwealth of Massachusetts, and millions of dollars will not cover the losses it will occasion. I have personally investigated this matter within the last few months, and speak to you from personal observation regarding it.

Many of you are probably familiar with the way by which the San Jose scale, *Aspidiosus perniciosus*, was introduced from California into eastern nurseries, and from these scattered broadcast over the land. Though these nurseries unwittingly received the pest, I have ample proof that some of them sent it out to their customers as late as last spring, when they could not help knowing what they were doing, and there was not a shade of an excuse for their acts. What has occurred is likely to occur again under similar conditions. It is said of the sultan of Turkey, that he respects nothing but an ultimatum, and some nurserymen respect nothing that does not threaten their business. Some men obey the law out of respect for it, others wholly through fear of retribution.

This is the situation in which growers of fruit trees, as well as vegetable growers, are placed, with little prospect of an improved condition of affairs; for, just in proportion to the effort made to improve our fruits by securing foreign stocks, and the time required for transporting them from their native homes to this country is reduced, do you increase the probability of adding to the number of these pests, every one of which renders your business more expensive and the profits thereof more uncertain.

What can you do? For my own part, I have little faith in state laws. Under many foreign governments, laws are made to be enforced, but in ours many of them appear to have been made to be broken. In Ohio we have laws regarding the destruction of the Canada thistle and black knot, but they are void over a large portion of the state because they are not enforced. I have been told again and again by enterprising, public-spirited men, that they kept both of these pests off their premises but preferred to say nothing about the condition of their neighbors' grounds because of the trouble and annoyance in which they would be sure to involve themselves if they were to attempt to support the execution of

the law. In other words, they preferred Canada thistles and black knot to trouble with their neighbors.

The subject of state legislation against the importation or harboring of insect pests reminds me of the position of a man with a family of boys of various ages. The father says, "boys do this or that," and every boy will wait for his brother to respond, and the old gentleman will more than likely be compelled to execute his own commands, if they are carried out at all. In sections where the fruit interests are general and paramount, a state law will be enforced. Elsewhere it will not.

Having pointed out to you the dangers, what I shall say as to protection will be only suggestive. It is a problem which those most interested must work out for themselves, because they can do this far better than it can be done for them; and whatever may be the outcome, any system that they may adopt will be likely to prove more practical and ultimately successful, than if evolved by the aid of those who do not have a direct and vital interest in the matter.

It appears to me that it is not a different code of laws in forty or fifty different states that is wanted, but United States laws that shall apply equally well in all of the states, and enforced by United States officers—men who know no such things as state lines; who have no neighbors, if you please; who know no difference between the people of New York and Michigan, Ohio, Indiana, or California; men who are required to pass a competitive examination in whatever is required to make them competent to fill such a position, and besides this possess a firm but judicious temperament that will enable them to fulfill their duty with promptness, firmness, and moderation, whenever and wherever it may be necessary to do so. Let one of the duties of these officers be to inspect all nursery stock, trees, plants, shrubs, or seed before these are permitted to be landed in this country. Then make it illegal for vessels of any description, railways, or express companies, to accept for shipment any freight of this description, that does not bear with it a guarantee of its freedom from insect pests; and if found otherwise by the inspector, it shall be promptly destroyed.

Now, this may at first sight appear like a harsh measure and one that will work undue hardship upon innocent people. Let us see as to this. A guarantee is not an assertion sworn to by all of the saints in the calendar, but the statement that proper precautions have been taken to have an object just as represented; that the owner believes it to be so, and stands ready to make good anything that is otherwise. With a knowledge of such regulations in this country, it will not often occur that freight of this sort will be offered for shipment at foreign ports that will not pass inspection on this side of either ocean, and the cases where stock is condemned and destroyed will be few; so that, instead of such a law working a hardship to the foreign shipper, it will really lead him to exercise more caution in regard to what he consigns to this country, and when such consignments reach their destination here, the receiver will not only have the guarantee of the shipper, but this will be endorsed by the government inspector.

But suppose that a fruit pest escapes not only the attention of the foreign grower and shipper, but also the critical eye of the inspector, and becomes established in some inland orchard or nursery. When the fact

becomes known, an inspector simply takes charge, not of the business of the owner, but of such a portion of his property as is infested with the pest, and goes to work in an intelligent manner to eradicate it; and, this accomplished, he turns what it has not been found necessary to destroy over to the owner, with a certificate of its condition. What has been destroyed may be paid for by the government, the price being so arranged as to protect the government from being defrauded, and net the owner a portion of the wholesale value. The fact of an inspector having charge of an infested nursery would be the best assurance possible that everything that might be shipped out was free of infection, while the unfortunate nurseryman may purchase supplies from uninfected localities to carry on his business until a time when he can use his own. His customers will have no possible excuse for deserting him, and a panic among them would thus be prevented. Even if he were disposed to do so, it would be impossible for the owner to ship infested stock, and his trade would be thus retained by him until all trouble was over. Where the infection has spread over a considerable territory, much of it being private grounds, several counties might have to be managed in the same way; but, with our inspection laws in force, this could hardly occur.

Let us now pause a few moments to contrast the probable conditions to be secured by such a system, with our present condition, under no system. At the present time there is practically no protection from the importation of foreign insect pests, and if a nursery or two are suddenly found to be infested, the cry goes out that one or two nurseries in such a state are affected, and are likely to spread a certain pest. Now, this does not give a prospective purchaser the least indication of where the trouble is really located, and as a consequence every nurseryman in the state indicated must be boycotted in order that the two infested ones may be avoided. This is surely the reverse of good business management, or even justice, for it places the rascal with no reputation to lose on a par with the man who has, perhaps, spent a lifetime in building up a reputation. I do not know of a worse feature of our present method, if, indeed, it is worthy of such a designation, and I certainly believe that there can be some plan devised whereby the public can be protected from the dishonest and disreputable, without wrecking the honest and deserving in order to do so. Now, as I remarked before, this is merely suggestive. You may revise my plan and re-revise it, and re-re-revise it, until it will be as unrecognizable as the Wilson bill, yet I fully believe a system can be devised, and will be some time in the future, that will protect our people from both the carelessness of the foreign grower and shipper and from each other. The cost to the government of sustaining such a system need not be more expensive than the revenue service of a single one of our more important ports of entry, and would not only protect the fruit interests, but save many of our prominent nurserymen who continually import their stock from any amount of worry through fear of innocently importing foreign insect pests.

There is but one more phase of this problem, to which I wish to call attention, and that is the importation of foreign parasites. There is so much misconception in regard to this that I trust you will pardon me if I take time to fully explain the matter, which is one with which I have had an intimate connection. As I have stated, many of the foreign insect

pests that are brought to this country do not bring with them their natural enemies that hold them in check and prevent serious damage by them in their native homes; and when established here, and before our native insects learn that they are fit food for them, they work their ravages unrestricted. It does not require any great ability to at once see that, if we can bring these natural enemies to this country and place them where they will find their natural hosts in abundance, they will follow the same course that they did at home, and overcome them. But when we go to a foreign country and get insects to prey on others that are indigenous here, and with which those imported have had no previous knowledge (do not know that they are suited for eating) you have an entirely different problem; and the chances are that such importations will fail, because the strangers will perish of hunger before they can adapt themselves to new and strange kinds of food. In the case of the cottony cushion scale of the orange, *Icerya purchasi* Maskell, it was found that Australia was its native home, from which it was brought to California, but that it was far less destructive there than in America, thus showing that something was holding it in check in its island home. These natural enemies were investigated by direction of our government, found, and imported to California, where they at once began to feed upon the pest; and, finding an abundance of food, increased so enormously as to overcome the scale and save the orange industry of that state. But had the Australian governments attempted to introduce insects from this country to destroy it there, they would more than likely have failed. I mention this because I am so often asked why we can not import insects to kill such other insects as the striped cucumber beetle, squash bug, and canker worm. In the one case we are aiding nature, while in the other we are going directly contrary to her well-established usages.

In your discussions, gentlemen, I will ask you to confine yourselves directly to this phase of the subject of injurious insects (those that are being or have recently been imported) because in a second paper I shall deal with those that are natives of this country, or have been with us so long that they have become thoroughly naturalized and acclimated.

OUR HOME-GROWN PESTS.

Under this caption I shall include only insect obstacles, as there are far too many others with which the fruitgrower has at present to contend, to admit of even an annotated list in a paper of the customary length. It seems to me that horticulture includes within its scope every natural science known under the sun. The horticulturist must be a botanist, entomologist, ornithologist, meteorologist, chemist, and goodness only knows what else, in order to profit by the elements among which he is placed, and with which he must contend, or from which he derives his profit. Science can do much to enlighten him, but outside of them all there must be an unfailing supply of "gumption" on his part, as well as a disposition toward thorough effort and prompt action. Some men are scientific without knowing it, and would deny the charge of being such. One of the most practical and successful fruitgrowers of my acquaintance is comparatively uneducated, and I have often wondered what he would

have been could he have obtained an education in his youth, for he is well endowed with practical good sense. Now, what I mean by this is that the entomologist or botanist can do much to aid in the prevention or suppression of insect and fungous pests, but there is a point beyond which neither the realms of botany nor entomology extend, and the problem becomes a question of effort—not one or two people, but of a whole community. I may give you information as how best to fight the codlin moth, but can not compel you to follow it, nor can I compel your neighbor to do so, even though your whole crop is threatened by his negligence.

I wonder how many of you have considered the matter of old, antiquated, and nearly or quite worthless orchards, or the remnants of such, that were planted out a half century or more ago, and are now scattered over the country. Very often they are off back in the field somewhere, just a few trees, gnarled, twisted, and leaning, the tops a labyrinth of watersprouts of all sizes and ages, the fruit, when there is any, small, knotted, covered with scabs and full of worms, both tree and fruit veritable nurseries for all manner of insect and fungous pests of the apple. If we search about, we shall find broken bricks and pieces of earthenware, the latter with pink or blue colored ribbons on them. The hands that planted the trees are now folded on breasts within which the hearts have long ceased to beat, and the recollection of those old faces stirs within us some of the noblest feelings of manhood and womanhood. It is no wonder that the old trees are allowed to remain, nor can we but look upon their destruction with sorrow. Now, we either ought to carry our reverence a little further, and care for these monuments of a generation fast passing away, or we should remove them, for every one of these old orchards is a menace to every younger and better one in the neighborhood. If cared for and sprayed annually, it would certainly improve their appearance, and reduce the total number of codlin moths, borers, tent caterpillars, and many other destructive insects in a neighborhood very materially.

Then there is another matter that does not in the least appeal to our sympathies, and yet is even more conspicuous than the old orchards. I refer to the roadsides and jungle of weeds and plants that line them as well as interior fences. Not only do these afford breeding places for such insects as affect the plants growing there, but myriads more find shelter during winter, and have only to wake up in spring and make their way to the adjacent orchards, vineyards, and fruit farms, and there work their will. Is it not strange that people will overlook the fact that fire, when used under proper conditions, is one of the very best insecticides we have? Sheep are almost as good, and I have wondered if it had ever occurred to any of our people that the removal of the tariff on wool could have had any effect on the occurrence of destructive insects. If roadsides, fence corners, and similar places were to be burned over every fall, all or nearly all insects that had taken refuge among the grass, weeds, and brambles, as well as many of the inhabitants of these, would be destroyed. So, also, a flock of sheep, if given the range of the roadsides and fields in the fall and winter, remove all grass and weeds that serve to protect injurious insects during the months of hibernation. Of course you can not give sheep the run of young orchards or grounds where young vines and shrubs are growing, but you can give them the range of waste places, and in

some localities they will find food there during most of the winter. Therefore, the axe, fire, and sheep may all be employed in removing one of the obstacles to profitable fruitgrowing. If you ask me what particular insects are likely to pass the winter in the places just mentioned, I will say that the red-necked agrilus, *A. ruficollis*, that causes galls on the canes of raspberry, blackberry, and dewberry, often working serious injury to them; the raspberry root-borer, *Egeria rubi*; the plum curculio, *Conotrachelus nenuphar*; the apple curculio, *Anthonomus quadrigibbus*; possibly the codlin moth, *Carpocapsa pomonella*; and the possibility will reach a reality if seedling apple trees are growing up among peach and cherry trees, all in a half wild condition. And, in fact, if these last occur, you may safely multiply the number of insects by ten. I never see a barbed wire fence take the place of an old Virginia worm-fence, with its rod of jungle along each side, without feeling that the cause of economic entomology has been aided, and just that much done toward keeping injurious insects in check in that particular neighborhood. We are all of us familiar with that old threadbare anecdote of the fellow that had a leaky roof. When it rained, it was too wet to fix it; and when the weather was dry, it did not need any fixing. We all laugh at the ridiculousness of this, but there are thousands of fruitgrowers that are practically doing almost the very same thing. There comes a season when the apple crop is almost a failure, and the codlin moth is consequently greatly reduced in numbers—almost exterminated, in fact—for want of apples to breed in. During such years, when I go about the country and ask people if they are spraying for the codlin moth, they look at me in blank astonishment, and say, “there are not apples enough to pay”; or, “is it not bad enough to lose a crop without adding the expense of spraying?” Again, insects have their ups and downs—seasons of great abundance and others when it is said that there are none. Natural enemies and meteorological conditions render the situation with reference to the numbers of most of our injurious insects much like that of a child on a teter-board; now it is up and now it is down. How many fruitgrowers are there who, when insects are at the top in number, say it no use to try to fight them, because they are so abundant; and when they go to the bottom, so to speak, that it is not necessary to spray or fight them, because there are not enough to do any harm! It is the story of the man with the hole in his roof, told in a different way. When there is almost a total failure of the apple crop, it is the very time of all others to spray. Ten times more good can be done with the same amount of labor during such a season, than can be done when the codlin moth is present in great numbers. When an insect is reduced, through natural causes, to the minimum, is the very time of all others to fight it, with all your might, with artificial measures. Your enemy lies bound and almost helpless before you, and without effort on your part, yet you are not willing to make the effort to restrain them. You say such and such insects are gone and will not return. But they have done this again and again in the past, and always returned and worked as much or more injury as before. Just in proportion as insects are reduced in numbers through natural causes, just in that or a greater proportion should every one redouble his efforts to vanquish the remainder. It is right here that “gumption” and science are needed in about equal

quantities. Of what value will all the scientific knowledge in christendom be to you if you will not use it intelligently?

When I refer directly to you, I do not mean that the people of Michigan are any more negligent, or differ in this respect from those of other states, or in fact from the people of other countries, because I have the very best of proof to the contrary. These appear to be weaknesses that characterize the people everywhere; and I can not understand why it should be so. Scientific men are continually and forever being reminded that they are impractical; and they are, some of them. But in this and hundreds of other cases there is a failure, among what we might with propriety term one of the better classes of people, to use the results of scientific research to practical advantage. It may be because we are continually living among these insects, and that familiarity *does* breed contempt, that we are so negligent, and fail to do that which our own judgment is continually whispering in our ear we ought to do, as a matter of justice, not only to our neighbors but to ourselves also.

The easy-going neighbor: He is usually a good fellow with a big, warm heart; a man you can not help liking, whether you will or no. If you are obliged to borrow, he will lend with a spirit that will, somehow, make you feel as though you were granting a favor instead of asking one of him. If you or your family are ill, he or his will be at your bedside, asking only for the privilege of being of service to you. If death visits your family, he will pour into your ears words of sympathy and consolation that will soothe and help to heal the bleeding wound in your heart, because you know that he is sincere, and every word comes from the very bottom of his soul. But he is easy-going. He plants out his trees or shrubs, but does not care for them properly. His old orchard, back on the knoll, is neglected; his roadsides and along his fence borders are grown up with an interminable tangle of weeds, brambles, and bushes. He promises, again and again, and fully intends, to make an effort to destroy the insects or fungi on his trees, when you ask him to do so; but he does not. When you point out to him that he is raising insect pests that will come to you and destroy your property, and ask him to take measures to prevent it, he really means to do as you wish, but simply don't. You ask him to cut the black knot off of his cherry or plum trees that are just over the fence from yours, and he says, "yes! why, certainly," but he does not do it.

Now, what can you do with such a man? You will bear with almost any amount of neglect and procrastination, rather than speak the words that will cause his injured soul to look out to you through his eyes in reproach. You do not wish to, and will not, wound his feelings if you can by any possible means avoid it. Why does not this neighbor of yours rob you? Why does he not set fire to your buildings? Why does he not rage at you and attempt to take your life? Because he has been taught from the cradle that these acts are crimes and grievous wrongs. In his childhood he was trained against thoughts that would prompt such deeds, and in manhood his mind has been so steeled against them that it not only requires no effort to restrain himself from committing such crimes, but he would be horror stricken at the very thought. He is the easy-going neighbor, just because procrastination has ruled the man until he is not his own master. Having never been compelled to do certain things, he can not find in himself the power to do them of his own volition. But once

let him become fully aware that such things must be done, and he will not only do them, but that, too, without hardship. The fact is, we have grown up from childhood, perfectly innocent of the fact that it was a wrong to allow destructive insects, fungi, or weeds to spread from one farm to another, or that it was possible to prevent it, and in manhood we have gone on letting ourselves and each other neglect doing that which is becoming every year more essential to our mutual protection. Is it not that in this whole matter we are like overgrown children, that have been reared unrestrained, and now feel that restraint is an infringement on our individual rights, that it is not really the thing itself that stands in the way, but the feeling that such efforts are not strictly necessary, and no serious wrong would result from a failure to make them? It is never so hard to do something that we know must be done, as it is to do another, or even the same, act with the feeling that it is not necessary, and there is no power behind to compel us to do it.

The necessity of combined effort in fighting insects has come to us gradually, and we can as yet look at it only as a personal matter. Let the United States require a five-cent revenue stamp to be placed on every promissory note, and the stamp will go on all such, and without any procrastination about it. Your easy-going neighbor would spray and disinfect his trees and plants, and care for them in a manner that would protect yours, just as promptly and willingly as he would place a five-cent stamp on his note, if he knew that he had to do so.

Possibly you have also a neighbor who is slovenly, stubborn, and ill-natured, one who will make himself very disagreeable on slight provocation, and who, as in some cases that have come under my observation, threatens to shoot any person who comes upon his premises to inspect his trees or treat them for insects or fungous pests, that menaced the interests of his neighbors. In Massachusetts, where they are fighting the gypsy moth, men who are employed in this work by the commonwealth can go anywhere and are armed with full authority to search any man's premises, and do so; despite which, shocking casualties do not occur. No one thinks for a moment of molesting these men. Again, in Adelaide, the capital of South Australia, a city about half the size of Detroit, there was not, in February, 1889, a single tumbledown house or rookery to be found. Why? Because the government would not allow such to stand. If anyone wished to build, he must construct a reasonably substantial building, large or small as he desired; but, having once erected his building, he was compelled to keep it in good condition, and the day he ceased to do this the government would take it in charge, and either repair and compensate itself out of the rental, or else tear it down. Nobody here thought of maintaining dilapidated buildings, and the law is obeyed willingly and without hardship, because every one knows in advance what the termination of an attempt at an evasion of the law will be, and no such efforts are put forth. Your irascible neighbor will not shoot nor harm anyone, but will obey the laws promptly and willingly when he once learns that he must do so.

Now, you say, I am talking to you of men when I was supposed to have prepared a paper for you on the subject of economic entomology; and so I have. But for the last fifteen years, every problem in practical entomology that I have attempted to solve, has sooner or later ceased to be

such, to a large degree, and become a problem in social dynamics. The question of what an insect will do is not a difficult one, after we have learned its full history and habits, but what men will do toward controlling its movements or preventing its ravages is at present a more complex question. It is a question that has come to us with the growth of horticulture as a profession, and the increase in population, and it seems to me that it will continue to force itself upon us more and more as these factors increase in importance, and I am speaking to you with an eye to the future as well as the present. And, while this subject may at the present day be more important in some states than in others, it can not be termed a local one, and is, therefore, of a national character. You can spray your orchards in spring with arsenical poisons, for the codlin moth, and destroy by far the larger percentage of the first brood of larvæ; but your neighbor on either side of you, who does not, will surely add materially to the second brood, which you can not fight at all. We know that the plum curculio will scent out a plum orchard for miles, making its way against the wind which brings the odor. I have seen rose bugs, *Macrodactylus subspinosus*, emerge from a patch of sandy land and make straight for a peach orchard and grape vineyard, both situated on clay lands, where the pests can not breed. Last year, in the grape vineyards, in the famous Euclid district, while fighting the grape root worm, *Fidia viticida*, almost from the start people began to ask me if, after they had conquered the pest in their own vineyards, it would not come from the others, as it most assuredly would.

I do not mean to say that we can overcome the insect pests of our orchards and farms by making laws against them, or harboring them, but it seems to me that we have carried individual efforts far enough to now demand something more. The use of arsenical poisons, as we now apply them, has passed the experimental stage, as has also the use of kerosene emulsion, where, from the nature of the insects we wish to destroy, poisons can not be used. I am quite sure that in the future carbon bisulphide is to work wonders in the management of subterranean insects, just as it has revolutionized our management of those that attack stored grain, and which a few years ago we were absolutely unable to destroy. How many of us have read, again and again, the old recipe for destroying the weevil in barns, viz., burn the barn. Now it is one of the easiest things in the world to clear a bin or elevator of grain-infesting insects. I am satisfied that future experiment will develop some way of using this carbon bisulphide in a manner to destroy many of our root insects. There are, indeed, many ways whereby we can improve the methods to be used in individual efforts to destroy insect pests, but it looks to me as though we had arrived at a point where we are much in the condition of a detachment of an army that had pushed forward to an advanced position, which it might properly continue to hold and strengthen while the main body was being brought up and into line. So far, since the fighting of insect pests began in this country, it has been done by a comparatively small detachment of the great army of horticulturists, and it looks as though it was about time that these last should be brought into action, to aid and support those who have been for years in the front, and alone at that. It is true that we have very much to learn about fighting insects, but we have acquired a sufficient amount of information to

warrant a much more general application than at present is secured. The horticultural interests of this country are becoming of vast importance, too vast to be threatened without more than individual protest to offer protection, and those whose interests are at stake have a right to demand that their business shall receive public recognition. In some states, laws are being passed by the respective legislatures, for the protection of horticultural interests, and county commissioners are being chosen to see that such laws are duly enforced. Now, this is all well enough, so far as it goes, and where fruit interests are paramount will probably suffice. But the poor fellows who go into localities where this is not the condition of affairs will reap no benefit. Even if county commissioners are there selected, they will more than likely not half do their duty if at all. Very few of us care to acquire the ill will of our townsmen, even in championing a measure that we know to be a commendable one, and you can hardly expect to make a man a commissioner and have him willingly do that which you would yourself shrink from doing. It is asking too much of human nature. Would it not be far better to place the whole matter in the hands of the national government, and make the system a part of the one designed for preventing the introduction and diffusion of foreign insect pests, as indicated in my paper relating to that matter? You may think me a crank on this subject, but I have been among farmers and fruitgrowers all my life, and during the last fourteen years have seen more or less of insect depredations in many parts of the United States and Australasia, and I have not been encouraged by our attempts to compel decisive measures to be taken by those who did not wish to do so, and have seen these very measures enforced by governments less powerful than a single state here in America. More than this, the people of at least one of these foreign governments have shipped apples nearly or quite 10,000 miles, and placed them on the market in the city of Toledo, almost at your doors, and besides are keeping American apples out of the English market. I have been buying fruit for the use of my family for the last twenty years, and never yet saw a time when I did not have to pay a good price for a first-class article. There is and always will be a demand for good fruit, but you can not raise a crop of fruit and a crop of insects on the same tree at the same time, and make money out of the transaction. You can kill your own insects, in the majority of cases, but there is nothing that you can apply to keep those your neighbor raises from coming to you, unless you can prevent his raising them at all.

In conclusion, let me say that I did not infer that you wished me to come before your society and tell you when and how to spray; to tell you that you must cut the borer out of your peach trees; to tell you that you could not poison the woolly aphis, and other similar things that you can get out of almost any horticultural book, experiment station bulletin, or even agricultural paper. I knew that you had many old veterans among you that knew as much as, and possibly more than, I do about such matters, and I thought I might safely take this advanced position. Besides, I did wish to tell you some things about the introduction of foreign insect pests into this country, as it is going on today, and point out to you what appear to me to be the greatest obstacles to the growing of fruit profitably. Obstacles that must, it seems to me, increase rather than decrease in the future, unless you can compel those about you to respect

your calling and not continue to rear up numberless foes to destroy the fruits from your orchards, vineyards, and farms. I have taken this somewhat advanced position because I know that more than one horticulturist and nurseryman has had his face turned in the same direction, recognizing that the questions that I have brought before you are the coming important ones of his profession.

DISCUSSION.

Mr. Morrill: This most excellent paper treats of an enemy that is very insidious; an enemy that gets possession of our trees almost before we know it, and they are the most puzzling things we have to contend with, except, perhaps, the fungi, which are of somewhat similar character, so far as our business is concerned. Now, I hope, as long as war has been declared on these insects and we are all looking for some means of fighting them, that you will take up Prof. Webster's papers and discuss them thoroughly.

Prof. Taft: I would like to have the Professor tell us something about the San Jose scale.

Prof. Webster: There are some things I know about it and some things I don't. I don't know where it came from. We have it in six orchards in Ohio. How many more, I don't know. I know how it is being managed in those orchards and that it will never go any further, because I drop down upon those orchards every few months and go through them before I go to the houses. It is without doubt one of the worst pests that can get into an orchard, and the most difficult to get rid of without destroying the trees.

The worst infested orchard we have, when I first learned of it, had probably about one hundred affected trees out of, I think, six hundred. That was last December, not quite a year ago. Before spring the owner had cut out seventy-five, I think, and burned them, and the others he had treated with kerosene—clear commercial kerosene, but he didn't do that with my recommendation. I told him probably he had killed the scale, but that I did not know about the trees; but it didn't kill the trees. It does not seem to have done any injury to them whatever.

Mr. Morrill: Pure commercial kerosene oil?

Prof. Webster: Yes sir.

Mr. Millard: How did he apply it?

Prof. Webster: Went over the trees with a paint brush.

Mr. Morrill: What kind of orchard was it?

Prof. Webster: Apple—I find them principally on the apple. I can explain that if necessary, and why it has occurred in that way. The owner treated with kerosene, with the idea of grafting into the stump. That is, he would by this means save about 18 inches of the old trunk with root, and he thought he would get a top without delaying bearing more than a year or two. Some of his trees were so far gone that they died, and others he grafted, as explained. It worked all right, so far as we could see; that is, the grafts grew all right, but there was one element he didn't take into consideration. That was, the grafts had so much root backing them that they sent up a growth that was very rank and brittle, and the winds would twist them off, almost invariably, so that we decided to adopt another plan. Instead of cutting them off two

or three feet above the ground, the owner simply cuts off the limbs, letting the stubs be, perhaps, six inches long. That leaves simply the bare trunk and a few stubs of limbs, and this has worked much more satisfactorily. I saw the orchard three weeks ago, and while the scale is not entirely killed it is pretty nearly used up; and as he proposes to take the same heroic method this year that he did last, I venture to say that there won't be many living scales in the orchard next spring. The trouble is that they will get lodged in the old trees. If a man will tell me where he bought his trees, I can trace it back to the nursery, but the trouble is in learning of this; and if you don't stamp it out promptly, it will spread from one tree to another, and perhaps get into the forest trees where you can not manage it. We have had a good deal of contention with some nurserymen in the east (in fact, I have done nothing but fight for the last year), and I have had my hands full, but I believe we have got it now where it will be kept down. I know of one nursery that did send it out last spring. I was told in Massachusetts that this scale had been found last summer on trees sent out last spring. I don't know how closely these people have to be watched, but they are watched in New York very closely, and they know they will be exposed if it is attempted to send out infested stock; and anyone with a reputation won't do it anyway; and as to those who haven't—there are three or four entomologists who will try to see that they don't.

I don't look for much of the scale to be sent out from the east, but it is an important matter that we should know where it has become established, and destroy it.

Q. Do you think kerosene is the best remedy?

A. I haven't anything to say about that. It did work in that one case, and I can not see that it did any injury.

Q. What is your remedy?

A. I would use a whale oil soap mixture, say $1\frac{1}{2}$ pounds of whale oil soap to a gallon of water. Use that before the buds put forth in the spring and after the leaves drop in autumn.

Q. Is that the regular solution, or would you use it a little stronger?

A. You can use two pounds to the gallon (I think $1\frac{1}{2}$ is about right), just before the buds start in the spring. Get it into every little crevice and crack in the bark and then you can reduce the area to be treated by pruning the tree back as much as you dare to if the tree is worth saving.

Q. Do you apply it with a spray?

A. You can do it thoroughly with a sprayer; if it is badly injured it is better to burn it anyway, because, if you will open the bark, you will see that the inner bark has a blood-red color; the insect sucks the sap, and where it does this the bark is diseased. Even if you succeed in getting your tree to live, it will not be healthy. It will pay better to pull it up and burn it if it is seriously injured. But where you attempt to treat it, prune off the limbs and then treat it with the whale oil soap mixture. It is in the trouble of getting around to do it that the difficulty lies, and what I am afraid of is this: There is nothing to hinder their becoming established alongside of a nursery, by some careless fellow, and the owner of the nursery be perfectly innocent; and yet, the first thing he knows, he has this trouble in his nursery, and for which he is in no way responsible. My greatest fear is that it will get started in that way.

Mr. Smith: Will you please explain this scale so that we will know it?

Prof. Webster: If I had known you were going to want some such information, I could just as well have brought some twigs with me, some I have baked pretty thoroughly; but there is nothing in America to which I can compare it, and nothing that you could readily confuse with it. The insects are very small, round, and flat, and cover the tree thickly wherever they become established. They have a gray appearance. The scurvy bark-louse is larger, and spreads out less compactly over the tree. These form compact masses, or gray patches; and if you take your finger you can scrape them off, like scurf, and among this there will be little yellow particles which are the young. That is the only way I can describe it to you. I only regret that I did not bring some with me. If you once see it you can not mistake it.

This (exhibiting illustration in the Annual Report for 1894) is a good deal enlarged of course. Those on the fruit are larger. But these you will notice particularly at this time of year will be on branches or twigs, and of this shape. The figure in the upper left hand corner shows the form, only greatly magnified. A full-grown female is not larger than the head of a pin. The male only has wings. It spreads by the young being carried by the winds or on the feet of birds, as the young get on their toes and are sometimes scattered in that way, though not often. I can clearly trace it to the action of the winds.

Mr. Willard: I would like to ask if they are similar in their habits of reproduction to the oyster-scale bark-louse, the eggs being laid in the fall and the parents dying?

Prof. Webster: They do not lay eggs. The young are hatched in the body of the mother, and they reproduce by giving birth to young. They lie dormant in winter and begin to reproduce in the spring.

Mr. Williams: Has this scale been discovered in Michigan orchards?

Prof. Webster: I don't think it has been reported.

Mr. Morrill: There are other scales that were shown at the meeting of this society at the Agricultural College, of which considerable was said, in New York, and it was shown there as coming, I think, from Port Huron. Prof. Davis had that sample, a thick mass of them on a limb, and then he had samples of elm scale which he got somewhere near the Agricultural College grounds, but I don't know whether they attacked the fruit trees or not. Perhaps some of these scientific gentlemen can tell us about that.

Mr. Williams: Is there probably a certain latitude north of which this scale will not work? Has it been officially defined, so that we could feel sure that our Michigan climate would be too severe to allow of it troubling us seriously? Is there any such encouragement for us?

Prof. Webster: It has been suggested by entomologists that there is a line beyond which it would not live. But it has been found beyond this line, and that, too, on the experiment grounds of an agricultural college. It is not living there now, understand, by any means. It will live as far north as northern Idaho. Of course, the climate may be milder there than in some parts of Michigan, but I would be very cautious on banking very much on latitude or climate. I don't know of its occurrence north of Massachusetts, except in Idaho and on the Pacific coast. It occurs there clear up to British Columbia; but you know the influence of

the black stream of Japan has the same effect on the Pacific coast that the gulf stream does on the Atlantic. I should say, though, that it was very likely to spread in your latitude.

Mr. Morrill: Wasn't that a very proper thing, if there was a questionable climate for the San Jose pest, for him to test the matter by locating himself on the experimental grounds? I don't suppose he had a fair show though there, so far as climate is concerned; they probably made it too warm for him.

Mr. J. J. Harrison: This idea of Prof. Webster, of having governmental supervision of this matter of insect pests, I think is a good one, and not only ought to apply to that, but many other things that the state assumes as its prerogative. I, for one, am heartily in favor of the idea of the general government taking this matter into its hands, and enforcing such laws as are adapted to destroy or check the various insects that are preying upon our fruits. I should think the national government ought to take hold of this matter and assume the entire control, not only of precautions against the introduction of insect pests, but also of the keeping in check of our native pests.

Mr. S. D. Willard: I have been very highly interested in the paper that Prof. Webster has given us. I think he has suggested some opinions rather in advance of the rest of us, but we must have some leaders, some who keep just a little ahead of us, because the masses of us are in the dark, anyway. Now, I have suffered greatly, not so much from my own neglect as from my indifferent and neglectful neighbors who have kept hedge rows and old orchards and everything else, as breeding places for everything in the way of noxious insect life. I have pleaded with them, but you might as well talk to the town pump. That is just about all there is to it. They are absolutely indifferent; they don't mean to be bad; they are the kindest and best neighbors in the world, ready to lend anything they have (or borrow anything you have); but that is the typical man as you find him scattered throughout my state. We have enough of them, anyway, and I presume you will find them everywhere; and we are suffering today from such causes more than we are from any neglect of our own. I now speak of intelligent fruitgrowers. But what are you going to do about it? We are a slow, conservative set down in New York. We have to get away to get new ideas, and the further east you get the worse it is. It has been the most difficult thing in the world for us, in the state of New York, to get a law passed (it is now in operation) for the destruction of black knot, yet there is no place in the world where they have suffered from it to the same extent. I can remember when the Hudson river was lined, all along the banks, with the most beautiful plum orchards you ever saw. I took my cue from what I saw there; and yet, today, there isn't a single live plum orchard on the banks of the Hudson, but you can ride as far as you please and find fence rows and relics innumerable of the old orchards, filled with black knot. They are unwilling to burn up what they have left. Cultivation of the plum and sour cherry on the Hudson is hard to handle. If there had been a good man there, up to times, and with the right ideas, his surroundings and environment were of such a character that he would have been powerless, and so the thing has gone, and we are suffering upon the lines indicated by Prof. Webster. A few years ago, I myself determined that there

should be some legislation in our state, in regard to this black knot. I was suffering severely, with others, from the influence of some black knot in our neighborhood. The owners wouldn't do anything and would not allow me to. I offered to burn it up, but to no effect; finally I made up my mind that they would come to time; and, even with the man we had for governor, we did get a law passed, and in our county the commissioners were lashed up to their work, and we had a house-cleaning such as Ontario county had not had for years; and the result is that there has been a great reduction in the amount of black knot found in our plum orchards. I don't know about the idea of our government taking hold of this thing. There are a great many complications in connection with all this, and it seems to me that right here in our own state—in every state—we ought to be able to have laws enacted which would cover the case, so far as we are concerned. Our environment is different in the different states. New York and Michigan are on the same level. We have climate and soil very much alike, and above all, we have a homogeneous people; but in my opinion we ought to be able in our own states to take hold of these matters, and have such rigid legislation as would control this thing. Perhaps it would be better for the general government, but it seems to me that there are obstacles that would be dispensed with if we could create a public sentiment that would keep in force whatever measures might be required for the extermination of these pests. They are multiplying faster than we are aware, and it is perfectly marvelous. I do not think that you or I have any comprehension of the rapidity with which all these insect pests multiply, and how difficult it is to restrain them in their efforts to set aside our work. This thing certainly needs to be taken hold of; public sentiment must be worked up, or we will have to go under. We are in a good deal better position as horticulturists than the agriculturists. Public sentiment is growing in the right direction, people are becoming educated, and they are going to consume a good deal more of these choice fruits than in the past. We are going forward; let us go in the right direction.

Mr. Peter Collar: These laws that we have now are too local. Men in townships are appointed, but they are afraid of offending neighbors, and I am in favor of having laws that are not quite so local in their character. I would like to ask what chances there are for a man who sprays his orchard and is surrounded by neighbors who don't spray? Are his chances any better than if he didn't spray?

Prof. Webster: Of course his chances would be better with some things than others. As I said in my paper, he can destroy the first brood of codlin moth, which does the greater amount of damage; but men have sprayed large orchards—thousands and thousands of dollars at stake—have sprayed thoroughly, and then sent to me to know how it was that their fruit was wormy. Their neighbors had not sprayed and they had furnished more or less of the moths that had gone over and produced a second brood. There is a case where you can do a great deal for yourself, but can never get rid of the injury until your neighbors join with you. The same is true as to curculio. Of course you can watch your trees, and it does not take any longer to jar for your neighbors' curculios and your own, than for your own separately; but, understand, if your neighbors didn't raise any, and you didn't you wouldn't have to jar at all. I should

say that, in most cases, perhaps seventy-five per cent. of good could be done by spraying your own orchard whether your neighbors did or not, but that other twenty-five per cent. will hang by you forever. I don't want you to hesitate to criticise my papers; that is why I presented them. I have no axe to grind, and I have just come from a crowd that I was very much more afraid of; I thought at times they were going to throw me out of a window; it was a crowd of two hundred nurserymen. I am working, with other horticulturists, for your interests. There are certain of your interests that I look upon as being in my keeping, and if I don't look after them the state has no use for me, and would be better off without me. I want to get your ideas. What I have thought out with the twenty years' experience I have had, may be in part wrong. As I say, you can revise that scheme of mine, and re-revise it, and the more weak points you can suggest, the better I shall like it, because that is what I am after.

Dr. Thomas: I am interested in this matter, though engaged in other business. I often think, when a question of this kind comes up, of the convention the mice had, one day. They thought it would be an excellent idea to put a bell on the cat. She was too sly for them; they had a convention and the vote was unanimous to bell the cat. Then one little fellow stood up and asked, "Who will put the bell on the cat?" And of course that knocked the whole business out. Now, then, I have had some experience in other directions, in regard to passing laws. You know it is an easy thing to pass a law, but the trouble with the American people is that they are all law and no execution. In Europe they pass laws and they carry them out every time. In the United States laws are passed, but they are seldom carried out. The statute books are full of them on the temperance question, on noxious weeds, etc. Michigan has a strong law in regard to noxious weeds, Pennsylvania has one, and I dare say New York has one, but no one pays any sort of attention. We have weeds right in the city of Adrian, within the city limits, that produce seed enough to seed the whole state. What are we to do? Do just what this gentleman from New York says. You can't accomplish anything of that kind until you get up a strong public sentiment. In Europe the officers are in league with the government. In this country they are in league, largely, with the evil-doer, and how can you expect the laws to be carried out? I believe what you are doing this week is the right thing. Help to start these societies in every part of the state. Meet with them and talk with them, and eventually you will create an interest; and then, if a law is passed, it will be carried out. But to pass a law in Michigan today, that the old orchards are to be taken down and the homes of these insect pests destroyed—no one would pay any attention. Even the good state of New York could not do it and has not done it. The gentleman who read that paper has presented the question—a thing that stands in the way of our cultivation of fruit, either for personal benefit or for profit. It stands straight in our way, and we will have to do as the temperance people are doing, make a moral question of it, make a sentiment of it, and see whether we can not by our own example and urging our example upon others, create a sentiment that will destroy these things. I don't believe we should depend upon the law just yet.

Mr. A. Hamilton: I think the professor has suggested the proper thing to do. While I agree with Dr. Thomas, that to create a sentiment

is a very excellent thing to do, we have learned this, that nearly every saloon has its United States license. The federal power can regulate the whisky matter all through the United States. It regulates the distilleries and all that sort of thing, and it could do a great deal in this matter where peach-growing is our principal business. Where our orchards afford us our only income, if we had to depend on sentiment to exterminate and keep out yellows, we would be out of the business today. They are out of the business, wherever yellows has come in and they depended on sentiment. But the law stepped in, and we have almost rid ourselves of yellows. Right along the lake shore, where I live, where we had ten trees a number of years ago, we haven't one, now, affected. It was done by having and enforcing state law, but it wasn't enforced so well as it might have been, nor so well as United States officers might have enforced it. I believe with the gentleman from Ohio that the United States officer, who has no neighbors to please and no favors to expect from any one, can enforce that law better than a state official. I think, therefore, that perhaps he is right, and I am glad that he presented the question.

Mr. Woodward: I have, for several years, pursued a different course from any yet mentioned here. I am not blessed with the black population that Brother Willard is; I think I have the best of neighbors, but I have this practice: For instance, in regard to the plum knot, I say to them, whenever I see one of them, "Have you any plum knot?" "Well, I don't know what it is." "I will go over to your place this morning and show you." Every one of my neighbors takes care of the plum knot, now, and my man, that I keep on my place, isn't allowed to go to his meals unless, if he comes across a plum knot, he cuts it off and burns it. In regard to the spraying, I also pursue a different course from any I have heard recommended. I have five or six spray pumps. When I am not using one, I ask my neighbor to use it, if I can not get him to buy one. I have one that I haven't seen for three years that is going around the neighborhood. If the hose is worn out and the neighbor will not buy another, I say, "Let me know, and I will get another." I say, "Mr. A., it is time to spray. Tomorrow you can have my pump; Mr. B., you can have it next day; Mr. C., you can have it next day. Take my pump and welcome. When you get through, bring it home." I often have to go after it, but the third time I say "You can have that pump at wholesale." "How much is it?" I answer. "Well," he says, "I have used it enough, here is your money." Then I buy another and lend that to him. Brothers, use a little charity and cultivate the taste for good fruit. Teach them that they must spray to do away with the pests, and when once you have that idea established in your neighborhood, you will have no trouble. It is easier than legislation. Some of you perhaps have neighbors whom you can't get to use your tools. Spend a little time with them.

Dr. Thomas: I am not a lawyer, and I would like to raise this question: Can the general government take hold of such a question as that? Can we depend on the government?

Mr. Morrill: They can take hold of the quarantine and sanitary laws.

Dr. Thomas: Isn't this a domestic question?

Prof. Webster: I simply looked at it as any other public nuisance, and I see no reason why the federal government could not control that just as

it does those other things. They do it in other governments, though under other governments the police is governmental, and the matter is put in their hands and enforced. Now, I perhaps feel a little different over this than most of you. I have spent eight years of my life at one end of a telegraph wire, and when some one at the other end said "Go," I went, and I am accustomed to doing those things—doing what I am sent to do, perfectly regardless of public opinion. My business was simply to do what I was told to do, and with as little inconvenience and damage to the people as possible, and it can be done; if one is not obliged to go into his own immediate neighborhood, it is all right. Of course, if you can get your neighbors to do things willingly, it is better, but those good neighbors are not universal, I am sorry to say, and in the light in which I look at it, it is really a public nuisance. I believe the government could take it in charge just as they do with reference to domestic animals. They can stop Texas sending cattle across here, any time, and if it would apply to domestic animals, why not to insect pests?

Mr. Post: I think you will find the interest taken in this question is increasing with the fruit interests. Two years ago, nothing had been done in our township, but I think it would be difficult to find a black knot there now. The men put in for yellows commissioners are men interested in fruit. There are probably not more than a dozen in the township that would take interest enough to do the work necessary, but we take pains to put in men for commissioners who are interested in their own orchards, and they will use every means in their power to get rid of pests and diseases.

Mr. Morrill: The question raised by Dr. Thomas was, "Who will bell the cat?" We agree perfectly on the necessity of belling the cat, but who is going to do it? Who has done it in the past? Many of you are familiar with the manner in which some of these things have been worked up; some are not. The yellows law has been spoken of. I don't know the origin of the recent yellows law, but it proved faulty. There is a law now in force, and that can be enforced, which was drawn up by three members of the Michigan Horticultural Society. Two are in the room today and the other is in Florida. I know that, and I know that the State Horticultural Society, ever since I have been a member or acquainted with it, has been of rather small membership. I know, too, that, so far as we have been able to learn, the people of the state have been with us in sentiment, but not for work. I know that the Michigan State society is the only one that sends its men to the halls of your legislature to work out these things. They do it nearly every time the legislature meets. They put men there for a purpose, and that purpose is the advancement of the fruit interests of the state of Michigan. How many of you stand with us and say, "Go ahead and do these things"? Are you taking care of yourselves as well as other industries take care of themselves? Every time you go on the floors of the legislature, to fight any measure, it has to be the meanest kind of swindle, or a pest of some kind, that you can successfully fight, if some other man has a dollar at the other end, because every business that conflicts with ours seems to put up the money and the best talent they have, to whip us back home, and often they can do it. But this yellows law is being enforced; and now, at the last session, there was a compulsory spraying law passed, intended to cover the ground so far as this state

is concerned, but the provisions which were incorporated makes it very difficult of enforcement. When it becomes apparent to any ten freeholders of a township that there is a necessity for such a thing, they may petition the township board; when they do so, it becomes obligatory on the township board to select commissioners, who shall inspect and order sprayed, or otherwise exterminated, the insects and fungi therein. In case this is not done by the party notified, the commissioners then may enter upon the premises and do it, and collect pay, and there shall be no recourse against them. That is very good so far as it goes, but ten of your neighbors have to get together and petition, then three of your neighbors must attack you on something that you perhaps don't believe in; it must be done, but you don't believe it, and you are immediately antagonized—first with ten of your neighbors and afterward three. It is a very unpleasant thing, and I think this suggestion covers the ground very nicely. Whether it is constitutional or not is another question. Take the matter of the cattle plague, or any large national interest. The government has repeatedly taken those things in hand, and probably can again. The only question is, who will bell the cat, and you want to think about that.

Mr. Monroe: It is a large question, but it seems to me that the case is covered by analogy. It is settled that the general government has power to protect the people; so far as I know it is entirely settled, that it has ample power to pass sanitary enactments to protect our animal industry, and I think it has ample power to protect the vegetable. Of course, this question has been more prominently brought to notice than ever before by the first paper read by Mr. Webster, and shows very clearly the international nature of the question, and it seems to me that the time must come, and is not far away, when the national government must take steps toward protecting us in this respect, because we know from what was said by Mr. Lyon last night, in regard to the Japanese plum and the favor with which they are considered, and also the large number of flowers and vegetables imported, and as long as we know that they bring with them these destructive insects and diseases, there can not be any question, it seems to me, that our national government has ample power to protect us in this matter. The particular point I would like to emphasize is this: We all appreciate the importance of associated effort in every department of human endeavor, whether in business, social, or religious life. We appreciate the importance of associated effort, but I undertake to say that there is no place in which it is so much needed as in the fruit business. Two farmers may adjoin, and one raise a good crop of grain by complying with the necessary conditions, and not be at all affected by his neighbor, who neglects them; but we can not fence against disease and insects, and we must work together, and we must use every available resource if we are to succeed in fruitgrowing.

Dr. Thomas: We don't want to work in a line that is futile; we want to do some good, and I still raise the question on the constitutionality of this thing. I don't think that by analogy we can accomplish this, not by that kind of reasoning. It is true, the government can protect us against the importation of these things, but when it comes to the domestic affairs of the state, I question whether the government could or would interfere. Of course they do it in Europe, but they don't have constitutional govern-

ment there as we do here. It seems to me that this is a question for the people of the state. The importation of the disease or insect is all right for the government to interfere with, but the question still rests with us here, to know whether we can apply, in the other matter, to the general government or to the state.

Mr. Reid: I do not assume to be a lawyer, but it is a well-known fact that congress has the right to regulate interstate commerce, and so far as the inspection of these nurseries is concerned, before the stock is shipped from state to state, it would seem that in that instance, at least, there can be no possible doubt.

Mr. Thomas: So far as nursery stock is concerned, it becomes an interstate question of immense proportions, but so far as concerns the local insects, that might be another question.

BIRDS AND HORTICULTURE.

BY PROF. WALTER B. BARROWS, MICHIGAN AGRICULTURAL COLLEGE.

The relation of birds to horticulture is a many-sided one. There is a practical side and a theoretic, a common-sense view (dollars and cents) and an æsthetic side, one based on a sense of the beauty, grace, music, and companionship of birds. The latter side is by many a man tersely described as "stuff," "bosh," "nonsense," "sentiment," and so on, and the proper treatment of garden and orchard birds during fruit season is said to be powder and shot in liberal doses and at frequent intervals until all the symptoms disappear.

But I am not willing to believe that such a view of the matter is the common one, even among the fruitgrowers who suffer most severely. The successful horticulturist is successful mainly because he is thoughtful and far-sighted, and men of that kind do not ignore or belittle such things as beauty, grace, and companionship, whether they are shown by men and women or by birds. Of course, there are unfortunates everywhere, whose crops have been small (perhaps through no fault of their own), and they can not bear to see the birds with full crops, especially when their own fruits are levied on for any part of the filling. But the majority of fruitgrowers are reasonable men who keep their eyes open, and so learn something new once in awhile—or perhaps twice in awhile! Such men recognize the desirability of birds about their houses and grounds, and honestly regret the necessity which compels them from time to time to wage war upon them. To such men the bird-lover can appeal with a certainty that his arguments will be fairly considered, and to such a body of men I feel sure I am speaking today.

Do not for a moment imagine that I shall attempt to justify the thefts of fruit by robins, cherry-birds, catbirds, and orioles. A robbery is a robbery, and though we may take the loss philosophically, and even assure ourselves that we do not mind what we can not help, yet after all we know that the grapes are not all sour, and we can not help calling the birds

rascals, if not thieves. Yet, with very few exceptions, possibly none, there are no birds which are altogether bad; while it seems certain there are many which do an immense amount of good and little or no harm. We must, however, recognize the fact that several common species mingle their good and bad in such proportions as sorely to puzzle their best friends.

Probably our nearest approach to an altogether worthless bird is the English sparrow, yet even this depraved foreigner has its good points. The harm done by crows far outweighs the good, but if we give the devil his due we must admit that crows consume immense numbers of grasshoppers and some other harmful insects.

It is not hard to call to mind numerous examples of wholly beneficial species. Such are our meadow lark, swallows, wrens, chickadees, creepers, and a host of sparrows and warblers.

When early cherries are ripening, the owner is likely to think the whole bird population against him; yet the frequent visitors to the trees may be numbered on the fingers of your two hands, and those really troublesome on one hand alone. If we take into account the depredations of birds on all kinds of cultivated fruits, from the earliest strawberries and cherries to the latest grapes and apples, the number of species concerned is surprisingly small. Here is the complete list, to the best of my knowledge and belief, and the birds are named as nearly as possible in the order of their importance as fruit eaters: 1, robin; 2, cedar-bird, cherry-bird; 3, red-headed woodpecker; 4, English sparrow; 5, catbird; 6, Baltimore oriole; 7, brown thrush, thrasher; 8, flicker, golden-winged woodpecker, high-hole; 9, crow blackbird; 10, blue jay; 11, crow.

A few other birds, it is true, may take a berry occasionally, but they are not real fruit stealers, at least in Michigan. Even among the eleven species just mentioned there are several which are not commonly known as fruit eaters.

The crow blackbird rarely touches any fruit but cherries, and the blue jay and crow are only mentioned because of their occasional damage to ripening apples and pears. The flicker or golden-winged woodpecker eats wild fruits mostly—cherries, frost-grapes, Virginia-creeper berries, etc. The brown thrush is seldom abundant enough to do actual harm.

The remaining six species are well known as fruit-thieves, and each has his own characteristics, his own likes and dislikes. Doubtless many of us think ourselves familiar with these birds and most of their tastes, but if we knew as much of their *dislikes* as of their likes it would be easy in most cases to keep them away from our cultivated fields.

Before touching upon methods of protection, let us consider for a moment the actual loss occasioned by these birds. As a rule, the more fruit a person grows the less likely he is to suffer from birds. Paradoxical as this may seem, it is nevertheless true. The more fruit he grows, the more he may lose, it is true; but the proportion of loss is so small as to be insignificant. The owner does not complain, he does not know that he has lost anything; he does not suffer.

Iowa blackbirds once destroyed nine tenths of the entire corn crop of the state. Probably they destroyed more this past year than ever before, but I have heard no complaint. The explanation is simple. When the first few acres of Iowa prairie were planted to corn, there were thousands

of acres of sloughs and bottoms adjacent, in which the blackbirds nested by millions. As the acreage of corn increased, the breeding grounds of the blackbirds decreased more or less, and as more and more ground was planted the attacks of the birds were distributed over more and more territory, until now the tax levied by them is so light that it is rarely felt at all.

A single catbird once destroyed my entire cherry crop! True, I had but one tree, and the tree but one cherry; still, he took all I had.

Were you now to plant the only acre of red raspberries in an entire county, where there were few wild fruits, the birds would certainly get more than you; but where raspberries are raised on hundreds of acres, and where the berries grow wild as well, very little loss occurs. Unquestionably, the abundance of wild fruits is often of great service to the horticulturist, and were it possible to grow in hedges or otherwise some small but attractive fruit which would ripen as early as our earliest cherries, no doubt such a counter attraction would be the most economical method of protecting our more valuable fruits. It is noticeable that, although there are scores of species of woodland birds which eat wild fruits in their season, very few of these birds ever attack cultivated fruits, while the birds which cause us most trouble are those semi-domesticated species, like the robin and catbird, which are most abundant about our homes, and which, up to a certain point, always increase as a region becomes more thickly settled.

Let us take up in order the principal fruit-thieves already mentioned, and give a little attention to each.

It may be fairly said, with regard to the robin, that, all things considered, it is the species which does most harm to the horticulturist; and furthermore, I am honestly doubtful whether the good which it does in the course of the season is sufficient to overbalance, or even to equal the harm. But, granting for the sake of argument, that this is true, that the good done equals or exceeds the harm, it is still difficult or impossible to prove that the good done to any one fruitgrower is sufficient to offset his loss in fruit. Birds have an unfortunate habit of going to one place for their fruit and another for their cut-worms; and if these two places are owned by different parties, it is difficult to adjust the loss and compensation so that all parties, including the birds, shall be satisfied. Both the good and harm done by robins have been much exaggerated, yet there can be no doubt that a fruitgrower should have the right to protect his fruits from birds, even if it should become necessary to sacrifice some of the birds. The various methods by which partial or complete protection can be secured with the minimum of expense and sacrifice of bird life, will be discussed at another place. We may perhaps sum up the robin's case briefly in this wise: He eats many injurious insects, many insects of no particular account one way or the other (as well as snails and earthworms), and some decidedly beneficial insects; he destroys much fruit; he has a loud, rather commonplace song, which is valued highly by some and considered worthless by others.

The cedar-bird, cherry-bird, or cedar-waxwing, is a typical fruit-eater, and probably known to the average farmer or fruitgrower only in that capacity; and the capacity of one of those birds for cherries is simply amazing. They come almost invariably in flocks, and ordinarily are not

much alarmed by shooting. As a matter of fact, however, they eat cultivated fruits only during a small part of the year, two or three months at most, and even at that time they also eat very many injurious insects. Probably they eat more canker-worms than any other one species of bird; it is not uncommon to find their stomachs crammed with these worms, to the exclusion of all other food. They also eat the strong-smelling Chrysomelid beetles, which few other birds will touch, and, as this family of insects includes some of our worst leaf-eaters, the bird's insect diet is almost all in its favor. True, it has no song, (I know of no other small bird so nearly voiceless), yet its beauty commends it and its quaintness and sociability makes it a favorite with many.

The red-headed woodpecker seldom becomes a serious enemy of the fruitgrower, except in the vicinity of heavy timber, or where the woods have been thinned out and dead or dying trees are disproportionately plentiful. Much of the bird's insect food comes from such trees, and is therefore of little importance. It eats many grasshoppers, however, as well as large beetles, some of which certainly are injurious. In most districts where this bird was superabundant formerly it is yearly becoming less so, and in many places is seldom seen at all.

The English sparrow is now so well known that any comments may seem superfluous; yet after all, very few people realize the constantly increasing danger from this pest. Aside from its sturdy, cheery, aggressive presence the year around, and the additional fact that it does sometimes eat a few insects, it has nothing to commend it, but much to condemn it. It drives out some of our most useful and best-loved birds by taking possession of their nesting places; it contaminates rainwater, stops up roof pipes, soils porches, buildings, trees, shrubbery, and ornamental work; and it always attacks grain crops which are accessible, and often preys upon fruits. The latter charge is often denied, because it frequently happens that sparrows are known to be abundant in the midst of ripening fruits and yet no injury is noted. Just why this is the case is hard to explain, but it is certain that, sooner or later, there will come a time when some one sparrow will discover that grapes or cherries or raspberries or apples are good to eat, and then in less than a week the whole sparrow population will turn greedily toward this newly-discovered food supply. This has been the history of the plague everywhere, and it will continue to be repeated so long as the sparrows are allowed to multiply unmolested. The good done by eating is infinitesimal; the possible harm is almost infinite; the certain damage is immense.

The well-known catbird has so many good points that it almost seems unjust to call attention to his failings; yet he is by no means faultless. No other bird steals into the vineyard so noiselessly and punctures the choicest grapes until only ragged clusters remain; and he is equally bad on cherries, and scarcely less so on strawberries. Our principal consolation lies in the fact that catbirds are never very numerous, and our next bit of comfort comes in connection with the beautiful song of the bird. Really, the species probably has a yet stronger claim upon our forbearance, from the nature of its insect food, but as yet our studies of this subject are too meagre to make it safe to say very much. The bird fills a place, however, which is hardly shared by any other species, and it is more than probable that it consumes enough of our insect foes to more than

compensate for all the fruit stolen. The catbird certainly is one of the birds which we can least afford to lose.

The Baltimore oriole is another bird which might presume upon our good nature for a long time; and in spite of his petty thefts of cherries, grapes, green peas, and sundry other eatables, his rich, bubbling notes and brilliant livery almost always seem to repay us for the mischief wrought. For one, I would gladly plant an extra row of peas, and a quarter acre more of small fruits, for the pleasure of seeing the purse-shape nest on every elm in the neighborhood, and hearing the cheery notes among the snowy apple blossoms. But the bird is useful as well as ornamental. We have no more faithful ally than the oriole in fighting the tent caterpillar and canker-worm, and among the scores of species of insects which he consumes every day there are many of the worst foes of our orchards and parks.

What, now, can be done to lessen the damage done by birds in our orchards and about our homes? My recommendations are few and simple. Some of them will be suitable for one person, some for another; some, perhaps, will not seem to meet the needs of anyone.

(1) Grow lots of fruit. If possible, grow more than you need or can use. The more you grow the less will you know you lose.

(2) Get early varieties (which always suffer most from birds) near together, and where they can be easily watched or all protected at once. With the trees properly grouped it might even pay to keep a man or boy to watch them a few hours, morning and evening, when the birds were hungriest and most reckless.

(3) A stuffed hawk placed conspicuously near such trees or vines has proved very effective, for a short time, and by varying the position occasionally, or using several hawks of different sizes and mounted in different ways, this time can be much lengthened. Of course, living, semi-domesticated hawks would be far better, and, wild as the idea may seem, it nevertheless is perfectly practicable. The expense, of course, would be an item for consideration, but the result may be worth paying for.

(4) Stuffed cats have been used for the same purpose, and it is said with fair success. We are not able to speak from experience on this point.

(5) Nets of strong, light twine, made for the purpose, are extensively used in the old world, and might be used here with good results. At present I do not know that they are made in this country, but almost any manufacturer of seines would make them to order at prices varying with quantity and quality. If tarred or soaked in a creasote preservative before exposure such nets would last ten or a dozen years, if carefully handled. In netting trees, care should be taken to bring the net well down toward the ground, lest many birds find their way under the edges and become imprisoned and die. Almost as good an effect may be secured on fields of strawberries, raspberries, etc., by "stringing" the field with white twine, placing the lines a foot or two apart, and crossing them at right angles, or nearly so, with another set of lines the same distance apart. This gives a net with meshes one or two feet across, sufficiently small to keep out most birds for a long time.

(6) In case robins, cedar-birds, blackbirds, or other species become so abundant as to cause serious apprehension, it may be well to gently dis-

courage such birds in their attempts to nest on or about the premises. A little watchfulness will enable you to discover the nests before they are completed, and they can be knocked down then; and after one or two such hints the birds will go somewhere else to nest. This sounds cruel, but in reality is far less so than the common practice of shooting parent birds on or about your fruit trees, thus leaving the unknown young to perish miserably of starvation. That the law forbids nest destruction is only a present obstacle. You can make the laws give you your rights, and you certainly should see to it that you are able lawfully to protect your crops from birds or other animals.

(7) Use the gun only as a last resort, and even then it will pay you to use blank charges. With the exception of the cedar-bird, you would seldom be able to kill more than one bird at a time, and each charge of shot would damage fruit and branch more than the value of the bird killed. The blank charge will carry just as much terror, and save the tree and the birds as well.

English sparrows, being present all winter, and thus "open to treatment" when most of our valuable birds are away, may be poisoned with perfect safety, and with absolute certainty. But this should only be attempted by those who can be trusted to follow instructions implicitly, and to handle the poisoned grain with good judgment. Directions for such work will be given to any one interested on application.

Finally, in any attempt to protect ripening fruit or other crops from the attacks of birds, remember that it is very important to prevent the birds from getting a taste at first. Once they begin upon a tree of ripening cherries, the difficulty of keeping them away is increased ten-fold.

DISCUSSION.

Q. What about arsenic?

A. Arsenic will work within twenty-four hours, but meanwhile the bird has a chance to go anywhere, and there is of course a possibility that the birds may reach the roofs or get into the gutters or cistern pipes and make trouble, but with a little care that thing can be obviated, and strychnine is better.

Q. You say it takes thirty minutes for strychnine to act?

A. It may kill them in ten or even three or four minutes. It depends largely on conditions we don't know much about. If the stomach is full, and he only got a grain or two, it may be some time. It is often when he feels the first twinge that he will fly, and having eaten only a few grains, it will take some time. This thing has been tried, and we know how it works, from experiments with birds in cages. As a rule it acts promptly and very quickly, and there is this that I would like to say in defense of the method: It does not seem to be painful to the birds. I don't believe death by strychnine is painful to the sparrow. In very many cases, in fact it is the rule in poisoning with strychnine, when a poison begins to take effect the bird has a convulsion; it flutters and stiffens and falls down. After a few minutes it recovers, sits up, and blinks as though ashamed of itself, and begins to eat. Then another spasm comes on, and the second or third spasm is fatal, but in the intervals the bird goes to eating. I can not imagine that a bird suffering any

great amount of pain would go to eating, and yet they will do that almost invariably. There are other reasons why I do not believe it a painful death; there is certainly no comparison between it and shooting into a flock of birds where twenty or thirty will go away with shot here and there, through them, to die in misery somewhere, or starve with broken wings.

Q. Is the strychnine dissolved in water?

A. One eighth of an ounce of strychnine in a quarter of a bushel of wheat. It is best to put enough strychnine in, and it is inexpensive. Strychnine is sold in two forms. One form will not dissolve readily in water. If you add a drop of vinegar to the water, it will dissolve. If you get the crystals of strychnine, which is the form in which it is best to use it, it will dissolve readily in the water, and of course the utmost care must be used as to where you put that water and poisoned grain afterward. There is one annoying thing about it, and until we discovered it, we did not understand the repeated failures in poisoning birds with strychnine. When you go to the drug store and buy strychnine, ten, fifteen, or twenty cents' worth, the chances are about even, if the drug clerk doesn't know you, that he gives you salt or something else, and if you soak up salt, you may impair the digestion of the birds, but you don't lessen their number. If necessary, make a confidant of the drug clerk, and tell him what you want it for, and let him mix it, and take your grain down there. He will be satisfied then that you don't want to kill yourself or any one else. I am doing perhaps a rash thing in advocating a poison, without looking up the legality of it. I don't know what the law is. In some states there are regulations that would prevent the use of poisons in this way. I don't find anything on that subject in the game laws, except that they are not allowed to kill game by any such methods, but I do not think any trouble would come from it, unless a person should recklessly distribute poison; but in the way I have indicated, it can be safely done. I have had some experience in killing robins. In one large harvest apple tree I killed a hundred robins in one year, and picked up seven bushels of apples that they had picked off. We also have the rose-breasted grosbeak, but I seldom see one that is destructive. I noticed, though, on one of my Richmond cherry trees, that the petals of the blossoms were falling off. By and by, I saw a rose-breasted grosbeak and an oriole, and I found that they were taking out the little cherry in the center. I seldom have killed one of them, for they are not destructive, and they are too handsome a bird to kill, and I can stand the oriole pretty well. The robin, until five years ago, never touched my pears, and he learned it from the oriole, which is a very destructive bird and troubled my early pears badly. The blackbird injures me most, in the sweet corn. When I undertake to seed, they will clean it right off. The first English sparrow I shot, I opened his stomach, and I found the gizzard full of grubs. I was told that the robin wouldn't eat grubs. I shot one and opened his stomach, and I didn't find any grubs there; on opening the gizzard, however, I found remains of grubs. The English sparrows do not bother me at all. It is only necessary to shoot them once or twice and they stay away. They do get into mischief, though. The English sparrow will stick his little bill into a grape and break the skin, taste it, and then the honey bee does the rest. I have seen them in the maple trees, picking off the leaves and letting them fall, just for the fun of it.

SOME REFLECTIONS UPON APPLE-GROWING.

BY PROF. L. H. BAILEY OF CORNELL UNIVERSITY.

[Stenographic notes of extemporaneous talk.]

If one is going to cultivate apples for profit, the getting of three or four crops in the life of the orchard is not successful apple-growing. The general farmer goes into his orchard and finds a crop of apples. This is not success. It is simply discovery. What we must have to make our orchards profitable is a crop every year for a period of many years. Most of our orchards do not bear more than three or four good crops in a long lifetime, and even a large part of these crops will be partially lost by a variety of causes or by poor markets.

This discussion has very forcibly shown that the application of certain principles must be made by every man for himself. Although a professor may know something about the general principles of orchard management, about irrigation and spraying and cultivating, the farmer himself must apply these things to his own land. He sees the land morning and night, winter and summer, and if any one knows more about a man's farm than himself, it must be the man who holds the mortgage. So when you ask me why your orchard don't bear, I must say, "I don't know." Perhaps I could never tell you; but what a person can do, is to detail some of the general reasons why orchards do not produce. We can indicate what lack of pruning or spraying may do, what improper tillage or injudicious selection of soil can do, and then you must tell whether that is the reason of the failure of your particular orchard.

I believe a large part of our orchards are past their prime. I believe they are already so old and fixed in their characters that we can not do much with them; and I am convinced that the best treatment to give some old orchards is to pull them up and plant new ones. We can not break a colt that is twelve years old and make a good horse of it; and yet we want to teach the old orchards new tricks and make them productive. The land was not properly treated in the first place, not deeply enough tilled, and the roots suffer from lack of moisture and food, and the trees have not been bred into a bearing habit.

I believe that there is money in apples; at least I have felt sure enough of it to put money in apples, expecting to get money out of them. I am not planting my orchard hastily, but getting the land in good condition. I believe I can afford to wait two or three years and make the conditions right, because I feel that in the great majority of cases we have made mistakes, and we ought to begin all over again.

I do not wish to discourage irrigation, but I do not believe it is going to come into general use east of the great lakes. In Michigan there are severe drouths, and further west the dry winter winds take up the moisture; but these are difficulties which are seldom serious in New York and eastward. I do not look for much irrigation in New York for general orchard lands; I do not believe the extra crop would pay for the expense of the plant and the cost of applying the water. I believe, however, that

especially for annual crops and truck garden crops, it can be made to pay.

But I want to bring this thought before you: No one has any right to talk about irrigation until he learns to save the water which the Lord gives him; and even then, the man who makes the most out of irrigation is the man who tills his land best. We are likely to think, especially further east where commercial fertilizers are used more than here, that the application of fertilizers to land will atone for poor cultivation. The man who gets the most benefit out of fertilizers is the man who has his soil in the best condition—the one who tills the best.

The farmer has not half fertilized his land, and can not afford to put on so much fertilizer. Likewise, a man can not afford to irrigate his land unless he is thoroughly familiar with the effect of this dry earth mulch on top of his land, which serves as a layer of non-conductive material between the soil below and the air above, preventing the evaporation of soil moisture. So the man who is not thoroughly convinced and does not act upon his conviction that tillage is conservative of moisture, is not the man to irrigate.

Another difficulty is this: Our rain-fall is fitful and uneven. In some parts of the arid regions of the west and southwest, they can prognosticate that there will be no rain for two or three months. We have lands that have heavy sub-strata that hold the water like the bottom of a dripping-pan, and if you get an inch of rainfall the dripping-pan runs over, the water runs off and is lost. Then, as soon as the land becomes too dry, it bakes. But if we have prepared our land, and put our reservoir down eight or ten inches, by good tillage, we can save our inch of rainfall. If we prepare a soil reservoir and fill it full, and then nature gives us rain, the pan runs over and we lose much more than we gain.

Bear in mind, I am not depreciating the value of irrigation, because I am convinced that some horticulturists must resort to irrigation; but it is profitable only to those persons who are good cultivators also, and who put sufficient energy into saving what water nature gives. In New York we have an annual rainfall of thirty to forty inches, and more. In those places where it is fifty inches, it would be folly to talk about irrigating, and yet people are talking about it, at the same time that they have wasted fully one half the water the Lord has given them.

The very most important feature of this whole discussion is the one which always comes up with regard to the question of subsoil. The deeper the bottom of our pan, the more water we can store. Subsoiling increases the depth of our reservoir, lowers the bottom of the pan. Shall we then subsoil our lands? That depends primarily on the character of the land. Unless we have a hard bottom there is little use in subsoiling. Subsoiling is necessary in the same places where irrigation may be profitable—for the raising of crops of high value, as in the growing of some special kinds of nursery stock, truck, etc. I do not believe that subsoiling is profitable on all orchard lands, because you can subsoil only once; thereafter the soil reverts to its former condition.

My first lesson in this was a piece of land twice as large as this room, from which three feet of surface dirt had been taken off and a hard clay left. We put on two heavy teams of horses to plow the land, and we have subsoiled the land twice; but we found that it was nearly as hard in

a couple of years as in the first place. It packed again. We had only trifled with the difficulty; it needed something else. It profited as much by tiling and green manuring as by subsoiling.

In orchards you can subsoil only twice in the lifetime of the trees; but when it comes to strawberries, where you can turn over the land frequently, you can subsoil at every rotation.

People often look upon drains, it seems to me, from a wrong point of view. They look upon them as ditches, as a means for carrying off water, but that is not always primarily the object; it is to make a reservoir for holding water. The land becomes broken up and fibrous, and holds water by capillary power. It is important to put the drains in deep enough, say from three to four and a half feet deep, and then you have your reservoir deep. This piece of land that we subsoiled with such poor success, is an excellent soil since we have drained and manured it, and we are now raising roses on it. When we put fibre in it, we increased its capacity to become a reservoir of moisture.

I do not make these remarks for the purpose of discouraging experiments upon irrigation, which are exceedingly important, but I only want to impress upon you the fact that no man has any business to talk about irrigation until he is thoroughly convinced that good culture and everything else must go along with it; otherwise he would not get enough to pay for the cost of the water.

In regard to the cultivation of apple orchards, there are many points I would like to discuss, but I will mention only a few. First, in regard to the current discussion about the use of crimson clover. I suppose half the experiments with crimson clover have been failures. The reason why it fails, it is not necessary to enter into. I might say, however, that the crimson clover is an annual and, if sown too late, will not mature; and if too early, will become too ripe. We think that the middle of July or first of August is a good time to sow. I do not believe that very many people know why it is sown. The great majority of fruitgrowers in New York state, who talk about crimson clover, think that it is good to protect the trees from frost. I do not suppose it makes one degree of difference with the temperature of the soil whether it has a covering of crimson clover or not.

It is a part of the general philosophy of tillage to introduce this crimson clover at the end of the season. We know in the first place that rotation is necessary. Now, this is a means of introducing some sort of rotation into our land, by means of which we put fibre into it, and at the same time increase its fertility. The reason why nursery trees "exhaust the land" is not because they take too much potash from the soil, but because the land has been "killed," as the nurseryman says. It has become hard, settled down, dead, and lifeless, because of its injured mechanical condition. I do not believe that crimson clover is the only crop which should be used as a catch-crop to cover our lands in the winter. I believe that we should not confine ourselves to any. We need rotation of manures. Rye, buckwheat, corn, oats, winter wheat, all these things and many more, can be used as catch- or cover-crops. But of all these, crimson clover, I believe, is the most valuable; but I would not use it exclusively, year after year.

Trees begin to grow early in the spring. I have been surprised to find that forest trees and most other trees, especially those not highly cultivated, make a half to two thirds of their total growth before the leaves are fully grown in the spring. You will notice that the growth in length is nearly always completed by July or June. We need to cultivate very early in the spring, and get the tree at work as early as possible. The advantage of this early cultivation lies in several directions. In the first place, we get the tree at work, as I have said. We prevent the soil from becoming baked and cemented on top, and we complete the growth of the tree early in the season, so that a little later on, in July, or August, or September, the tree can spare some of the moisture and some of the nitrates. Then we have a chance to put on some other crop which can grow upon the moisture which the trees do not need, and which will catch more or less of the nitrates which tend to leach out with the rains.

Now, a cover-crop upon our land is valuable for two or three reasons: It affords us a means of getting some plant food, for, while most of the food elements are originally taken from the soil, nevertheless they are worked over, adjusted, and put back into the soil in a more available condition than would have been the case otherwise. Butter is the most easily digested of all foods because refined twice, once in the plant and once in the cow. And then, we are improving the mechanical condition of our land by putting fibre into it. But what is most important to you is this point, which I wish to bring out forcibly: Lands which are bare during the winter shed water like a duck's back, especially if those lands are somewhat rolling; watch a shower in the summer time and you will notice how the water runs into the ditches along the roadsides; and yet, go into an adjacent area, on a green sod, in the meadow or pasture, and you will find the water held on the surface. It is held there until it has time to pass down into the soil, and your land becomes saturated with the moisture because of this covering on the land. The soil has not become cemented. The fall plowing has much the same effect, the water can not run off and is taken into the land. If we have a pretty thorough system of tile drains, pretty deep down, we do not lose so much water. We have a deeper reservoir and we have it stored away for the coming of spring.

The most important effect of the cover-crop, then, is that it prevents the surface soil from becoming dry and cemented. It holds the snow and moisture until it shall have time to absorb into the soil; and then, in the spring time, the crimson clover—just as soon as growth begins—commences to pump the water out of the soil and makes your land dry early. But here comes a difficulty. People leave it on too long. The value of crimson clover, or any other crop, does not lie in the spring growth, except so much as we get before the land is dry enough to plow, but in its protection of the land during the winter, in holding the snow, and in itself, which we turn under in plowing. Plow under the crimson clover before it blossoms, just as soon as your land is dry enough in the spring. The only exceptions are when cultivation will tend to hurry the growth in places where there are likely to be late spring frosts, but these are exceptional cases.

Everywhere, I see instances where people sow rye or something else, late in the fall, and leave it too long in the spring. Now, if we plow

this herbage under in the spring, just as early as the land is dry enough, the herbage will decay quickly, while if you leave the clover there until it becomes hard, it lies there, a foreign body, perhaps the whole season, breaking up the communication between the upper and lower soils. Never leave crimson clover on your orchard lands until it blossoms, if you can plow it under before.

Along the lake shore people leave their rye until they have to drag it under with a chain on the plow. The land has received more damage from that rye than benefit, for, in the meantime, we have lost much of the water the Lord has given us, and which in July or August we are praying for, and wishing for irrigation to put it back. Again, I say, don't talk about irrigating your land until you have thoroughly mastered the problem of saving what water you have.

We have been much exercised during the past few years over the subject of spraying, and we have heard a good deal upon the subject of insects, fungi, and all the other pests that have come into our orchards, and we wonder why the apple is singled out to be the pest-house of our farms. The very best remedy for leaf-blight of the strawberry is early setting; force your strawberries to early bearing, and by the time the enemy is there, you are off. The man who is quick enough to keep ahead of these pests is the man who tills his land well and gets his crops off quickly. I do not believe that, as a rule, it pays to spray for the strawberry. I am thankful the strawberry leaf-blight has got into New York state, for it will make us better cultivators.

But to return to the apple orchards. Their rotation is forty to sixty years. We can not tear them up, and they are a perpetual breeding-place; and all these years the pests have been encouraged to breed.

Now, as to the matter of spraying. I do not wish to discourage it, but it is not the sum and essence of cultivation. We must grow our trees first, must begin at the bottom and do the whole thing right from the start.

The man who does not find that his apple orchard is unprofitable until it is thirty years old, is not the man to do much with orchards. An orchard ought to bear every year, and I know of some that are doing it.

Now, when an orchard is ten years old, a man ought to know something about it, or be able to form some idea as to whether it is going to be profitable, and his remedial treatment should begin then. In the majority of cases, when an orchard has not been profitable after twenty-five years, he would better give it up. I am looking to the Russian thistle to help us out in this matter. It has gotten into New York, and it is going to wake us up. We will get some western ideas and when it gets into the old orchards it will shake them up from top to bottom, and it will be as good a reformer as the codlin moth or apple-scab. The apple-scab is bound to revolutionize apple-culture; it is the prick that keeps the man thinking. The cultivation of the potato took on a new phase shortly after the potato bug came in. At first every one was in the dumps; but soon they found that they could beat the potato bug, and then, as the man went up and down his rows, he wondered whether it paid him to raise twenty-five or thirty bushels per year. It is a matter of education, and where these bugs are worst is the place where potato men ought to be the best educated. Peach yellows is also a case in point. It is bet-

ter than a course at any agricultural college on the growing of peaches. It wakes a man up. It is much the same way with weeds. They say that 25,000 square miles are rendered profitless by the Russian thistle. The farmers sow wheat year after year, and the farms are so big that they can not be cultivated. It would be very poor Russian thistles that would not take possession of the land under such circumstances. The Russian thistle is certainly going to have the credit of introducing a mixed population into that western country. In New York state, many years ago, some people said that the Canadian thistle would soon establish its empire over the whole state. It has increased and scattered over the country, but land is too valuable to grow thistles now. A man has not time to bother with Canadian thistles; he grows plums. Solomon once went by the field of the slothful man and by the vineyard of a man void of understanding, and lo, it was all grown over with thorns, and nettles covered the place thereof, and the stone wall was broken down. Those nettles might have been Russian thistles.

What we need to understand is fundamental principles. I do not discourage the agitation about all these fungous diseases—the more agitation the better, because it educates the people; and I am pretty sure that some of our farmers in New York state are going to be educated by the Russian thistle and other things coming from the west. We are ready for them; or, if we are not, we must give place to the man who is ready for them, and he is the one who will get the money out of the farm in the future. Consequently, I do not look upon all these things with so much regret. Let me enforce again, that we get the greatest good out of these improved methods, when we do the best we can with what we have already, and that nature abhors bare land, and tries immediately to cover it up. We ought to cover our land in the fall as much as possible and keep it covered till spring. Nature would do it for us if she had a chance.

If you would go over some of those old hill farms in New York and New England, you would find them in process of abandonment. That is another one of the good things—that the farms are being abandoned. They ought to have been left for forestry purposes in the first place. They have been cleared and given to grass; grass-farming always makes grass-farmers. They sell a few loads of hay in a season; you will find them in the little town markets, on the public street, with a load of hay; they will stand there all day hawking for a customer, trying to get ten or fifteen cents more on a load of hay, which they with great pains have cleaned off from two or three acres. If you would go over those hill farms, you would think their owners were florists. Their fields are filled with ox-eye daisies and fleabane, and the people all the while say, "The daisies have crowded out the grass." The land was sick and tired of grass years ago, and the sod has become thin, and nature is trying to improve that land, and she has tucked the daisies in here and there. Pretty soon, perhaps, she will tuck in the Russian thistle.

Some two or three years ago there was an endeavor to pass a bill in congress to appropriate a million dollars to set Coxey's army at work pulling out the Russian thistles. I suppose if anything on earth would have disbanded that army it would have been setting them at work pulling out those weeds. Now, suppose Coxey's army had pulled out the

Russian thistles, what would we have put into the holes? The only way of keeping the thistle out is to put something in the place of it. No weed can keep pace with a lively, resourceful farmer.

DISCUSSION.

Mr. Baldwin: When the land becomes somewhat exhausted, I should draw the conclusion that you think it would be better to abandon the farm for awhile and let nature take its course?

Prof. Bailey: Your question is this: That instead of so much muscle, we sometimes let nature have her way a little. Yes, to a limited extent. Mr. Willard will tell you that, after the land has been "treed" once, they like to put the land out to clover. The nurserymen have caused the land to become settled down and hard, and then they dig their trees in the fall, and that means one or two fall plowings; and you know that fall plowing often causes the land to run together. I often hear our professor of agriculture (at Cornell University) say that he can make more money by going out and sitting on a fence and whistling than many men can by tilling their land. That is to say, by practicing careful rotation, he can slip in some sort of crop that can be turned under, in order to put fibre into the land.

Mr. Beal: I remember hearing our friend, Prof. Tracy, say the other day that he was always glad when some new insect came along, because then he had a new enemy to conquer, and he was sure to come out ahead in the long run. I said a year ago that the Russian thistle would be worth hundreds and thousands of dollars by way of a state scare-crow.

Mr. Morrill: I have yet to know of a successful effort to raise crimson clover in Michigan; I am sorry my friend, Mr. Starr, has been obliged to leave, because I would like to have him tell of his experience along that line. He is one of the most successful cultivators in the vicinity of Detroit. He raises every year, five acres of squashes. He has been accustomed to watch as jealously as any man could through June and July, as he finishes up his cultivation, for the rainy day, and just before that rain comes, he is accustomed to sow the ordinary common red clover in the squash patch, and this fall there was clover that would actually conceal the fruit. Early next spring he will plow that under. He has followed the same practice with corn, and I think Mr. Starr watches the sky as anxiously through June and July, for a shower, for the opportunity to put in his clover, as he does for any other purpose. I throw out this suggestion, for I think there is much in it.

Mr. Baldwin: As Prof. Bailey was speaking of utilizing the water that the Almighty gives, before trying to get more, he also speaks very interestingly on the subject of tiling. I am, perhaps, something of a crank on tiling, and I have experimented somewhat. I thoroughly believe that if one is not much in debt he can afford to borrow money and bury it in his own bank, and that bank will repay him the capital with the interest he pays, inside of two years, either wet or dry season. Last spring (I speak of this as many of you perhaps have not tried it) I put in a hundred rods of tile. It was an excessively dry season, but I say to you that every row of corn that was anywhere near the vicinity of this

tile, escaped entirely from the effects of that drouth, and I have but once in forty years' farming ever secured a heavier crop. I have two fields well tiled, and one not tiled at all, and the tiled fields this season yielded more than double per acre, and a quality doubly good; and I believe that any one can overcome our drouths on all land admitting of tiling, by thoroughly tile-draining, by opening the pores of the ground and keeping it in condition to receive the moisture that the atmosphere gives us.

Mr. Kehoe: I have had experience in tiling. I have a farm of 200 acres or more; and from what experience I have had with tiling, I would rather have the same amount of tile rather than have a thousand-dollar plant for irrigating from the river. I can see that on this soil that I have drained, which has a heavy subsoil of clay, mostly, and in some places loam, it has made the soil different. Right through the hard land it would make it lighter, and it would retain the moisture a great deal better, always producing good crops of any kind; and on low land, where the water settled and ran in, where nothing used to grow, I would get abundant crops.

Mr. Rice: I would like to know in regard to the depth of tile. Prof. Bailey said, "Put it in deep." We have three men in our vicinity who are cranks on putting tile in deeply. It is a quicksand soil and they put them in six to eight feet deep. They now think they have made a mistake.

Prof. Bailey: I think they have. I simply threw that out as a suggestion. I should say that three and a half to four feet is supposed to be about the ideal depth for tile. It will depend much upon the land, but I should think six or seven feet too deep.

Mr. Willard: The best tiled land in the state of New York was laid fifty years ago by John Johnson. It is working perfectly today, but the best tiling that has been laid in the past twenty years, in New York, is where the tile has not only been laid to a good depth, but then filled in with cobble stone, so as to bring all the cobble stone eighteen inches or two feet above the tile, insuring a percolation of the water; the soil will never pack badly about the tile, but it will insure perfect drainage. The most unpromising land I ever saw, that was absolutely not worth a penny per acre for any purpose, before it was tiled, today is the quickest land that can be worked on that farm. The tile were put in three and a half feet deep, on a retentive bottom, so retentive as to be almost impossible to get a pick into it. William Brown Smith of Syracuse, whom I have regarded as one of the best horticulturists I knew, secured for years and years the waste from the iron foundries—the slag (some of you know what it is; it answers the same purpose as the cobble stone, and he has drawn thousands of loads of that, to put in in connection with his tile. Prof. Bailey said that if rye was left until too late in the spring, and plowed under in that condition, it would form a layer between the upper and lower stratum of earth, and do damage. Without regard to the question of early or late, this theory is being advocated by at least one prominent fruitgrower, that that layer above the roots of the trees in the orchard prevents the escape of the moisture from below, breaking up the capillary attraction, and is for that reason an advantage in the season of drouth. I would like to hear Prof. Bailey's opinion on that.

Prof. Bailey: I presume that both sides of that question are correct in a way. It will depend largely on the season and on the depth of plowing. If the rye is turned so that it is only a few inches down, it may act as this man thinks it does, in preventing the escape of the moisture from below. I had in mind a deeper plowing, and in that case we do not wish to have so much dry soil on top. If we have, at most, three or four inches on top dry, it is the most we can afford. Of course it does not always follow that we will have this bad result of late plowing, but the probability is that the longer you leave it on, the less readily it passes into decay. I have some doubt, however, whether that turned-under old rye really would form a good conservator of moisture. These remarks respecting subsoiling and draining apply especially to clay lands and hard-pans.

Q: What effect would subsoiling have on sandy subsoil?

A: It might do harm. A person raised the question as to the kind of soil for an apple orchard. It reminds me of our man Smith, who was a good authority on hogs. He was driving along one day, when a farmer hailed him and said, "You are a good authority on hogs. My hogs have been running in pasture all summer and they have not done well." Smith says, "Shut those hogs up." Another man came along a little later and said, "Smith, you are an authority on hogs; my hogs have been penned up all summer and they aren't doing well." "Let them out," said Smith. No doubt the man was right in both cases, and this discussion of soil is similar. A soil that is leachy can be improved by cultivation, and a soil that has a retentive bottom can also be alleviated by culture. Ordinarily we want to make a hard bottom on our loose lands, and in such cases I should exercise the greatest care to plow always about the same depth, and make a bottom with the plow; but a soil that is hard may have to be plowed at different depths in order to break up the bottom.

THE NEGLECTED AND DEJECTED RASPBERRY.

BY MR. W. F. BIRD OF ANN ARBOR.

A score of years ago, in the eastern part of our town (Ann Arbor) might have seen two plantations of the Cuthbert raspberry, the only ones of importance in the vicinity. Their stately canes and branches waving in the breeze, robed in green and decked with crimson bells, were a wonder to the neighborhood. And, wonder of wonders! the crimson turned to gold. Twenty, twenty-five and thirty cents per quart! Eight dollars per bushel!—a congressman's pay for a whole day.

Of course, everybody rushed for the Cuthbert, and those who could not get the Cuthbert planted other varieties, both red and black. Raspberry-growing had a boom, and the acres were soon numbered by the hundreds.

But a great change has taken place. The plantations for the most part are now broken down, diseased, infested with insects, and wrestling for dear life with timothy, June grass, and wild lettuce. In fact, the champion of berries has been playing the role of a by-word for some time.

But is there no cause nor remedy for the present condition? I think there are both. Perhaps the first step in the down grade was when the blacks fell below five cents per quart and the reds below six. It was a question with many where the profit came in. The tried and true proverb, that "whatever is worth doing at all is worth doing well," was thought not to apply to the raspberry, and so an annual cutting out of the old canes and a trip or two through the rows with a cultivator was about all the care bestowed. Some of the neighbors thought to economize in labor and fertilizer, and plowed a deep furrow in the space between the rows, put in the old canes, and turned the earth over them. This was just what the insects and disease spores wanted—a good covering for the winter. So, when spring came, they were all ready for business, a hundred thousand strong. One man who two years ago harvested over 600 bushels, this year did not have 100, as a result, mostly, of the above treatment.

Our friend from Ionia is expected to tell how to grow big crops of blackberries, and will no doubt treat of their cultivation and breeding. The same will apply to the raspberry for the most part. So I will confine my remarks chiefly to injurious insects and diseases of the raspberry, not knowing at all, but hoping to call out facts from some of you that may not be generally known.

The insect that is doing the most damage to the raspberry in this section, and the injury has come to be quite serious, is the tree cricket. I have never seen it described as a katydid, or as belonging to that family, but the two insects are certainly very much alike. They are about three quarters of an inch long, pale-green, semi-transparent, with dark stripes on the head and thorax. They have long legs and antennæ which are also dark colored. The female lays her eggs during the early autumn. It is not her eggs so much as her method of laying them that causes so much mischief. She is furnished with a long ovipositor with which she punctures the tender canes more than half way through, laying an egg in each opening thus made until a dozen or more are laid. This weakens the cane to such an extent that it is broken off before the next season, and thus the crop is diminished one half or more. The eggs, or at least the most of them, do not hatch until spring, so the remedy would seem to be to cut off all the infested canes just below the row of eggs and burn them.

Another serious enemy is the red-necked agrilus. The full-grown beetle is scarcely half an inch in length, with a small, dark-bronze head, a beautiful bright, coppery neck, and brownish black wing-covers. The under surface is of a shining black color. The eggs are deposited on the young canes during midsummer and soon hatch. The young larvæ feed in the sap-wood, working all around the cane and up and down an inch or two, thus producing quite a bunch or swelling, called by Mr. Riley the raspberry gouty-gall.

But, not satisfied with this mischief, the larva, upon the approach of cold weather (Mr. Saunders says in April or May), penetrates into the pith and works down toward the ground, destroying the cane as far down as it goes. I have found larvæ in early spring very near the ground.

The same remedy will apply in this case as in the former.

Still another pest is the raspberry cane borer, with numerous scientific aliases. The insect is a long-horned beetle, with a long, narrow,

black body, the top of the thorax pale yellow. When placed in an upright position it looks like a sister of charity in miniature. About the first of July they commence laying their eggs. Their curious manner of proceeding furnishes an easy clue to their detection and destruction. A few inches from the tip of the young cane two rings are girdled about an inch apart. Midway between these two rings the cane is pierced and an egg deposited. The egg hatches in a short time and the larva begins working down, consuming the pith, until it is full grown, when it may be found about half way down the cane, where it remains during the winter, undergoing its transformations and gnawing its way out of the cane the next summer.

To destroy this pest the plantation must be carefully examined several times during July, and all the canes with withered tips cut off below the lower ring.

For some of my descriptions I am indebted to Mr. Saunders in his "Insects Injurious to Fruits."

Next to the insects, if not worse in some localities, are the diseases, of which we have two in our section—anthracnose, the same as you have perhaps all seen in the grape, and the second we call the curl-leaf.

Anthracnose attacks the growing canes, causing blotches somewhat resembling the effects of small-pox in the human family, and it is perhaps nearly as contagious. It seems to operate worse on the black raspberry, but it is not at all confined to it. Two remedies have been prescribed for the disease, neither of which is very satisfactory. Spraying has been practiced, with only partial success. The other remedy, which has only been used in the case of the blackcaps, is to force the young plantation to do its best the first and second year, then dig up and plant a new one.

In the case of curl-leaf, no remedy has been applied, so far as I know, except to dig up and burn the infected plants. It is to be hoped there are some here who are better acquainted with this disease and its cause as well as a remedy.

There are two things in this connection that may be worthy of notice. Every observing fruitgrower has noticed that the raspberry is a gross feeder, consuming more nutrition than does other fruit. Chemical analysis proves this, and shows that it requires three times the amount of plant food that many other varieties do. Hence it would seem that a more liberal use of fertilizers would produce a more healthy and vigorous growth.

Then matter of "blood." I fancy I hear our Ionia friend whispering, "pedigree, pedigree." And pedigree is all right, a valuable thing to have; but when the old horse is wind-broken, wind-galled, diseased, and broken down generally, his pedigree will hardly save him. This it seems to me is the condition of some of our raspberries.

We need some new varieties, and then to see that they are not allowed to degenerate. We have varieties enough, but of all the scores that are named there are only two of the reds that I would care to plant extensively. These are Cuthbert and Marlboro.

The blacks of merit, so far as I know, are also quite limited. The Gregg seems to hold its own very well, and with Palmer, Conrath, and Eureka, I think we have about the best.

If the present slothful methods of cultivation continue, we may expect to see prices advance; but if not, those who give care and cultivation to

their plantations will have the satisfaction at least of getting pay for their labor, and the consciousness of having done no injury to their neighbors by propagating destructive diseases and insects.

DISCUSSION.

Q. I would like to ask if any of you have tried Leader blackcap. It is about like Ohio.

Prof. Taft: I think Leader is valuable, but that Conrath is far preferable.

Mr. Morrill: My experience is limited, but on a thousand hills, standing on a trifle over half an acre, I raised some that I sold at ordinary prices, some of them at extraordinary prices, and I certainly think Leader is one of the hardiest, most vigorous things I ever saw. I don't know but Conrath is up with it. Mr. Bird spoke favorably of Marlboro red. When it first came out I paid \$700 for 14,000 plants. I got my money back, but in three years the foliage succumbed to our climate. I had other plantations started at that time, but it would succumb every time, inside of three years. I don't know of anything out of which I could get the same amount of money that I can out of Marlboro if it would withstand the climate.

Mr. Harrison: I think it requires heavier soil and moister ground. On lower ground, where it is rich, Marlboro produces tremendous crops, and is healthy and hardy, but on sandy land, with us even, the heat of the summer and the dryness of the atmosphere, destroys its fruiting powers.

Mr. Morrill: How long does it last with you on the class of land you recommend?

Mr. Harrison: Seven or eight years.

GREAT CROPS OF BLACKBERRIES AND HOW TO GROW THEM.

BY MR. R. M. KELLOGG OF IONIA.

For a commercial berry, there is a wide opening in blackberry culture. There is scarcely a community even partially supplied, and, as generally grown, the quality is so low that the consumption is the merest fraction of what it would be if such methods were adopted as would secure the highest development in flavor, size, and productiveness. When grown as I shall hereafter point out, under reasonably favorable location, soil, and climatic conditions, the crop should exceed three hundred bushels per acre of a grade that would rank with the luscious strawberry and even outdo that king of the small fruits as a money-maker. They come at a season when there is no other berry in the market, and make the connecting link between raspberries and grapes, so as to enable the small-fruit grower to appear on the market every day throughout the season.

Let us consider for a moment some of the causes that have led to the quite general failure of blackberry-growing, either for market or home use. I do not care whether it be plants or animals, the continued breeding or propagation from scrubs will soon cause them to part with every good quality they possess; on the contrary, the only way to improve and accumulate good qualities in any variety is to discard everything which does not approach perfection, and select ideal specimens, keeping them so restricted that the powers of reproduction (fruiting) shall constantly be increasing. From time immemorial it has been a custom of nurserymen to take an old patch and plow it in the fall, cutting the roots up as much as possible, so that each year suckers would come up in the greatest profusion, and then the more plants were dug the more came up until the whole was a tangled mass. They were rarely or never pruned, but were allowed to stand without tillage to support them during the drouth, so that the strain of maturing even a small quantity of berries was beyond their ability, and consequently exhaustion followed.

Growers took these plants and fruited them eight to ten years, until run out, and then dug suckers from them and set a new patch, successively, until, getting only seedy, buttony fruit, they threw up the business in disgust. When a blackberry cane becomes weakened from any cause, it will throw up suckers until they become an intolerable nuisance, and we must never forget that in making cuttings, either tops or roots of a plant, we are only dividing it, and whatever weakness it possesses we are carrying into the new plantation.

When we dig a sucker plant we generally get only a few roots with it; the foliage absorbs the strength of what rootage there is, and, there being no callouses formed, few new roots start. Those already established grow only from the end, and in this way will often go out forty of fifty feet from the bush, while near the plant will be found very few roots. The sap, having to pass through these long roots before it can reach the foliage for assimilation, greatly aggravates the sucker nuisance, and the few berries secured are generally dry, seedy, and flavorless.

Now let me describe my ideal of what a blackberry should be, and see if I can formulate a method of producing it and preserving the highest fruiting vigor, and put on the market a grade of berries so delicious that the demand shall always be in excess of the supply.

First, there should be no weak nor puny bushes, but all uniformly large and enriched with full blood and the strongest reproductive powers of fruiting vigor. Now we can not do this by propagating from anything less than perfection itself, and so we must go to the fruiting field early in the spring to search for this ideal. Find the cane that is thickly studded with large, well-developed buds, and examine the tips to see that it has stood the winter blast without the slightest weakening, and stake it, taking care to so prune it that its fruit shall be no more than it can bring to perfection. Examine the stamens carefully when blossoms first open, and note their size and general condition. Where stamens are plenty and well charged with the vital dust (pollen), score it high and give it the preference. I hold it of the utmost importance, and believe I have proven by actual test, that maximum crops of berries or any other kinds of fruit can not be secured where plants, trees, and bushes are allowed to shed their pollen year after year without restriction until

the potency of the pollen has been destroyed. That restriction, selection, and high feeding are as essential to building up good qualities in plants as they are in animals must stand unquestioned, and I believe the lack of these essentials is the greatest cause of failure in fruitgrowing. A plant over three years old should never be chosen for propagation.

Find as many bushes as possible and give them high culture so as to secure the highest development. At harvest time, count and measure berries accurately and determine which possess the most points of excellence. Now, early in the fall, or as soon as leaves are fallen and the plant is entirely dormant, dig up every root, select those about the size of a common lead pencil, cut into pieces three inches long, and bury them in clean, sharp, fine sand, placing the boxes in a cold cellar kept just above the freezing point so they will become callous and form wood buds. If the cuttings are kept too warm, they will start and grow; if too cold, the callus will not form. A "callus" is the bringing together of certain wood cells and formation of a gristly substance out of which a root will grow. No root will start until this callus forms. This will form at a low temperature, and if roots are kept in this condition several months they will form at the ends, as well as all along the sides, of the roots.

The following spring, prepare a piece of rich sand loam with plenty of moisture, on a south incline, and plant the cuttings in nursery rows about two or three inches apart and not over two inches deep. If planted too deep, the shoots will damp off, and if too shallow they will dry out. Some system of irrigation in case of drouth should be provided. In the fall the plants should be taken up and roots cut back to about eight inches, and again packed in fine sand, keeping them as before, until spring, when they will be thoroughly callous and, when planted out in well prepared soil, will fill the ground with a mass of feeding roots, all near the plant, thus bringing the "food gatherers" near the organs of assimilation. Each plant occupies its own feeding ground without trespassing on the others, so we know where to apply fertilizers and do the cultivating. As already stated, every cutting possessing any weakness has failed to grow, and we can not now have anything but the strongest and most healthy plants.

Blackberries will generally do well on low land if winter protection is given, but if the hardy varieties are used without protection, they should not be placed on either lightest sand or heaviest clay. In fertilizing, bear in mind that ground rich in potash and phosphoric acid makes strong, firm wood and greatly aids seed formation, while that excessively rich in nitrogen makes the wood soft and succulent and easily winter-killed, hence all the wood ashes should be used for the blackberry patch.

Having our ground deeply worked and subsoiled, we plow furrows about eight feet apart and six inches deep, and set plants about three feet apart, taking care not to expose the roots, loaded as they are with the calluses, but cover them at once and firm the soil, and cultivate shallow the same day of setting, so the water may draw up around the plant and nourish it at this critical period.

The two chief difficulties in blackberry culture are drouth and winter-killing. These may be reduced to one difficulty, because the management during the summer is often the chief cause of winter-killing. Every possible effort should be made to force a vigorous growth early in the spring, and this should proceed regularly until fall rains come, when the

autumn months should be used to mature the wood. The cultivator should be set going as soon as the ground is dry enough in the spring, and the priceless water should not be allowed to get away. The whole surface should be covered with fine, loose earth all the time, and a crust should not be allowed to remain a moment longer than necessary. Cultivate every week and after every rain. It is the greatest blunder to stop the cultivator when picking begins, just when the bushes need moisture so much to fill their great loads of berries with their rich juices. The feet of the pickers tramp the ground down hard, and capillarity is perfect to the surface and water passes off with the greatest freedom. The berries soon dry up, and the vitality of the bush is sapped by having its functions suspended in hot weather. The plant goes through the same process as if preparing for winter—buds form and foliage ripens. Later, the fall rains come and a new growth starts, and the early frosts destroy the leaves, rendering the proper ripening of the wood an impossibility, and winter-killing is sure to follow.

It has been almost the universal practice to pinch new canes when about eighteen inches high, so as to make them throw out laterals and become stocky and self-supporting. If the ground is rich so a vigorous growth is made, and no trellis used, the canes would sprawl around on the ground so as to interfere with cultivating and picking, and thus pinching in may become a necessity, but I confess I have come to entertain the gravest doubts about the advantage of suddenly stopping growth by removing terminal buds when in full tide of growth. I am satisfied it brings on a congested condition that seriously interferes with the hardiness and vigor of the canes. The better way is to set stakes about every thirty or forty feet, string a No. 9 wire about four feet high; then, with well-gloved hands and a bundle of short willows, pass along rapidly and tie each cane, spreading the canes out fan-shape so they will have plenty of air and light, so all will be out of the way of the cultivator, and pickers can get to the fruit with the greatest ease. No dirty berries, none threshed off by the wind, no broken canes, but pruning and all work done with an ease that much more than compensates for the cost of wire and tying the canes to it.

Different varieties require different pruning, and on some soils the canes can be left longer than on others; but in any case it should be so close that there will not be any overbearing and consequent exhaustion. A green blackberry is not the sweetest thing on earth. The berries should be black at least three days before picking. Twice per week is plenty often enough to gather them. Exercise the greatest care to not let the berries stand in bright sun after they are in the boxes. They quickly sour and turn red. Keep them in a cool, dark place.

The list of desirable varieties is not long. Of the extremely hardy sorts, Western Triumph and Synder still head the list, Taylor Prolific being the best late variety and of highest quality. Ancient Briton is a grand berry and a leader in many qualities. It is classed as hardy, but should be given winter protection in the north. Erie has gained many warm admirers and will remain with us until we find our ideal berry. It has many of the desirable qualities. Wachusett, Early Cluster, Lawton, Kittatinny, and a few other sorts have nearly gone out of use in this section.

Of the new varieties, Eldorado, which I fruited the first time last season, is the most promising. I could not find a cane showing the slightest injury from cold the past winter, and its fruit is very fine. Wilson Jr. and Early Harvest rank high, but must have winter protection in all cases, if fruit is expected. With improved methods of culture and a better knowledge of the requirements of the blackberry, we shall, in the no distant future, see it a leader in the berry market.

HOW A WOMAN GREW RED RASPBERRIES.

BY MRS. M. S. TRINE OF ADRIAN.

The red raspberry, and a few things I have learned in its cultivation, is the subject given me. It would have been a queer thing for a woman (an American woman at least) to do a few years ago, to go to fruit raising and gardening, but now industries are opening wide their doors for women, in many new fields; and as fruit culture has its attraction to one who wishes to combine health for herself and little ones and pleasure in raising the best of fruit in generous quantities for family use, this decided my employment.

Having only an acre for garden and orchard, what should I set? Apples, peaches, plums, and cherries in great variety (for the space) were set first. Shade trees and ornamental shrubs must have their place in this home building, but while these little whip-stalks of trees were growing, what must be done with the land to be enriched, cultivated, and the weeds subdued? We set out a row or two of strawberries, but found the soil too cold and thin, over a clay subsoil, for their successful growth. We had hundreds of loads of fertilizer spread over the whole lot, and began to grow—weeds. Hopeful sign! for if weeds won't grow nothing will. We put in all kinds of "garden sauce" and yet there was room for more. Then quince trees and currants and gooseberries went to fill the space, then a few blackberries and blackcaps were tried, but found too rough for a woman to cultivate, and finally 300 red raspberries, purporting to be Cuthberts, were set in a square patch. And how they grew and how quickly we got delicious berries, and how we enjoyed them! We found they sprouted badly, and, to keep the sprouts and weeds down while we were doing other necessary work, I had about eighty loads of old sawdust drawn from a mill near by and spread nearly six inches deep. It was just what that patch needed, and it bore well and was easier cultivated. I soon saw I had set them in the wrong place, on account of the shade of the trees, and the shape of the patch was bad, as it prevented cultivating with the horse through the lot. So we set anew. I found among the rest two bushes more vigorous in growth and bearing larger, more fragrant berries. I let them sprout and from them set three long rows through the garden. But as the trees grew around them they became too shaded and lost vigor. So I again transplanted eleven long rows, five feet apart and four feet in the row, where they could be kept quite free from shade the most of the day. I had them cultivated thor-

oughly the first season and got two years' vigorous growth, and the next year a good crop of berries. Then I rented my place for a year and a half, and when I came back this spring I found this patch largely grown up to sprouts and the canes weakened. They had not made the growth I expected with the care I had spent on them previously. I inferred the sprouts had sapped the roots and that they needed enriching and cultivating thoroughly. We took out the extra growth of canes and gave them away, hundreds of them. We cultivated every week, both ways; cut the canes down to four or five in a hill and kept the growth closely in the hill. The cultivating lightens up and aerates the soil and keeps down other growth. I only had one third of a crop, compared to last year's yield. This year I gathered about 300 quarts of fine fruit, sold more than half, getting not less than ten cents per quart; and after the first higher-priced quarts were sold people came right to me for their fruit, and I had hard work to save what I needed for my own use. With proper care in pruning and cultivating, I feel sure of good crops in the future of this delicious, wholesome fruit, for canning and other use; and for its easy culture and handling I heartily recommend it to my sister-growers who are seeking, like myself, health, strength and pleasure in garden work.

PAST, PRESENT, AND FUTURE OF FRUITGROWING.

BY MR. S. D. WILLARD OF GENEVA, N. Y.

In the early settlement of the country which constitutes our homes, wheat-growing was the principal industry. Wheat, wool, and clover were the products that enabled our forefathers to pay for many homes; but those keen, discerning descendants of the New Englanders were not slow to discover that the fertile lands, unsurpassed for the purpose then used, also possessed capabilities for growing such fruits as were required to meet their growing wants. Perhaps the old Indian orchards, of which there were more or less in western New York, may have given an inspiration to the work. Hence, we find at an early day fruitgrowing received the impetus that quickly made it a leading feature in farming, while contributing in an essential degree to the comfort and health of the pioneers of those early days. They were not slow to perceive that the soil, so finely fitted for agriculture in its broadest sense, also was peculiarly adapted to producing in the greatest perfection all of the then known fruits grown in the remote regions of Europe. Seeds, scions, and plants began to be imported, and plantings began with reference to production for commercial purposes.

On the banks of one of the little lakes of western New York is yet standing the remains of one of those early orchards, the stock of which was brought into this country about 1812 by a Frenchman, composed of varieties of the most improved character then known. True, it was limited in size, covering only three or four acres, but of great value as an object lesson. It was the admiration of all, and well known for many miles in every direction. It was a source of great happiness to the

owner, and, in after years, afforded a revenue that enabled him to live in luxury. But it was of more value in its influence and results, which can never be estimated. "Sowing the seed, what shall the harvest be?"

The elements of plant life then existed in such abundance and requisite proportions as to produce the most healthy tree and perfect fruit, which found its way to market at prices affording profit so satisfactory as to stimulate increased planting from the valley of the Hudson to the shores of lake Michigan, of an acreage then unknown in the world's history. Those were days of promise. Such beautiful and excellent fruit could be found nowhere else on the face of the globe. Many of us can recall those days when the produce of a single tree of White Doyenne pears sold at from \$20 to \$30 per annum, and whole orchards of Bartlett's netted their owners \$10 to \$12 per barrel. Those beautiful Spitzenberg apple trees, yielding from six to eight barrels each, were a sight worth going miles to see. The apples were sold at from \$2 to \$2.50 per barrel. Not a blemish on them. No orange tree laden with its golden fruit surpassed them in beauty. The Newtown pippin, another favorite, unexcelled for productiveness and keeping qualities, was produced in the greatest perfection and with great profit. But, in the nature of things, these palmy days could not always continue. Those varieties of apple then generally grown became worthless, and in time were superseded by the Baldwin, which we were assured had come to stay. Not equal in quality to its predecessors, its productiveness and fine shipping qualities were regarded as compensating sufficiently for what it lacked in goodness, and the Baldwin was planted to an extent unprecedented in the history of any other apple. No one seemed to realize it possible that too many could be grown. From every apple-growing section was heard the cry, "More Baldwins." But what is the situation today, with a favorable season for apple production? A surplus is always found of this variety, and purchasers take advantage of the fact by purchasing them at pretty much their own prices. Worse than all, it has fallen a victim to the deadly fungus, which, wintering upon the tree, attacks the young and tender foliage, and finally is found upon the fruit that is so often rendered worthless. While in this weakened condition the tree is rendered powerless to appropriate the required supplies for a crop for the succeeding year. Such were the conditions incident to hundreds of orchards in western New York in 1894. Hence, no crop on them in 1895, and the same has frequently been observed in southern and central Michigan—two crop failures in succession, sometimes accounted for in one way and at others in another, but quite frequently people assigned the wrong cause rather than the right. The fact, however, has been made clear that this popular variety has foliage which, today, is more readily subject to disease than that of almost any other apple known. Hence, many planters are discarding it, while others, discouraged by their repeated crop failures, denounce apple-growing in general, and assert that it is no use to follow it longer as a profitable business. One acquaintance, with fifty acres, tells me that he has not averaged a crop once in five years, and his trees, being regarded as past that age at which they may be profitably grafted over, he is strongly inclined to convert into firewood. Nor is he alone in his conviction. There are hundreds cherishing the same sentiment throughout the country. Scarcely a horticultural meeting is

convened but many fruitgrowers express their doubts as to the future of the apple industry. We are told that this variety or that has run out or outlived its usefulness. We can not, however, come to think this a correct conclusion, but rather regard it as an unwarrantable assumption. Is it not more likely to be true that the soil upon which most of our unproductive, diseased fruit plantations are found, may by continued croppings have become so impoverished of the essentials required for perfect production of the thing sought to be grown, that the weakened plant structure has not the vital power to resist disease and the perils of insect life, the apparent increase of which has been the outgrowth of this lack of material for their support? It is an undisputed fact that the leaf, root and fruit all make a wonderful draft upon certain well-known elements which may or may not exist in quantities sufficient to meet this continued drain required to maintain vigor and productiveness. It is quite well known that different varieties of the same genus differ materially in their constitutional strength and power of resistance, so there is need of different treatment to meet nature's requirements. We have been told that, upon some of our newest lands, varieties that have ceased to be of value in the older sections are grown with the greatest success, while some who are regarded authority report corresponding results from the very liberal use of appropriate plant food. Is it not safe, therefore, to argue that neglect to comply with nature's laws is largely the occasion of failures with which the fruitgrower is contending in this year 1895?

But what of the future? Just now we seem to be in a state of transition, with no fixed purpose of what to do next. With the rapid increase of evaporating and canning interests; the multiplication and cheapening of facilities for transporting the products of the same to all known parts of the world, and, above all, with a sentiment keeping pace with the increased intelligence of the human family, in favor of fruit as a wholesome and economical food, we predict an annual increase in consumption of all of the fruit products that will greatly exceed the anticipation of any whose plans for future work are based upon the demoralized condition of trade as found today. Low prices prevail for all soil products, too low to afford a fair remuneration for labor and investment, but we believe the horticulturist who is working on intelligent lines has decidedly the advantage of the agriculturist, and that this condition will continue to prevail for years to come.

A friend who was a guest on Thanksgiving day has a farm of one hundred and fifty acres. On this he has a peach orchard of about nine acres, the product of which was sold the past season, to a near-by canning factory, the returns amounting to about \$1,000, which he assured me was considerable more than was received from all other of his farm crops combined. Ten acres for horticulture and 140 acres for agriculture! But, lest some one may say, "I am not in a situation to become a grower of peaches," we will cite a good grower of apples who, seventeen years ago, desired to set a Baldwin orchard of 1,000 trees. The variety was scarce, but, having his land prepared, he was determined to plant something; and finally, contrary to his judgment, he put 800 Oldenburgh apples and only 100 Baldwins. This was a matter of necessity, inasmuch as he could not secure the desired number of Baldwins. The former have not failed of a crop since the fifth year, and in the month of July

last, when invited to visit them, not a tree could be seen but had from ten to twenty props to aid in sustaining the most wonderful crop of apples upon which I have ever set my eyes. It was marketed in a near-by city at from \$1.50 to \$2 per barrel, the net returns giving him between \$2,000 and \$2,500. Illustrations of like character could be named, pertaining to other fruit crops, had we time, such as the plum, peach, cherry, apricot, quince, currant and gooseberry, any and all of which, while not, perhaps, giving returns as large, would afford abundant proof that our ground is well taken, and there is encouragement for the grower of good fruit both now and in the future. It is but just, however, to state in this connection that the owner of the apple orchard just referred to, excels as a thorough cultivator and high feeder. His equal in these respects is hard to be found in the Empire state. Doubtless there are those who will pronounce these instances rare exceptions. Admit this to be true; but is it not also true that those who show marked success in any business enterprise are the exceptions rather than the ordinary rule? But my purpose in mentioning this variety of apple more especially was to illustrate the fact that apples can yet be grown, and that with profit. If not one variety, then another. Select a line of sorts less subject to injury from fungi than Baldwin and the old, tried sorts, and we believe that the key-note to successful modern apple-culture has been struck. In such a list we find Hubbardston, Gilliflower, Ben Davis, Longfield, Stark, and Sutton's Beauty—surely a list large enough for any orchardman to experiment with, and Oldenburgh added, affording a succession from late fall to early spring in their period of ripening. I am a strong advocate of a more general use of the spraying pump, with such mixtures as aid so greatly in the extermination of all the insect life and diseases with which we have to contend; and, as these varieties are grown apparently without the necessity of spraying, except for the codlin moth, we believe, if properly provided with the required plant food, they may be profitably grown for many years to come. Some of them, however, inclined as they are to over-production, require a careful thinning of the fruit to insure the desired size and fine quality. Our institutions of learning are making the subject of horticulture a leading feature, the outgrowth of which will be the development of a class of men prepared to make a practical application of the principles of fruitgrowing that should make them succeed and enable them to avoid the bitter lessons that have been learned at such a cost by some of us.

The schools of horticulture now being held by Prof. Bailey and others, in various parts of the country, so thoroughly practical in their nature, are imparting new interest to this work and giving to Cornell university that pre-eminence to which she is justly entitled—the greatest institution on the continent for furnishing the most practical education on the most easy and economical basis.

Of scarcely less importance is the work that is now being prosecuted by the various agricultural colleges and experiment stations of the different states. Horticulture is receiving its full share of attention at their hands, and the character of the men employed in its prosecution is a guarantee of what the results may be.

To illustrate more fully the magnitude of this work, it may be of interest to know that they are now growing for test purposes at the Geneva

station, 427 varieties of apple, 30 of crab apple, 102 of pear, 10 of quince, 21 of apricot, 43 of cherry, 111 of peach, 204 of plum, 234 of grape, 40 of currant, 219 of gooseberry, besides others, not including a large number of seedlings the outgrowth of efforts to originate meritorious new varieties by plant breeding; and, as your own and other states are engaged in a similar work, it indicates an interest that in the near future must give results of incalculable value to the professional fruitgrower. We can but believe that failures which have been so widespread in this department of industry have been more the fault of the man than of the plant. The cereals, potatoes, and other farm crops have each been studied as to their character and requirements for the protection of abundant crops, and special commercial fertilizers provided for test purposes; but the instances are indeed rare where the poor fruit tree, obliged to obtain the nourishment to maintain its existence within the circle of its roots, is ever given a particle of available and nutritious plant food. This is pretty much the same the country through, the exceptions being those who tell us the business is one of reasonable profit, and who are increasing their plantings. Nature was very lavish in the distribution of those elements required for producing plant food in perfection, but man's extravagant waste has well-nigh left the storehouse in an exhausted condition. These are the conditions that we are called to confront today in many of the older settled sections. We must restore to the soil, in the most economical manner possible, those essentials required in the attainment of success in our work. From my own experience I have often been led to say, "If I were to have only one single fertilizer with which to feed my plants, I should pin my faith to good, unleached wood ashes." Forty-five years ago, while yet the land was new, a man then regarded as the most successful farmer in the county in which I was brought up, employed his teams during the winter season in picking up the ashes which were hauled upon and scattered over that one-hundred-acre farm. He was then called a crank, but his success was a sufficient indication of his wisdom. He was just a trifle in advance of his generation. A few weeks ago, incidentally, with a friend, I walked over that old farm, that has now passed into other hands; and, impressed as I was with the thrift of the orchard through which we were passing, as well as adjacent fields then in wheat and grass, I remarked to my friend, "What a farm this has been!" The present owner, Mr. B., was not regarded as very much a farmer. "How is he getting along?" the reply was, "He never fails to have the heaviest crops of everything in this vicinity." Mr. A. has now been dead thirty-five years, but by his superior methods he laid a foundation that so far has seemed to be inexhaustible.

Ashes were cheap in those days. They were often given away, and when sold rarely brought to exceed five cents per bushel. Today we are compelled to pay from fifteen to twenty cents, and there is some question whether these elements thus obtained can not be had more economically by the purchase of muriate of potash and pure ground-bone meal. It is said that, in your own state, there are thousands of bushels annually left to bleach upon the lands where burned, while thousands of fruit trees are starving for the food they would afford. We believe that one of the most fruitful causes of the rapid increase of diseases and insect life that prey upon our fruit plantations and cause their premature death, is the lack of those elements in the soil that, in a great measure, might be restored

by the very liberal use of wood ashes. We would not ignore the value of barn-yard manure, but for most fruits it seems to us rather too stimulating and inclined to promote a soft, unripened wood; hence, a fruit bud ill-calculated to withstand a very severe winter. No nurseryman can grow the best trees on lands that he has highly stimulated with rich barn-yard manure. As often as tried, it has been a failure—too much nitrogen and too little potash and phosphoric acid.

In summing up this case, I would suggest that we have been expecting too much from our fruit plantations without such reciprocal attention upon our part as they have deserved. The same parsimony and neglect in the management of other interests would bankrupt the parties engaged. A man who makes this, as well as any other business, profitable, must keep thoroughly abreast of the times. Indeed, if a little in advance of his more conservative neighbors, he is not likely to make any mistake. The fashion and demand for varieties of fruit change as well as that for anything else, and to keep in close touch with all requires constant study and thoughtfulness. Some old sorts are wanted, and probably ever will be, while others are being superseded by those of more recent introduction of great merit. It is not always safe for a commercial orchardist to place too high an estimate on quality. While this is a factor that should not be disregarded, style and productiveness should be given precedence in anticipating future profits. The Ben Davis apple, while quite low in the scale of quality, usually sells at higher prices than many others of far greater excellence, the cost of producing which would be accompanied with loss.

Profitable fruitgrowing is, however, not confined to the larger tree fruits. The very great improvements made in the smaller fruits, and the enhanced interest in their culture shown in every section during the last decade, are but conclusive proof of the fact that some men have learned that they can be produced with profit. Currants by the ton, gooseberries by the bushel, blackberries and strawberries by the car-load! Who would have anticipated all this a quarter of a century ago? All things being equal, most of the above named crops, grown with reference to markets easily reached, should pay the producer from \$100 to \$150 per acre net per annum. Some of them thrive and continue to produce well for many years after planting, and, being well adapted to long-distance shipments, they are our choice; hence, we pin our faith to the currant and gooseberry. While not affording the large profits frequently attached to the strawberry, they do afford a fair remuneration for labor bestowed, with but slight variation in price from year to year. The largest profits are confined to a very few sorts, while the others we can not afford to grow at any price for which they can be sold.

In conclusion, we believe in the future of the wise apple-grower. Other varieties of fruit are being largely planted, but little attention is given this king of fruits. Not one acre is planted where there were 100 ten years ago, while thousands of trees are going to decay and death. They have outlived their usefulness, and all this in the face of an annual increase of consumption both at home and abroad. What are the probabilities, what the possibilities, for the skillful fruitgrower of Michigan, directing his energies with all the intelligence and appliances at his command? He is blest with a soil, climate, and other required conditions unexcelled for the production of the greatest variety of the choic-

est fruits; with a fruit experiment station under the supervision of a director of acknowledged authority on all subjects pertaining to pomology; with institutions of learning whose alumni may be found filling professorships in the various departments of instruction for work in horticulture throughout our land; with a state horticultural society made of men so practical and successful in their work as to be found only in the front ranks of their profession, among the first to advocate the use of, and putting to practical test, such insecticides as are required to hold in check the depredations of our most dreaded foes; with inventive genius that has given the country the most valuable spraying machinery in use; with facilities unequalled by that of any other region of the continent for distributing, in the most economical manner possible, everything produced. I leave it to you, Mr. President, and the members of this honored association, to determine in your deliberations what shall be the future of horticulture in this most highly favored region. Be thoughtful, act wisely; but, above all, act up to your convictions and execute with that rapidity demanded by the exigencies of the times in which we are living, remembering that masterly inactivity has blighted more prospects and ruined more men than all other causes combined.

As I glance over the young men in this audience, I am reminded of lost opportunities, and what I might have accomplished when full of ambition, vigor, and nerve possessed years ago; but I can only tell you what I would do with my present knowledge and convictions if I were thirty years younger. First of all, there should be planted an apple orchard of ample dimensions, made of such varieties as would seem to be best calculated to resist the various diseases that are known today, to be followed by others, like the plum, peach, pear, cherry, apricot, and some of the small fruits—some or all of the above, as circumstances and conditions would seem to warrant, in the full faith that future results would vindicate the wisdom of the undertaking.

Faith unwavering is essential to success; but, gentlemen, "faith without works is dead."

DISCUSSION.

Mr. Willard: I think we do not always realize what the burning over of the orchards by the fungus means. I remember one day in the month of August, passing over the Michigan Central, when it was difficult to see an orchard (and there were multitudes of them) but showed the effect of this fungus. They looked as though a fire had gone over them. I remember I remarked, "No apples for next year." They said, "We certainly shall have them next year." I said, "No, you will have two successive failures." There is some reason for the wonderful multiplicity of these diseases, and I think you will find a great deal less of it on our newer lands, and my opinion is, and has been for some time, that it has been because our orchards have not been properly fed with material suitable for their support. I got the idea first from one of the professors at the Michigan Agricultural College, of spraying for the codlin moth. I stole it from Michigan, or borrowed it, rather, and I always feel like being very grateful.

Mr. Beal: The speaker has mentioned a variety of tests at an experiment station in New York. I wish to call on Prof. Taft to see if he dares make such an expression for Michigan.

Prof. Taft: I shall have to own that they are growing more grapes than we are; but, as regards apples, I notice that Geneva had 427 varieties. We have something over 450, and still others in the nursery. We have fully twice the number of peaches. There are 111 at Geneva, and we have something over 200. In the way of cherries, we have at least three times as many. There are only 43 at Geneva, and we have over 125. We have most of that number at the college, and an equal number, nearly as many more, at South Haven. We have also at South Haven rather more grapes—we have at least 200 varieties, and about that number at the college. As regards plums, they are some way ahead. They have 204 varieties; we, perhaps, have not over 150; and as for strawberries, we have fully half as many more, both at South Haven and at the college. We have, I think, nearly as many blackberries, but in the way of gooseberries, we have for less than they. They have 219, embracing a large number of English varieties, whereas our number is less than thirty. That, I think, covers about all we have. Now that we are on this point, I would say that we have sent out to individuals in all parts of the state, from year to year, commencing back in—I think Prof. Bailey commenced this in 1887 or 1888, and we have sent out since that time, counting all the tree fruits, as many as 100 varieties, two trees of a kind, to these different people. We have now over 100 sub-testing fruit stations, besides others who are testing small fruits and vegetables.

Mr. Morrill: Gentlemen, we have heard something about the work going on at the horticultural stations of two states, the two, perhaps, better than any others in the Union; but we have with us here today Prof. McCluer of the experimental station of Illinois, at Champlain. Illinois is a great fruitgrowing state, and the people of all others who get in our way in the Chicago market. I would like to hear from Prof. McCluer, and he can give us some idea of what they are doing.

Prof. McCluer: I am not prepared to give figures, though I think it is safe to say that at least, in one line, we are ahead of either New York or Michigan. Our university began, in 1869, planting varieties of apple tree, planting nearly everything they could get hold of, and we have on the list of varieties planted at that time, from 1869 to 1871, 1,298 names. That does not mean 1,298 varieties, because there are many duplications. I found that we had Red Astrachan under seven different names, and in many instances there are two or three or more names for one variety. Since then, we have planted 300 more varieties of apple tree. Of grapes we have planted 150 varieties; of raspberries and blackberries, five Plums and peaches—well, we haven't more than a dozen varieties of peach, and we don't do much with quinces or cherries. This is all on varieties. I would like to say, that, as to the good results from a number of varieties tested, it is something uncertain. There are local conditions that affect the fruit. The conditions under which one variety does well, will not suit another, even in the same orchard; for instance, we had Benoni planted, and the only record we have is that it was planted and died; we have it in another orchard, where it did well. Then, in that old orchard, if we attempt to make a report, we are not at all sure that we

are reporting the right thing, and I suppose the same can be said of other stations.

Mr. Reid: You have scattered your experimental work, have you not, you have a number of sub-stations?

Mr. McCluer: The other stations in Illinois are not under the control of the State University. They are under the control of the State Horticultural society. Their principal object is testing new varieties, and we are buying and putting in a good many varieties in these stations. They are scattered about over the state. Our state is divided, horticulturally, into three sections—northern, central, and southern. Our northern section has three stations, the central has three, and the southern five stations, where varieties are being tested. That is about the only work being carried on at the stations. There is some work in spraying and methods of cultivating, some work in methods of propagating, and some of our people believe in “double” working. That is a western idea, and at least one of our experimentalists is what people call a crank on the subject. He is doing a good deal of work in that line. When I speak about some of the results from our old apple orchard, as we call it, of the nearly 1,300 trees, there are perhaps twenty varieties on the list today, which, if I were planting an apple orchard for my own private use, I would put there. Twenty varieties out of 1,300 names. I think, sometimes, if I had planted 1,300 seedling trees, I would have had more varieties, but perhaps not.

Mr. Merrill: That brings out a valuable idea. We have heard from three of the greatest fruit states in the union, and what they are doing for our education. We have with us, today, Prof. Bailey of New York who has traveled over every portion of the Union and the fruit-producing portions of Europe. He is a Michigan product, now located in New York, but we claim him.

Mr. Willard: He has stood the transplanting well.

Mr. Morrill: I would like to have Prof. Bailey give us something of his impressions of the present and future of the intelligent horticulturist, what his prospects are and may be. He has an excellent knowledge of the markets as well as of what is being done, and the obstacles in our way. I would like to know, and I presume all fruitgrowers would like to know, your opinion of the financial probabilities and the obstacles to success which you see.

Prof. Bailey: I might say, Mr. President, in answer to that question, what my own practice is coming to be. I am connected, as you know with an experiment station at Cornell University. However, I have bought a farm and I am putting it out to fruit, and I hope the time is not far distant when my experiment and teaching work shall be done, and I am sufficiently confident of the natural rewards of horticulture to have the desire growing in me every day to move on to that farm and make a living from it.

Mr. Williams: How did the man Bradley come out, under the fertilization he has given?

Mr. Willard: There were a few of those Baldwin trees the past season that had some apples; but, as a rule, the fruit was scarce, and that has been true, always, more or less. That idea was not advanced for the purpose of advising people to plant bone dust, but to show that there were

advantages in planting these varieties. Mr. Bradley didn't know what else to do, and he put those Oldenburgs out much against his will, but the results have been marvelous. For the two preceding years, '93 and '94, from that orchard (I think it has ten acres), he has told me his sales netted him about \$3,000 per year, the parties from Cincinnati paying him this amount and themselves packing the apples; but last year he was not successful in getting them to do that—everything was demoralized.

Prof. Bailey: I am glad to say a good word for that orchard, for it is certainly the most remarkable apple orchard I ever saw. I notice that I am down on the programme to say something about apples, and while at it, I shall wish to bring up that orchard again. I don't know of any fruitgrowing in New York state which has brought more money for the amount invested, and the small risk, as that at this very Bradley orchard.

Q. What is the soil?

Mr. Willard: It is a loam. I can not say it is light; it is between a light and a heavy loam.

Prof. Bailey: It has been made of heavy loam by deep tillage and good fertilization. It is a good, strong loam at the present time.

Mr. Willard: I said, "Bradley, what do you do?" He answered, "I use bone dust and muriate of potash," and I could see a little barnyard manure, but you could kick right in up to your knee. Now, Woodward has a relative in Lockport who has always advocated the idea of keeping sheep, or something else, in his orchards, and not tilling nor cultivating them, and he has carried that thing to a wonderful extreme. It being not very far off, I said to Bradley one day, "Let's ride around and look at some of those other orchards." I wanted to see what the results were of that principle carried out. We looked over a good many of them, and wherever we found an orchard under reasonable cultivation the fruit looked well, but when we saw those orchards cultivated under Woodward's theory they were disappointing. If the theory had been carried out perfectly, it might have been all right. Woodward always says, keep sheep in your orchard, and feed your sheep and let them fatten, and the results of their feeding will make it unnecessary to cultivate. That idea might be successful, if fully carried out, but this man takes hold of it and puts sheep in, and they skin the ground, and instead of adding anything to the soil he is simply taking food away from the soil and putting it on the backs and into the stomachs of the sheep—the very food the trees needed. This we found to be the condition of the majority of those orchards where Woodward's theory had been attempted. Mr. Bradley sends magnificent specimens to the state fair—a whole barrel of Oldenburgs, and they look as much alike as two peas. This is an illustration of what can be done with an apple which has been regarded as not of much value, because we have come generally to believe that a winter apple is what we want. There is, however, a demand for good fall apples, and they can be sold at good prices.

Mr. Collar: You say that you cultivate deep?

A. I should say that his cultivation is not designed to be deep; he plows his land in the spring, and then uses his spring-tooth harrows, so as to keep the soil stirred up, and it results in the land being loose.

Q. Would it be better to cultivate, to keep the ground mellow on top, say three or four inches deep, instead of plowing?

A. That is as one may think best. I don't believe in deep plowing for an orchard. Our plowing is done as shallow as we can do it. People have different opinions about that and it can be argued for hours. My own experience teaches me not to cultivate deeply.

Mr. Morrill: Permit me to say, for fear a misapprehension may have arisen, that Mr. Willard has spoken to you of two men with two methods; one is Mr. Bradley, who is a thorough cultivator, and who carries the fertilization in. The other Mr. Woodward, who does not cultivate at all, but puts fertilization on through the medium of sheep, and I think Mr. Willard will say that the difficulty with the ordinary farmer is to get the details of the system into his understanding and then get him to practice them. Either of these methods is a success in the hands of a man who carries out every detail.

Mr. Willard: But on the whole I would choose the man who cultivates. That is my practice, and I don't believe I could raise good plums and a fine quality of other fruits unless I did it. I have made a reasonable success, and that has been the method I have followed.

Q. If I have an orchard just coming into bearing, so that it bears two or three barrels of apples, and I want to fertilize it with wood ashes, how much would I have to put on annually in order to keep it in good condition for ten years?

Mr. Willard: I don't know that I could answer that question, because we have never been able to use wood ashes to the extent we would like, for we haven't had money to buy them. Our rule is to put on a bushel at a dressing and to do that dressing once a year—a bushel to a tree.

Mr. Morrill: Do you make no difference, according to the amount of trees to an acre?

Mr. Willard: I don't know that I could tell you as to the acre. We have to have some rule for the men to work by, and I have laid down the rule, a bushel to a tree. We use them upon our pears, quinces, and plums, so far as we can.

Q. The inquiry was particularly in regard to the apple.

A. I don't think there would be any danger in using twice that amount.

Q. Would you put them under the soil, drag them under?

A. I don't think there is any loss if applied to the surface; the subsequent cultivation takes them in. Perhaps it would be best to apply them in the spring, but we have to spray for scale insects and everything on earth, and we usually do it at this season of the year (winter), trying to put them on when the ground is not frozen. Prof. Bailey perhaps would be able to tell you whether it is better to apply in the fall or spring, but I think there is little danger of any one applying too many wood ashes to any tree or fruit of any kind.

Mr. Kehoe: I understand there is a man in Adrian who plowed his orchard this summer with four horses, and it had an abundant crop of apples. If the gentleman is here, I would like to learn whether this is true or not; whether it is a good plan to plow deeply. Mr. Willard recommends shallow plowing and continuous cultivation, but if this other gentleman plowed deeply with four horses, and had a good crop such a year as this, I should like to hear from him.

Mr. Hoag: That gentleman is not here, but I happen to live just across the road from him and I will answer Mr. Kehoc's question briefly. The owner of this farm never lived on it, and he sent a man down from Chicago to work the place. The man had never lived on a farm and knew nothing about growing fruit, and that orchard had been somewhat neglected. The owner had planted this orchard of eleven acres, and treated it very carefully; in fact, he would not allow any crop to mature upon it. He cultivated it and grew the trees, those that lived, very nicely. He pruned them very carefully, indeed, and the orchard had borne but one full crop, and for the last two years previous bore scarcely anything. Well, this man proposed to raise a crop of corn, and went in there to plow. It was so dry that he had to get a neighbor to help him, and they did use four horses. Well, the fact is, that they cut off all the surface roots, and if it does not ruin the orchard entirely I shall be surprised; but he did get quite a crop of apples from part of the orchard. Several trees bore good crops; I hope they may in succeeding years.

Q. Are muck ashes valuable? Our swamps have been burned and the ashes left three or four inches deep. When the speaker mentioned the good qualities of wood ashes, I was thinking it might be a good thing to scrape out these ashes and use them in our orchards.

Mr. Bailey: I think they would be valuable if the muck was not too thoroughly decomposed—if the potash is still there.

Q. I notice our trees all went into winter quarters the middle of October. What will be the result another year?

Mr. Willard: Unless injured in some way, I should think it would be a good omen. I think it augers well for the future.

Mr. Morrill: Referring to the deep plowing and the consequent production of apples, I hope our professional men will not allow that to go by without making some statement. For fear they might not get the idea I have, I will mention it. Everyone doesn't realize that the crop was laid out last year. The plowing was done this year. The plowing might have a certain effect, and it might be the effect produced on the tree, that at the last moment before death exerts its utmost efforts. I should be afraid that would be the result.

Mr. Helme: If I were going to set any fruit, I would set an apple orchard, for seven eighths of the apple orchards in Michigan have gone to pieces and the apple is the king of fruits. Apples can be utilized from the time they begin to fall from the tree, when they can be fed to stock, right through to the end; you lose nothing. I think there is a good future for the apple in Michigan.

Mr. Hoag: There is one matter of practical importance to fruit-growers, and that is the kind of soil in which to set an apple orchard, and I would like to ask Mr. Willard what soil he considers best. While I am on my feet I will say that our soil is a gravelly loam, and these dry years have been ruinous, not only to production but to the trees themselves. I had one of the finest Oldenburghs, that bore excellent crops, and this year it bore a heavy crop and died. It was in the most gravelly place in the orchard, but the drought seemed to use it up; and my theory is that a clay loam, rich and well underdrained, would be better. If there are people who contemplate putting out orchards it might

be well for them to consider this. Our subsoil is of a gravelly, sandy nature; our surface soil is a mixture. It is a gravelly loam, consisting of a little clay and considerable loam for perhaps two or three feet. Then we strike a coarse gravel and then a fine sand, and below that is a coarse gravel where we find plenty of water.

Mr. Willard: I must confess that I think I know less and less, every year, about such subjects as that. At one time I had clearly defined theories as to what could be done under such and such conditions, but I have seen things so radically different that I have made up my mind that, so far as theorizing is concerned, it isn't of much use. My idea has been, and is still, that an apple orchard on a good loam with clay bottom is in a good enough place, and I think that is so with most fruits; and yet, some of the finest apple orchards I have ever seen, and also plum and pear, are on soils that haven't a particle of clay within half a mile. To illustrate: Prof. Bailey, I presume, and many others, have felt that a pear must be upon a clay subsoil or something of that sort. One of the finest pear orchards I ever saw was where I dug down as far as I could with a spade, and then I went to the bank of the river and looked up, and you couldn't see a particle of clay for seventy five feet. There are some of the finest apples in Nova Scotia, where there is apparently no clay at all. So it would seem that what is essential in one section, with a certain environment, has no bearing in others, and still the prevalent opinion is that a good clay loam with a good subsoil is the proper thing.

Mr. Kehoe: I have had some experience in setting an orchard on different kinds of soil, and I supposed that a clay or loam soil was just the place. Well, when I set my orchard out, about eighteen years ago, I set it on a piece of land of about three acres. There was about an acre of this orchard that was clay loam, with a very light, mucky soil on top, that reached from eight inches to a foot. Then there was a heavy clay soil. I ditched it thoroughly, so it was always dry. The rest of it rose up on a hard clay knoll. Some of this knoll descended to the north, and part to the south. I set my orchard out there, and all the trees were alike. The rows ran north and south, across both the high and the low land. The result was that, on the low land, the trees gradually died off, one by one, but on the hard ground, at the top of the hill, are perfect trees, all alive. I couldn't raise currants there, but I could raise corn and wheat or any other crop in abundance, on the lower part, but I find that the place for apple trees is on the high ground.

Mr. Beal: I would like to have Mr. Willard's experience in this matter; whether he has found that one kind of apple does well on one kind of soil—whether it develops better on one soil—and another kind on another.

Mr. Willard: I understand what the gentleman means, and I am satisfied that such conditions do exist. Because an apple does well in my soil is no evidence that on some other soil it will do well, or that it may not do better. Our trees have various temperaments. They don't all want the same treatment, and we must know how to handle them best.

Mr. Morrill: I don't like to close this discussion without calling Mr. Willard's attention to one thing that came out in his paper—his speaking of the Ben Davis as being such a favorite market apple, and out-selling the other varieties. I have been a close observer of Chicago markets, and they have all sorts of buyers, different classes; and it is the big Ben

Davis center, too. The big Ben Davis orchards are southwest, and this fall an entirely new phase of the market came, with buyers hunting for Baldwin, Greening, Snow, Spy, anything of that character that comes from Michigan, New York, or Canada; the consignees and commission men pushing Ben Davis and extolling them, and the buyers saying, "if we can't find Baldwins or Greenings at \$3 or \$6, we will take Ben Davis at \$2." That is a fact, and I think it is the beginning of a wave going back on the Ben Davis.

INDUCEMENTS TO FRUITGROWERS, WITH CONDITIONS OF SUCCESS.

BY MR. C. P. CHIDESTER OF BATTLE CREEK.

Let me say to you that I believe fruitgrowing, when conducted intelligently, is one of the most pleasant, as well as profitable, occupations in which one can engage; and it offers many inducements and advantages over any other line of agricultural pursuit. When the disadvantages under which the fruitgrowers of other sections of the northwest labor are compared with our own natural advantages, we can fully appreciate the favorable conditions under which we live. Of course, failures in fruit sometimes occur on account of conditions over which man has no control. I think it will generally be conceded that Michigan offers greater inducements to fruitgrowers, at the present time, than any other state, when we take into consideration the peculiar location of Michigan, surrounded as it is by the great lakes, whose mild influence is noted by every fruitgrower; and that we have a soil and climate possessing all the necessary qualities for the perfect development of fruit.

When we take into consideration the great advantage Michigan has over other competing states by being much nearer the great fruit-distributing centers, the advantages of Michigan become still more apparent. Another advantage Michigan enjoys over most western states is, windbreaks can be successfully grown where orchard protection is found to be necessary. We should remember that there is an immense territory west and northwest of lake Michigan, to be supplied with fruit, and the people of these western states will always look to Michigan for this supply, especially in apples, peaches, and grapes.

Overproduction of fruit has been the prophecy for the last thirty years, and yet the supply seldom equals the demand. Very few people realize the vast amount of fruit it takes to supply seventy millions of people. I am satisfied from my own experience, and by talking with many fruit dealers, that under-consumption is much more likely to take place from the fact that a large part of the laboring classes have not money in excess of their actual wants with which to buy fruit. I am firmly impressed with the belief that if the poorer classes could furnish themselves with the fruit which is necessary for their comfort and health, overproduction would not disturb the fruitgrowers for many years to come.

When we remember to what an extent canning and the improved methods of drying fruit have increased domestic consumption; when we note the improved facilities for the shipment of fresh fruits long distances, thus greatly extending our markets, we must come to the conclusion that commercial fruitgrowing is still in its infancy. It would seem that there would be no necessity for the person just commencing in horticulture to make any mistakes at the present time, when we take into consideration the vast amount of knowledge that the State Horticultural society and other similar organizations have published and sent broadcast throughout the land.

New and improved methods for combating insect enemies have been discovered, also remedies have been found preventing the fungous diseases of fruit trees and vines to a great extent. The above facts, together with the low price of farm products, are inducing a great many men to commence fruitgrowing. My advice to such persons would be, investigate the subject thoroughly before commencing the business. This would save much valuable time and expense. Taking the experience of the past five years in central Michigan into consideration, growing apples for profit has become a serious problem.

I think the facts will warrant me in making the assertion that not more than one orchard in five has paid the cost of cultivation during the above period. Now, it seems to me that some law of nature has been violated by man to create this universal failure to grow apples for so long a period. Almost every conceivable theory has been advanced for the cause of this failure, by leading horticulturists, at different times. The fact that failures have taken place under all these conditions, in the absence of orchard protection, shows conclusively that the true cause is not generally understood.

I have tried to impress upon the fruitgrowers at different times what I believed to be the greatest cause of failure, and that is insufficient protection to orchards by lack of timber belts. It has been my experience, from extended observation, that though you have every other condition in perfection, you will very seldom grow a good crop of apples. Observation has convinced me that, where orchards are protected by wind-breaks, the fruit attains a much greater degree of perfection. I wish to firmly impress this fact upon all who contemplate setting apple orchards, that they must have protection by wind-breaks if they ever prove successful any great length of time. This law of nature can not be violated without suffering the penalty. Careful observation has revealed the fact that, as our timber belts have been removed, apple-growing has steadily decreased. Therefore, if the above theory for the cause of failure is correct, we can not with any degree of certainty look to the future for an increase in apples. I do not wish to be understood as advocating that wind-breaks alone will insure a crop of apples. There are other conditions which are necessary to success, namely, keeping up the fertility of the soil, judicious pruning, and spraying to prevent scab and codlin moth. I am not prepared to say at this time what influence the removal of our forests has upon the amount and distribution of rainfall; but, judging from the increasing drouths which have visited this state during the past few years, it is evident to me that agriculture is suffering from this cause to as great an extent as horticulture. I believe it to be a law of nature that the more the timber belts are removed from a country the

greater will be its liability to injury from severe storms, and generally in such countries it will be found that the greatest extremes of heat and cold occur.

The success which has been accomplished by peach-growers in favored localities in Michigan, during the past few years, has created wonderful enthusiasm in the peach industry throughout the state. Thousands of trees have been set in almost every locality. That serious mistakes have been made, both in regard to location of orchards and varieties planted, is also true. Long experience has proved that high elevations of land are the most suitable for peach orchards. As to varieties, Barnard, Early Michigan, Crosby, Elberta, Snow's Orange, Kalamazoo, Gold Drop, and Smock are highly recommended as being hardy and productive.

The question of keeping up the proper fertility of the soil should receive due attention from the fruitgrower. It is a well-known fact that unleached ashes is the most perfect fertilizer for fruit within the reach of the general fruitgrower. Too much importance can not be placed upon this fact. Peach trees require thorough cultivation from May to August.

For preventing and exterminating peach-tree borers, remove the surface dirt from the roots of the trees and wash with strong soap suds, with the addition of a little carbolic acid. This should be done early in May and also in September.

The conditions necessary to success in grape-growing, briefly stated, in my estimation, would be to place the vineyard upon a high elevation for the purpose of securing air drainage and to prevent injury from early frost. It seems to me that there is nothing of so much importance to the grape-grower as good location. My experience with drouth for the past two seasons has convinced me that a rather heavy loam with a clay subsoil is the most suitable for vineyards. I visited several vineyards during the past season, that were situated upon sandy soils, where the grapes were nearly worthless on account of drouth. If you have a soil and location suitable to produce the best results, set your vines twelve feet by sixteen. I set my posts for trellis wires sixteen feet apart, in rows running north and south. This direction gives the sun a better chance to strike both sides of the rows. I use posts about eight feet in length, painting the ends that go into the ground with boiling coal tar before setting. I find this to be very beneficial in saving the posts from decay. I use No. 11 galvanized wire for trellising, placing the first wire about four and one half feet from the ground and the top wire about six feet. I usually allow one branch of the vine to run upon the wire eight feet each way. The advantages over other systems of trellising are, more sunlight and better circulation of air, which are very essential to production of perfect fruit. After the length of the vine is established, I usually prune in November, leaving two strong buds upon each branch of the present year's growth for the bearing wood for the next season. About the first of June, or when the vines have made a growth of about three inches, I go through the vineyard and break off all weak sprouts, leaving only the strongest ones which contain the largest clusters. I believe this to be very essential to prevent overbearing and to secure perfect clusters. Having the experience of the past two seasons before us, I would advise the planting of fruit trees and vines as soon in

the spring as the ground is in suitable condition. The experience of the past season has clearly demonstrated that ground plowed very early in the spring holds moisture much better than under late plowing. We should bear in mind that thorough cultivation applies to grape-growing as well as to other kinds of fruit. It has been clearly demonstrated by the experience of the past few years, that a very large proportion of the fungous diseases and insect enemies that infest our fruit trees and vines, can be controlled and kept in check by thorough and systematic spraying. I usually spray my vines in the spring, about the time the buds begin to grow, with Bordeaux mixture. If the Bordeaux mixture is calculated to be used as an insecticide, it will be necessary to add one fourth pound of Paris green or London purple to forty-five gallons of the mixture. I spray again soon after the grapes are formed. These two sprayings are usually sufficient in very dry seasons. It will sometimes be necessary in very hot, rainy weather to repeat the spraying in case the vines are liable to attack from black rot. The objects of spraying early in the season are to prevent the germs of black rot from spreading, and to kill the grapevine flea beetles that commence eating the blossom buds as soon as they are formed.

The grapevine leaf hopper, which is another grapevine enemy, is a very small winged insect, about one tenth of an inch in length. It appeared upon the vineyards in Calhoun county about the middle of June. These insects live by sucking the juices from the leaves during the summer season. I have no doubt, from the experience of the past season, that immense damage will be done to vineyards the coming season, unless prompt remedies are applied. The vines should be dusted early in the season, before the leaf hoppers have acquired wings, with pyrethrum or tobacco dust, or sprayed with kerosene emulsion.

Worden, Concord, Moore's Diamond, Niagara, and Vergennes are still the most popular market grapes among the old varieties. Winchell is highly recommended for a very early grape. Further testing has strengthened my belief that my new seedlings are superior in many respects to the best old varieties.

Let me say in conclusion that the ideal grape has not been found, but I firmly believe that the future affords greater opportunities for improvement in the grape than any other fruit. When we take into consideration the ease and certainty with which grapes can be grown, when we note the great length of time that they can be placed upon our tables as dessert fruit, we must come to the conclusion that grape-growing will soon become one of the leading fruit industries of our state.

DISCUSSION.

Mr. Woodward: The gentleman says that our drouths are largely caused by the destruction of the forests. Why was it that the Pilgrim Fathers, before the country was settled, had to set aside a day for prayer for rain, when the country was still wooded?

A. Perhaps that it might illustrate their faith.

Mr. Harrison: I would like to know if that is the best thing to destroy the grub. I supposed the best thing to do was to use white hellebore.

A. I think that remedy is put down by Prof. Weed for that insect. These insects never appeared with us until last season, and I didn't know what to do with them. They became very numerous, and I think the vineyards will be almost completely destroyed unless some preventive is used next season. The leaves turn brown, just as if they were dead in the fall of the year, long before they should be, and I think they injure the grapes also. The insect works on the leaves, near the wire, and not on the ends of the vines, so it is right along in the fruit.

Mr. Harrison: If the adult insect can be destroyed by pyrethrum or by any other method, we would like to know it. My idea is that the only sure way to destroy the thrip is to commence when it is young, so soon as it hatches, and I am not aware that there is anything that will destroy it afterward. I use white hellebore, and it should be fresh and pure in order to be effective.

Q. Is there any way we may know when it is fresh?

A. I am not able to say.

Mr. Willard: It isn't so much the question of being fresh as to be free from adulterations. I have bought hellebore by the barrel and used a great deal of it, and found it just as good, and it would make you sneeze just as hard, at the end of three years as in the beginning. The trouble is the adulteration it meets after it leaves the factory.

Mr. Helme: I have used it nineteen years and found it satisfactory. There is an impression that there is less rainfall than when this country was a wilderness. In 1839 I was down here hunting bear and deer, and Black creek and another were dried up then; there was no water running in them; there was just as big a drouth that year as there ever has been since. Of course, then it was nothing but a wilderness. The cause of drouth is that the land has been skinned year after year. It is the barrenness of the land that makes drouth. We could stand it better if the land were better. You will find that where the ground is rich enough to bring forth a crop, it doesn't suffer much from drouth.

Prof. Taft: From the Agricultural College bulletins we learn that we have not had nearly as much rainfall of late. When long distances are swept by winds, we must know that they take up the moisture from the ground and carry it to different places. The greater the obstructions to the wind, the less the wind would rife the surface of the earth. Of course, we had that drouth, but we didn't have as many crops then, and it wasn't necessary to have so much rain; but now I think we have just as good ground, and in many localities we don't have half a crop of corn where the ground was rich enough to produce three times as much if we had had a little moisture. The corn that was planted in May didn't come up until July, which shows that there was an excessive drouth.

GRAPES UNDER GLASS.

BY MR. ARTEMUS SIGLER OF ADRIAN.

A suitable place for a glass house should be free from the shade of trees and from roots of shrubbery of any sort. Sunlight, air, and moisture are some of the most essential elements of success. The soil for grapes is one more of the important features to be considered. I would recommend a preparation of well decayed sod, taken from some low, rich pasture land, and I would add as much barnyard manure as sod and mix them thoroughly together. Collect as many bones as you can get, and place them in the bottom of the pit, which should be eighteen inches or more in depth. Then cover over with the above compost.

If I were to build a small house, say twenty to twenty-five feet long, in the first place I would set Black Hamburg, and the second I would set the same, and for the last one I would set Black Hamburg also. But if I were to build one fifty feet long or more. I would add just two more varieties, and they would be White Nice and Barbarossa. This is the list recommended by the well-known nurserymen, Elwanger & Barry of Rochester, New York; and the experience I have had with the different varieties has led me to the same conclusion.

This list is for a cold graperly, where there is no artificial heat used. The roots should be set on the inside of the house, close to the sill, and ten feet apart. As they grow, pull off all the shoots but one, the first year, and tie up the one to the trellis, which should be wire, as that seems to be the cheapest and most suitable. Never allow the vines to come nearer than sixteen or eighteen inches of the glass, as the sun's rays are likely to scorch the leaves.

Use plenty of water, by spraying the vines daily, in order to keep up a humid atmosphere, so that the buds will develop more evenly. This should be kept up until they show signs of blossoming.

Then withhold the spray from the vines, for it will blast the fruit and cause it to fall off. At this stage of growth it is best to dust the vines thoroughly, all over the leaves and clusters of fruit, with sulphur, to prevent mildew on the leaves and fruit, for this is one of the worst enemies to contend with in raising this kind of fruit under glass.

In the meantime the ventilators should be kept open from early morning until four or five o'clock in the afternoon, then close them for the night.

I have practiced trimming the vines through the growing season by pulling off the lateral shoots, which I think is all right and proper; also to cut off all surplus shoots that will not be needed for next season's fruiting. It is a question in my mind whether it is practicable to cut off the branches at the third leaf beyond the fruit. I have experimented both ways, and if there is any difference it is in favor of letting them grow as long as nature and good care will allow them. After the hard frosts have killed the leaves and they have fallen off, I take my pruning shears and trim the vines for the next season, and before hard freezing

comes I take the vines from their trellis and lay them on the ground, and cover with leaves from two to four inches deep. Then the season's work is ended. I think it is not necessary for me to give any directions how to trim, as it is pretty generally understood. I will admit that the worst fault is that I am likely to leave too much bearing wood, with the result that the fruit does not ripen and is worthless. It might well be compared to an old saying, "spare the rod and spoil the child."

I made several visits to Detroit, almost specially to see Mr. E. B. Ward's graperies, in order to see and learn all I could about growing this kind of fruit. This was somewhere between thirty and thirty-five years ago. He was a very extensive grower of this kind of fruit at that time. I counted thirteen of these houses in one garden, and none of them less than 120 to 130 feet in length, and all filled with from two to four rows of grapevines, heavily laden with fruit. I found his gardener and introduced myself to him, and informed him of my business, that it was to see and learn how he took care of his graperies. I told him that I was an amateur in the business and seeking knowledge, and I found him to be very much a gentleman. He stopped his work and showed me through all of these houses, and explained the different processes of his work, for which I thanked him. I think it was the last time I was there, that he told me that there had been a gentleman from New York to see Mr. Ward, who was in some way connected with the New York Tribune office, and during his stay Mr. Ward invited him into his garden to see his graperies. After he had been shown through all of them, the gentleman made the remark that if the fruit was in New York it would fetch \$500 for each of these houses, the total sum of \$6,500. I was informed when there that Mr. Ward never sold a pound of grapes. He always kept on hand a supply of baskets and would give his orders to have some filled and sent every day to his friends, who were plentiful in those times. His gardener told me that Mr. Ward would eat four or five pounds at a meal, and this is the market he had for his grapes. This last statement I will not vouch for, as I saw the man but once when I was there, but I should not think he could devour so much fruit at a time from his dimensions, although he was quite a portly gentleman.

Some thirty-five years ago I first conceived the idea of building me a glass house in order to raise some of the choicer varieties of grape, and I went to work and built one about thirty feet in length and set vines in it of the White and Black Hamburg varieties, and I was so well pleased with the fruit that I continued to add to the house until it was 100 feet in length. So, in all this space, I kept filling in with new varieties until I had thirty-five where there should have been but three. But I have been taking up and throwing away and grafting in the better varieties, so that I have about one half that number left. I have been fairly successful in raising these finer varieties of grape. I have frequently raised clusters that weighed upward of three pounds.

Now, why can not I be allowed the expression, after seeing them grow and tasting them these many years, that they are the best fruit that our great and good Father has seen fit to bestow on man? They bring the highest price of any fruit in the known world. In proof of what I have stated I will give you the wholesale and retail prices of these grapes, as published in American Garden, between the years of 1886 to 1892:

		Wholesale.	Retail.
Dec., 1886.....		\$2 00	\$4 00@ \$5 00
Oct., 1887.....	\$0 50@	75	1 25@ 1 50
Oct., 1888.....	75@	1 00	1 50@ 1 75
March, 1888.....		7 00	9 00
April, 1888.....	3 00@	4 00	8 00
June, 1888.....	2 50@	3 50	5 00
May, 1889.....		4 00	7 00
Nov., 1889.....	60@	90	1 25
June, 1890.....		75	1 25@ 2 00
April, 1891.....		4 00	6 00
June, 1892.....	2 00@	2 75	4 00

I have averaged the 11 reports, and the wholesale price paid would be \$2.60 per pound, the retail \$4.39. I think I have shown you that my assertions about quality and high price are not without proof.

In the gardens of Queen Victoria there is a glass house seventy-five feet long, and only one vine in it, which is called the Hampton Court vine, and is of the Black Hamburg variety. It fills the whole house, is said to produce over three thousand clusters annually, and is over 100 years old. I think if the fox, as reported in the fable, had seen and tasted some of these grapes he would not have made up such a wry face and said they were sour and not worth the trouble of obtaining.

Experience of thirty-eight years in this branch of horticulture has been a very great source of pleasure to me, to watch the opening of the buds and the growth till the maturing of this most delicious of all fruits.

DISCUSSION.

Mr. W. F. Bird of Ann Arbor: Coming in rather late, I have not heard whether the subject of grafting has been treated or not, and I would like the best method of grafting grapes.

Mr. Sigler: I have grafted grapes and everything else, almost, even to the cacti. I think the best time to graft grapes is after the sap has ceased to flow, after the vines have begun to leave out. That has been my experience. If you can, keep your scions from starting until after the leaves appear. Then cut them off below the surface of the ground, and set them the same as you set a scion in an apple tree. I have grafted before the sap started and had good luck, but not as a general thing.

Mr. Morrill: Is it more desirable to change an unprofitable variety that way, than to take it out and set anew?

Mr. Sigler: Yes, you get grapes the second year. I set one Black Hamburg variety into a White, and it grew 360 feet of wood the first year. This fact was published in the New York Gardener, some twenty years ago, I think. That vine is still living and doing well.

Mr. Chidester: Have you had any experience in grafting in out-door work? I have a peculiar saw that saws two cuts at the same time, and a small chisel that makes a smooth cut, so that it does not require a blade to introduce the graft. I have found it more successful than to try to split the cleft, because a grapevine does not split easily, and when it is

sawed out it leaves a perfect space for the scion. Saw it down as far as you want to make the graft, and then make the graft to fit the sawed place, and it makes a perfect fit.

Mr. Morrill: You wax it, do you, and cover with cloth?

Mr. Chidester: I do not think it is necessary to wax. If you graft in the fall of the year, it is necessary to put an earthen jar over, and cover with straw, to keep from freezing. The frosts are likely to draw the scion out.

Mr. Sigler: I have experimented with wax and cloths. Take cotton cloth, strip it, and wrap it around the stub of the vine where you graft. I never got one to grow by putting wax, but the cloths keep it moist, and I think the vine is more likely to grow because this wrapping furnishes moisture for the scion.

Mr. Morrill: These are fine points which it is absolutely essential to bring out, to save people from mistakes.

Mr. Chidester: I don't know where you can find those saws; I bought mine of an old man living at Tecumseh.

Mr. Bradish: I am not very familiar with grafting grapes. I don't raise grapes under glass, and I don't believe grafting pays for out-door culture, when vines cost only from five to ten cents apiece.

Mr. Morrill: You can get Concords for two cents.

Mr. Bradish: If you had a vineyard that you were not satisfied with, would you tear it out and set new, or would you graft it? I would set new ones.

Mr. Morrill: On different land, perhaps?

Mr. Bradish: O, perhaps not, always. If I had a location that I thought was just right, or very nearly right, and it had been kept up in good shape, I would tear up the old roots and set new vines. I have done that frequently, and sometimes I have had to cut away at the old ones two or three years, to get them killed out.

Mr. Reid: Then, Mr. Bradish, you have never tested the matter of grafting, to learn the comparative value?

Mr. Bradish: O yes, you can get grapes perhaps a year or two sooner, by grafting, and large crops sooner, but I prefer resetting because land and labor are so cheap. It would be more labor to graft the grapes than to pull them out and reset.

Mr. Chidester: How many vines, taking old vines, say one and one half inches in diameter, can a man who understands it graft in a fair day's work, and what proportion ought he to make live?

Mr. Bradish: I should think a person might graft forty or fifty per day.

Mr. Chidester: Then it would be worth about three cents apiece to do the grafting?

Mr. Bradish: Yes.

Mr. Chidester: What proportion would you, of your own work, expect to make live?

Mr. Bradish: I think a person ought to make two thirds of them grow.

Mr. Chidester: That would make a rather ragged vineyard.

Mr. Bradish: Of course, I never had enough experience to tell exactly how many would grow. It is generally conceded that it is a pretty nice job to graft a grape successfully.

Mr. Chidester: Yes, but you gain at least two years on each vine that you get to grow.

Mr. Bradish: You can not get very much of a crop until three years after the vine is set out, and I have got a good crop the second year. If I were engaged, as I understand Mr. Chidester is, in propagating new varieties, I think it would be well to graft. Seedlings are sometimes long in coming into bearing.

Mr. Bird: There is one point that might be of great value, if it would work, the same as with large fruits. That is, the possibility of grafting a fine, productive grape, all other things being equal, that grows on a weak root, upon a strong-growing stock, like Concord or Niagara. I do not know whether this could be made to produce the desired effect, whether a slow-growing variety can be grafted upon a rapid-growing stock and partake of the effects of the strong stock.

Mr. Chidester: I think that thing can be done. I grafted a Wyoming on a Concord, and it made a wonderful growth the first year. It seems to grow just as rankly as the Concord.

The President: Is not that the best use you can put grafting to, growing weak varieties on strong vines? Mr. Willard, what do you think? Is it desirable to change a vine, except for such purposes as last mentioned?

Mr. Willard: I have a friend who is a large fruitgrower, and he practices that thing a great deal, and he says that he has had great success in it. Vergennes has been a great success with him, as a producer, and as a market grape. He said he had a large variety of grapes that he would graft over to Vergennes. I think one of the causes of failure in grape grafting is the manner in which scions are kept, and I believe that is true of any grafting. The buds should be kept in perfect condition. For that reason, in all of our orchard grafting, we are now cutting our scions (which I always do at this season of the year) and putting them one side and allowing them to freeze up solid, and in that condition we shall put them into the ice-house and keep them frozen until we want to use them, so that they are perfectly dormant. In the stocks upon which they are grafted the sap will have begun to flow, and they are in good condition to heal at once, and it seems to me that that is one of the important things in connection with the grafting of the grape. You can easily graft a weak variety upon a strong one, but you can not graft a strong variety upon a weak one. If you attempt to graft a sweet cherry into a sour one, you will make a failure, because it is the stronger.

Mr. Baldwin: Is it material to trim grapes in the early fall? I am just starting in. Two years ago last spring, I set about 300 grapevines. I was a novice, I knew nothing, and I asked nothing. I got hold of an old book of twenty years ago, and I find that the advice of that old book is about as good as I can get now. I dug holes two feet square and eighteen to twenty inches deep; I put a goodly quantity of bone into each one of these holes. I then put in a compost of clear cattle manure from the stables, on the bones, then covered that well, and I raised my ground in oval shape about the roots. I never saw such a growth as those grapes made. I set them two years ago last spring, and a year ago last spring, the first year after setting, we had a fine crop. Now, I want to find whether it is material to trim in early fall. I would state that,

on a few vines, I have trimmed from the time the leaves were falling until the leaves were out again, and I must say I never saw any difference in the bearing or growth.

Mr. Sigler: I have trimmed my vines, the last thirty years, in the fall, and I think that is the time to do it. I have trimmed for other folk in the spring, when they would bleed, and I do not think it is the right thing to do. If any one can explain why they should leave this wood on, for the benefit of grubs, I would like to know. I think after the wood has ripened it is of no more use to the vine, except what you want for bearing. The quicker it is cut off the better.

Mr. Baldwin: It is absolutely necessary?

Mr. Willard: I should say it is not. If you discriminate between early and late fall, that is different. There is enough time, however, when the vine or tree is in an absolutely dormant condition, to afford ample opportunity to trim in the fall. I consider it good practice to trim in the fall. Whenever the weather is suitable and there is no frost, our knives are going, every day.

Mr. E. W. Allen: One point I think is well taken, in regard to the reason why fall pruning is desirable, that the ends of the vines, where the spores are, mostly, of the fungous diseases, will be cut off and burned during the fall.

Mr. Morrill: I want to say that I consider it one of the most important things in all our works, nowadays, to burn the trimmings and do away with that much trouble, the propagation of additional disease.

A FEW THOUGHTS ON THE GRAPE.

BY MR. H. C. BRADISH OF ADRIAN.

Good grapes are wholesome, delicious, and conducive to health and longevity. We learn from history that the ancients esteemed them highly. One of them planted a vineyard, drank wine, and lived nine hundred and fifty years.

Since the Concord was voted the grape for the million, a number of other kinds have been produced that are good or better, and which furnish a variety of flavors. Among the better kinds that are adapted to southern Michigan may be named Brighton, Delaware, Niagara, Diamond, Worden, and Concord, for fall use, and Vergennes and Jefferson for long keeping.

Many varieties named in the catalogues are unworthy of cultivation on account of weakness of vine, unproductiveness, or bad quality, and should be dropped from the lists. Time is too precious to waste on poor kinds.

A situation elevated enough for good air drainage is preferable to a low level, as there is less danger from the early and late frosts. The soil should be deep, rich, well drained, and deeply pulverized.

Planting should be done before the buds start, in holes four or five inches deep, with convex bottoms. The roots should point in different

directions, like the spokes of a wagon wheel, and be covered with fine, rich earth, firmly pressed. Never allow the roots to become dry before planting. If planted in rows eight feet three inches apart and twelve feet apart in the rows, they will be about right for most kinds. Cultivate and hoe every ten days during season, destroying all weeds. Fertilize with wood ashes and bone. Spread the ashes broadcast and cultivate in. The bone may be supplied either ground or whole. A sheep-killing dog planted about two feet deep near each vine would do, and nature's laboratory would soon transform an ugly animal into handsome, luscious grapes.

Vines may be trained to stakes the first two years, allowing one cane to grow the first year and two the second. Thereafter, train to wires about six feet above ground, so the air may circulate freely among the branches and give less chance for mildew.

Before the buds start, spray with Bordeaux mixture and continue the spraying every two weeks while moist weather lasts.

In pruning, cut away dead and weak branches, and cut the stronger branches back to three buds, soon after the leaves fall.

If the finest and best fruit is desired, put bags on the bunches when berries are the size of peas.

To keep grapes fresh till spring, cut the bunches from long-keeping varieties and put away in the bags in which they grew, in a cool cellar, in shallow crates, where the children can't find them.

DISCUSSION.

Mr. Chidester: How far apart did you say they were planted?

Mr. Bradish: Eight feet three inches, because eight feet three inches make half a rod. Eight feet would do, or nine.

Mr. Chidester: We all agree with the sentiment of this paper, but I think a longer distance preferable. I generally place my vines about 12 by 16 feet. That gives, I think, a better chance for the grapes, especially strong-growing varieties, to grow and develop. I get more fruit, I think, from the same amount of ground, by having these distances—sixteen feet the way of the trellises, and twelve feet the other way. The sun has a chance to strike both ways, and there is a better circulation of air. I like a good size hole, as much as two and one half feet, anyway, and filled with surface earth, spreading out the roots, of course. Jefferson has never proved satisfactory with me; it is a tender vine and, with me, practically useless.

Mr. Morrill: Have you ever tried laying those tender varieties down in the fall?

Mr. Chidester: Yes, when they were small, but still, when we have plenty of better varieties, it is better to raise those that are hardier.

Mr. Bradish: I think I stated in my paper, "Holes three or four inches deep." Of course, I would't object to planting deeper than that, providing you did not cover too much earth on them. I think they will come up quicker to leave the roots near the sun. In raising Jefferson I find no great trouble. I think it is preferable, however, to lay the vines down, and you hardly find a better quality for long keeping than Jefferson.

In regard to distances apart, some varieties, like Niagara, want a greater distance. Varieties like Lady will do well if planted six or eight feet apart. It depends on the variety about the distances.

Mr. Chidester: I have always found that heavy loam with a clay subsoil was best on high elevations. In the first place it holds moisture better than other soils. I think it will hold moisture twice the length of time without rain that sandy soil will. In ordinary seasons it wouldn't make much difference if you didn't have a rain after your ground was wet in the spring. You could cultivate all summer without rain, while in sandy ground you could not do this, and of course I consider it much preferable for grapes, producing better growth of vines and better grapes.

Mr. Bradish: I would agree with Mr. Chidester, if he would allow me to cover his soil with six inches of sand.

Mr. J. W. Helme, Sr.: If it is sandy or light soil, it should be deeper, and if clay loam, I would think, shallower. That should be taken into consideration. I have set both spring and fall, and I think I have the best success setting in October or November. I agree with Mr. Bradish about the soil, and if it were clay soil I would like to have sand on top. As for manure, I use all kinds. I use cats and dogs, about a foot deep. Mark Twain said he used his old aunt. He said she was no particular use to him (an aunt by marriage), and he had a much better crop of grapes, though they were a little tart!

Mr. Chidester: I have a heavy loam with a clay subsoil; I believe in having the loam on top and the subsoil under.

Mr. Baldwin: I would ask if there is a representative from Monroe, so as to have an idea of the soil suitable for grapes in that locality.

Mr. Bradish: I formerly lived in Monroe county, and from eight years' residence there I know they are great grape-growers, and the soil that they grow their crops on there is nearly exactly what Mr. Chidester speaks of, a dark loamy soil with clay subsoil. It is underlaid with lime rock at a few feet's depth, and if any one wants to see grapes grow spontaneously, let him go there.

Mr. Morrill: I have been over the hills of sand at Lawton, several times, and they are today growing the finest crop of grapes, I think, of the Concord type, that goes into Chicago from Michigan, and that is where our theories all are upset. I do not believe that we can lay down a rule that will fit all cases. One of the finest things in fruitgrowing is good judgment. I have heard people say that sand was the only place to grow a real good crop; I have heard other people say that a clay loam was the only place to get a good yield. I have seen tremendous yields on both, and I have come to think that I don't know very much about these things, until they are tested, and I wonder if any of us do.

Mr. J. J. Engel: My people have raised grapes three or four years on light sandy land, here at Palmyra, and later we moved to Madison township, and are raising grapes on heavy clay, and we cultivate them the same as on the sandy land, and they are of better quality and ripen better than on the sand, and they are better tasting grapes by far than those raised on the sand.

Mr. S. D. Willard: I desire to corroborate what you have to say, Mr. Morrill. The great grape regions of my state, where a great portion of the choicest grapes are produced in profusion, are slate formation; a

slate land so poor that, years ago, it had been hundreds of times sold for taxes. It was not worth one single cent for any use that you could put it to, and yet the finest grapes that are grown today in the state of New York, and it is a very large industry (the wines produced from those grapes were very highly commended at the exhibit made in Chicago a few years ago) are raised on slate, a calcareous slate. I have thought of this subject a great deal, and my own opinion is that the development of the fine qualities of fruit they get there is due largely to the amount of potash in the soil. That soil shows a large percentage of potash, which helps to develop the saccharine matter in those grapes. So I do not know as we can tell exactly how to raise grapes right; but it is sufficient to say that they are, and can be, raised on a great variety of soils, providing the soil has the requisite plant food, but I believe potash is essential, though there is danger of getting too much of it. So much was Prof. Caldwell impressed with the necessity for proper grape food, that he asked of the grape-growers that experiments should be made with potash, using it as a special fertilizer, expressing the opinion that they would see the difference, not only in the perfection of the foliage but also in the amount of saccharine matter that would develop in the fruit after the use of potash.

Mr. Morrill: Mr. Willard, I am called in some parts of this state a "potash crank." You may be called a potash crank before you get through.

Mr. Willard: There will be a pair of us.

Mr. Bradish: I think it has been demonstrated, and I think I have demonstrated it myself, that potash on grapes will make a vast difference in the quality. You take a vine that bears poorly, and a poor quality of grape, and give it plenty of potash, you will get more grapes and of finer quality. Another thing: A vine, unless it is thoroughly fed, one that is a good yielder, will frequently fail to ripen its fruit, but potash will help it.

Mr. Sigler: I have used potash with grapes too much. It kills the roots if you get on too much. I had used it very freely on pear trees. It was excellent there, and I thought I would try it on the grapes, and I ruined several vines. It is better to use it in small quantities.

MICHIGAN PEACH ORCHARDS.

BY MR. J. N. STEARNS OF KALAMAZOO.

I hardly know what I am expected to say under this topic. We know there is no one subject receiving more attention in the minds of landowners in this state at the present time, and especially by those owning land adapted to peach culture. It has often been said that peach-growing was being overdone; and undoubtedly this may have been true where planters have covered more territory than they could properly fertilize and care for. But Michigan produced far more peaches the past season than ever before; and, notwithstanding the hard times, to the grower who gave proper care to his orchard, in cultivation and careful thinning, the result has been satisfactory, so much so that our peach-growing sections are in the best financial condition.

The past season it has been more than ever demonstrated to my mind that we make a great mistake in trying to cover too much acreage. That is, if we had but half the number of trees, and gave them all the fertilizers and cultivation we give the larger number, it would mean more money in our pockets. I had a good demonstration of this the past season. I made a plat of ground very rich, by a liberal application of barnyard manure and ashes, to fit it for growing gooseberry plants. Adjoining this plat are four peach trees of Mountain Rose and Oldmixon, and such beautiful peaches they bore!—twice the size of those of same sorts not getting the benefit of the liberal feeding. From one of these trees were picked thirty-five baskets, or seven bushels, some of which sold for \$2.30 per bushel. We may accomplish part of this result, where we have more trees planted than we can give the required amount of feeding, by pretty severe pruning and heading back.

I am satisfied that on most of our orchards we have too much top. We are too much afraid of cutting off the fruit. The tree is debilitated by trying to mature too much fruit; and not only this, but I think our friend Kellogg has struck a very important point, in warning us of the danger of debilitating fruits by over-production of pollen.

I am convinced there is very much more in this than any of us have been aware of. I have 350 Anjou pear trees, which have blossomed very full for several years, but have borne but very little fruit. The past spring I had one row of fifty trees grafted to Bartlett. The grafter cut off about half of the top (as he was putting them in by the hundred), and the result was, many of the branches which were left broke with the weight of fruit, and of the finest quality, while the rest of that variety bore but little fruit, although blossoming profusely, leading me to believe that the previous slight bearing was caused by impotence of the trees, brought about by efforts to produce so much pollen.

I am surprised to learn that, in some sections of what they call the peach belt, they object to so short a time as five days' notice to cut trees affected with yellows. If they had the experience that some of us have had at South Haven, they would want but five hours. I cut out 400 very

fine trees, just in the prime of bearing, in one year, and 300 the next, and so on down to five, and in the last three years I have had not a single tree affected in 2,500; and, as I have remarked before, if I could be one mile from other orchards I would have no fear of yellows. The growers in our vicinity are being very thorough in this matter, so we hear but little of this disease now.

I can not help feeling it most important to urge upon planters of peach orchards in our state the determination to grow only the best fruit and put it upon the market in the best possible shape.

There will be an immense number of peach trees planted next spring, but I should have no fear of the favorable result when they come into bearing if each one would only plant what he could properly care for, and then only put the best on the market. But I saw so much fruit brought to market the past season, that evidently had not been thinned, and in consequence had no quality, that it made me fear for the reputation of Michigan peaches. This will prove much more disastrous to the trees in such a season as the last, as it was so very dry. It taxes the trees severely, leaving them no vitality to produce fruit of good quality the next season. In fact, it will require several years to bring them back to vigor, even if they ever can be restored. I think most of us are too greedy in obtaining large results from our orchards too soon for their permanent good.

In the older peach-growing sections they are learning what sorts to plant for profit, but from the many letters I receive, inquiring what I think of the list submitted, I think the tendency of most new planters is to seek too much after some new, untried sorts. It is all right to try a few of the newer varieties, to learn what they will do in your section. If I had known fifteen years ago, as well as I do now, what to plant for profit, it would have been of great advantage to me.

I must speak of the great mistake many of us made, some years ago, in planting so many of the worthless early peaches. It has had the effect to keep the good peaches from bringing what they would if these had been kept out of the market. I believe the past season, if we had let every one of these drop to the ground and rot there, it would have been money in our pockets. I had previously dug out most of mine, and this season have branded the balance to go with them. I am inclined to think, one season with another, there is but little profit in anything earlier than Lewis.

CARE AND CULTURE OF YOUNG ORCHARDS.

BY PRESIDENT MORRILL.

The first requirement for successful orcharding is a suitable location, but as this matter is to be treated in detail by others who are well qualified, I shall only touch the matter lightly. In a general way, I would say that what we call the seed fruits, like apples, pears, quinces, etc., do best on heavy soils, containing fair proportions of clay, and will at the same time do well on lower levels than the so-called stone fruits. Stone fruits, such as the peach, plum, and cherry, flourish best and produce finer fruit on high, dry, airy locations, even though the soil be quite light and sandy; yet a fertile soil of the same texture is always preferable, the peach, especially, preferring high elevations and sharp slopes.

Preparation of Soil.—After selecting a proper location for your orchard, the next important step is the preparation of the soil. If we will listen to Mr. Kellogg's plans for preparing soil for a crop of plants or trees we can learn a most valuable lesson. The fact is that most of our plantings are made on land hurriedly and improperly prepared. It must be thoroughly impressed upon us that no structure is safe and reliable unless the foundation is perfect. The foundation of a profitable orchard has four big corner stones: (1) A suitable location on genial soil; (2) a thorough, careful preparation of the soil according to the needs of the fruit to be set; (3) a careful selection of stock or trees for setting, as regards varieties, age, vitality, etc.; (4) a thorough and proper system of cultivation, pruning, spraying, etc.

The building of a profitable orchard is like the erection of an expensive building. If you fail to put in a proper foundation, or use most reliable material, the structure is likely to fail, and it is a fact that a large majority of our Michigan orchards have one or more weak corners in their foundations, and never can fully satisfy their owners. We see peach orchards set on the borders of swamps, and in the cold, frosty valleys, and apple orchards set on high sandy ridges. We see soil being prepared for setting of orchards, in a slipshod manner. Hard clay soils, that would grow the finest apples and pears if properly prepared, are plowed perhaps six inches deep, the surface scratched down, and holes dug into the hard, retentive subsoil, and the tree set there. This looks like a deliberate attempt to murder the tree.

At about this time each year fruitgrowers begin to hunt for the man who will sell them trees for the least money. This often proves a fatal mistake in the laying of the foundation. Why don't we hunt for the man who has the best trees and the most profitable varieties, then allow him a living price for his labor in producing a first-class foundation for us? Who can tell why this is a common practice? Who, when he stops to consider, can expect good results from such practice? Who here does not know that a single hatful of fruit from a good tree will pay all the difference between a good tree and a cheap one? Who here has not seen the disastrous results from improper selection of trees for an orchard?

Culture.—The next great mistake commonly made in this state is the practice of over-cropping a young orchard the first few years, and failure to cultivate well the succeeding years. The topic assigned me refers entirely to the care and culture of young orchards, but I feel that it would hardly be complete without the above preliminaries, so I have incorporated them into the article as a sort of text. Care and culture begin after an orchard is set, so we will suppose our orchard location has been properly selected, properly plowed, subsoiled, rolled, harrowed, and made mellow at least sixteen inches deep, if clay land, or eight or nine inches deep if sandy soil; that we have made a careful selection of trees, as regards age, size, variety, and vitality; that we have set them early, on true lines, at proper distances apart; have taken pains to avoid exposure of roots, and to set carefully; that we have not placed any manure in contact with the roots; that we have not tried any washes or mixtures on root or body. Then our work of culture begins.

It is a common practice to plant some hoed crop between the trees, the first few years, and while a limited amount of such cropping is advisable, if proper crops are selected and best of care given, the fact is that such cropping is almost universally carried too far. In fact, a majority of our farmers seem determined to exhaust the soil by some sort of cheap crop before the orchard comes into bearing. This, it should be borne in mind, is a fatal mistake. Close observation and experience have convinced me that in the end our orchards would be more profitable if there was never any crop planted between the rows, but strictly first-class cultivation given from early spring until about August 1, or perhaps a little later if the season is very dry. The only exception I would make to this rule would be in the case of the peach, as I would prefer to grow some crop that matured not earlier than September, in the peach orchard, the object being to exhaust the moisture from the soil during that month, thereby assisting the tree in maturing its foliage and wood before cold weather; but nothing can be much worse than the practice of growing a crop that will mature in July or August. In short, the months of May, June, and July must be devoted to securing the best possible growth, and the months of August, September, and October to maturing the same and getting it ready for winter.

Among the best crops to grow between the rows of trees, the first year, I would mention corn and potatoes, but neither should be planted very early, as they will begin the exhausting process too soon to allow the trees full development. After the first year the orchard will prove to be more profitable if never cropped but well cultivated, and right here arises one of the most serious obstacles in growing a perfect orchard. A large majority of our farmers give an orchard absolute neglect if they do not have a hoed crop planted in it. But now, let me impress this idea upon you: An orchard is a crop; a valuable one, and needs and will pay for as good culture and fertilization as any crop you ever had on your farm. The present condition of Michigan apple orchards is a striking illustration of the lack of proper knowledge, or indifference, of the average Michigan farmer. June-grass, weeds, insects, and fungi have had possession of most of them for years, and the owners swear that apples don't pay any more; but now we find bright men in nearly every township who were not contented to lose their most profitable crop in that way, and have begun a thorough system of cultivation and spraying for insects

and fungi, and these same men are enthusiastic over the results, and well they may be. A few hundred barrels of choice apples during the months of November and December, selling at \$2 to \$4 per barrel, as they have for the past three years, helps wonderfully toward paying off hired help and taxes. But how slow we are to catch this truth!

But let us return to our theme. If you feel that you must grow some crop among your young trees, do so, but the more of it you do the poorer will be the results from the orchard itself. Depend upon that.

The cultivation of a young orchard should begin each year as soon as the ground will work well. Never put it off until the other crops are planted. The best practice is to plow early, then do the rest of your cultivation frequently, with the harrow, but never plow deeply after the roots begin to fill the soil. This is much sooner on well cultivated ground than most men would suppose. As the trees attain age and begin to bear, this culture should be shallow but even more persistent than when young.

Fertilization.—If an orchard is started on fairly good land and is not cropped to death before it arrives at a bearing age, it will not need much in the way of fertilizers until it has borne a few crops; but when it begins to bear I would begin to supply the soil with moderate dressings of potash and phosphoric acid, in the form of wood ashes or muriate of potash and ground bone. You can rest assured that it will beat money in the bank for profit. It may take a little time for the tree to appropriate it to its own use, but it will never be lost. What is not used right away is carefully stored in the soil for future crops. Barnyard manure may be used on apples, pears, quinces, and even plums, to advantage, but under no circumstances would I use it in a peach orchard unless it had been heavily cropped or badly neglected and I could not get the potash and phosphoric acid in the forms named.

Training.—The training of a tree in proper form is of the utmost consequence in its future development, and should begin as soon after setting as growth starts. The correct shaping of the top of a tree should begin when the growth is but a few inches long. To do this properly a man must have an ideal type in view and must be able to see the future framework in his mind. Then he can determine at a glance which limb to save and which to remove. For most trees I would prefer a body of twenty to thirty inches to first limb, then a top evenly distributed in four or five main limbs, scattered in such manner as to avoid the formation of a crotch and give an even, symmetrical head.

If the growth should be strong the first year, as in case of the peach, I would cut back the strong, leading growths to a point equal in length with the weaker ones, and each year following I would cut back one third to one half the annual growth on the strong limbs; and if this caused too much growth of small limbs I would thin them out evenly.

The common practice of beginning at the body of a tree and trimming up to naked limbs with a tassel at the end can not be too strongly condemned. The proper way is to commence at the top by cutting back or shortening in, then trim back toward the body, aiming to leave as much bearing wood near the body as possible. A tree pruned in this manner always produces more and better fruit, is easier to pick, stands the strain of heavy crops, gales, etc., far better than one grown in the ordinary manner.

All young orchards should be carefully watched for the various insects and fungi that are sure to begin operations in them within a few years. In the case of the borer, which attacks the tree near the surface of the ground, I know of no better practice than that of mounding up late in the fall and leaving the mound there until about June 15 following. By this time the beetle has probably finished laying her eggs, when, by removing the mound and rubbing the bark clean, we displace the eggs or young larvæ and prevent all damage.

In the case of insects that attack the fruit or foliage, as well as the various fungi, we must rely on spraying with the various insecticides or fungicides.

Why, when, and how to do this can best be learned by securing the Annual Reports of this society or the bulletins on this subject that are sent out free from the agricultural experiment station at Lansing; but remember that success in this operation requires thoroughness and an early start. Verily, here, "A stitch in time saves nine." Never wait until you are whipped before you begin to fight.

Implements.—The implements of culture best adapted to orchard work are the plow, for earliest work, to be followed by the light gang-plow if needed, then the spring-tooth or disc harrow, and finally the new-style one-horse spring weeder, with which one horse easily goes over twenty-five acres of orchard per day. This tool will not destroy weeds that are well started, but if used on land already in good shape will prevent weeds starting if used frequently enough. During the past season I went over my peach orchards three times per week, for six weeks during the terrible drouth, and the result was marvelous. I firmly believe that one man and a horse with this tool earned me \$10 per day every day of those six weeks.

The next important implement is a first-class spray pump. Successful orchard work can not be done without one any more. Keep it in order and don't hesitate to use it when the right time comes.

In conclusion permit me to ask if you have what is known as "a lucky man" in your neighborhood? If so, have you watched his methods? If not, do so carefully and see if his "luck" is not the result of plans carefully laid and executed. Such a thing as luck does not cut much of a figure in fruitgrowing. Fine crops of fruit and high prices do not come by chance. It does not just happen so. It is the natural result of any well and correctly conducted business.

The man who starts fruitgrowing spasmodically will not be likely to succeed, as it is a business requiring patience as well as skill, but the man who enters into it with well-laid plans and a determination to succeed is sure to make some money and find it a source of much pleasure.

STARTING A PEACH ORCHARD.

BY MR. L. J. POST OF LOWELL.

At one of the previous meetings of this society we were kindly informed that fruit men are always ready to tell all they know and sometimes more. Now, while I claim to know but little of what there is to learn of fruitgrowing, I am always ready to tell what I know, and perhaps more, knowing that among the many successful fruitgrowers present any criticisms will be kindly given. My subject, "Starting a Peach Orchard," is very far from being a new one, and yet no subject seems to be of more general interest to horticultural people, as every one knows that an orchard started wrong is often the cause of long years of regret.

Where.—While we would wish to discourage no one from setting a few trees for family use, even where conditions are all against them, any person setting extensively for commercial purposes can not be too careful in every particular.

While many disagree as to the direction of exposure, all will agree that there must be good air drainage, and yet there seems to be a diversity of opinion in regard to what constitutes good air drainage. Some seem to think that any elevated section, with a valley more or less deep running from it, is all that is required, while by closely observing the frost line for a term of years we find that these are not the only conditions to be considered.

We often find an abrupt descent at the edge of a large extent of table-land, with a deep valley running away, and all conditions for successful peach-growing apparently good; but if we observe carefully we find such a place often subject to severe freezing. The theory seems to be that, while the valley is constantly drawing the cold air, the large extent of table-land directly adjoining is constantly supplying a stratum of cold air, and while such a location may be fairly good it is not the best. Again, we find an elevated section entirely surrounded by valleys, and perhaps not more than one fourth to one half mile in extent, and we have such an elevation in mind that is surrounded by springs coming out of the side of the hill; and while there is no wet land on the top of the elevation, the whole hill is frosty. This we state simply as fact without pretending to know why.

In locating an orchard, then, we would select an elevated location with valleys on at least two sides, and as free as possible from surface springs.

Soil.—Good success may be expected on almost any soil, from quite heavy clay to very light sand, provided the other conditions are right and the treatment adapted to the soil. In preparing the ground I would plow either in the fall or as early in spring as the ground could be worked without packing. If plowed in the spring the ground should be thoroughly worked down, not only to facilitate planting, but that it may better retain moisture.

Distance to plant.—Before deciding what distance to plant, you should determine the method of pruning you wish to follow. If you intend to

keep the trees severely cut back, 18x20 feet is a good distance, or even 16x20; but if you intend to let them run out at will, and merely keep the center trimmed, 20x24 feet is close enough. Both methods have their advocates among successful fruitgrowers, but we favor the closer setting and cutting back.

Mode of planting.—After the ground has been thoroughly prepared, if you have decided to set 18x20 feet, take a one-horse marker, made light and with the frame well up from the ground, that it may be more easily controlled by the driver, and set the markers ten feet apart. Set a row of stakes where you want your first row of trees, and near enough together to detect any variation from a straight line. Then mark as you would for corn, going twice across the field for each row of trees. Mark the field both ways. A careful man will lay out a field in this way better than by any other method we have tried. If you want the trees sixteen or eighteen feet one way, set the markers one half the distance you want the trees. One advantage of this method is that you have the marks across the field to guide in setting each tree, and you can easily detect any variation from a straight line.

Take a light stone-boat or slide, with boards one foot or more wide at each side and at back end. Put a good armful of straw in back end and bottom, and you can pack in two or three hundred trees. Sprinkle them thoroughly, and while wet sprinkle some dry earth or dust on the roots. Keep them covered carefully with blankets and carry some water to sprinkle them if they show signs of dryness, but do not pour water into the holes when setting the trees.

Four men to dig holes and set the trees, one man to distribute trees and boss the job, and a horse to draw the boat of trees, will easily set 1,000 trees per day, so that every tree that is fit to set will live.

The kind of trees and where to get them.—We would if possible get a good, strong-growing, thrifty tree (not overgrown) in preference to the smaller sizes, being careful to see that they are well matured. The so-called June-budded trees sold by nurserymen we have often found to be only small, stunted trees of the same age of the larger ones. We much prefer good fall-budded trees to June-budded, anyway.

In selecting varieties I would be governed largely by the lay of the land to be set. If inclined in all directions, as is often the case with land we wish to set, I would put the early and strong-budded varieties, such as Early Michigan, Lewis, etc., on the earliest and warmest ground, for, if set on the northern slope, they are likely to be a few days later in ripening, thus coming into competition with the large yellow varieties. I would also put the late varieties, as Smock, etc., on the sunny exposure, as on a northern exposure they often lack color and are too long in maturing. Crawfords I have always set on a northern slope, and they are being set in Kent county quite extensively, and are still one of our most profitable peaches. Barber, a sort of improved Chili, and a little earlier, is quite largely called for this year. Kalamazoo is proving to be one of our best peaches.

Although it seems a very simple thing to propagate peach trees, it is very seldom we see a farmer or commercial fruitgrower have good success with them, and although I have no axe to grind I would recommend purchasing of a reliable nurseryman.

Root aphid.—In selecting trees, be very careful not to get the root aphid. I have known several extensive orchards entirely ruined by it, after trying many remedies.

Pruning.—Always trim a peach tree for setting to a single stem, being careful not to trim so closely as to destroy the latent bud at the base of the branch. After setting, let most of the sprouts grow until midsummer, except those starting near the base, as the tree will recover more readily from the shock of transplanting. About August 1, take off the side sprouts below where you wish to start the head, which should be about 2 1-2 feet from the ground, or less if where they are exposed to heavy winds, and cut back those that are making too much growth. We would recommend washing the trees, especially for the first few years, with a solution consisting of weak lye or water with one pint of sulphur or three ounces of copper sulphate to three gallons of water, with dry-slaked lime added until of the consistency of paint. This should be applied twice each year, in spring and fall, at the same time scrubbing the trees vigorously with a good brush. The application in spring will largely prevent the borers of the different kinds from injuring the trees, and in the fall will keep away mice and rabbits.

Cultivation and fertilizers.—The ground in a young orchard should be thoroughly cultivated at least once a week, from the time the trees are set until the first of August, and later if they are not making too much growth, and should not be neglected for anything if you value the life of your orchard.

Cultivate in your own mind a kindly, sympathetic feeling for your trees, and not regard them merely as something from which to make money.

Beans are a good crop to occupy the ground the first year or two.

Very little fertilizer will be needed the first three years if the soil is in fair condition, except enough to supply what is removed by the crop growing between the trees. If there are any very light, sandy spots, they will be greatly benefited by putting on clay at the rate of one yard to five trees. This, by mixing with the sand, will help retain moisture and prevent freezing so deeply in winter.

The treatment of a young orchard, especially in the latter part of summer, should vary according to the kind and condition of soil. If light and rather poor, the best of care and cultivation should be given during the entire growing season. But if the soil is rich, especially in nitrogen, great care should be exercised not to continue the growth too late in the fall. If the soil is rich, rye sown by the middle of August will help check the growth of the trees. The benefit received from rye will not be so apparent as a fertilizer as in regulating the growth of the trees in the fall and as a protection from washing by heavy rains in late fall and early spring. If rye is sown, it should be plowed under in spring before it has time to sap the moisture and thus become a detriment instead of a benefit, as it will if properly treated. We think the reason some people have become prejudiced against rye in an orchard is that they have left it too late in the spring.

A neighbor, who is a successful fruitgrower, set an orchard and determined to make it a model in every respect. The soil, a very rich, clay loam, was highly fertilized from the barnyard. The trees during the

entire season were given the best of care, made a magnificent growth, and were the pride of the owner and looked upon with envy by his less ambitious neighbors. The first winter was rather severe, and the spring found every tree as dead as hay, while other trees on the same farm, no better located, were uninjured. This was on one of the fruit farms in Kent county, where peaches have not failed for many years. Such results as these have convinced me that a little wholesome neglect at the latter part of the season is often beneficial, and that care should be exercised in using fertilizers rich in nitrogen. For the first three years, or until the trees become thoroughly established, we would practice banking with earth about one foot high, late in fall or just before winter sets in, taking care to get the earth several feet from the tree. This will prevent the ground from freezing so hard, and the water and ice from collecting about the tree.

Before closing, I will say that, although a few general rules will apply to all localities, nothing will tend to promote the success of the thoughtful fruitgrower more than obtaining the experience of his neighbors in a well conducted horticultural society.

DISCUSSION OF THE THREE PRECEDING PAPERS.

Mr. Willard: There are two very important facts that have been brought out by Mr. Stearns in that valuable paper. I rarely listen to a paper that seems to have so much meat in it, but there are two points I desire to emphasize: the thinning of fruit and pruning. He has illustrated that point beautifully, by speaking of the cutting off of the tops of the pear trees. I think one great reason of the complaints in relation to the quantity and quality of our pears, grows out of the fact that the knife is not used enough. The best dwarf pear orchard I have ever seen (which has yielded the greatest results I ever knew or heard of) is the one that has been cut the most. It has had annual prunings that took off large percentages of the annual growth. Of course it has been well fed. The results have been perfectly fabulous, and I undertake to say that, so far as cutting is concerned, there is no danger of trimming too much. It is practically thinning the fruit before it is formed, and I believe I have known of instances in my own experience, as well as that of others, where a surplus of bloom has resulted in a total lack of fruit. I believe there are instances where trees bloom so profusely as to weaken them. Now, he has covered that whole ground. He undertakes to illustrate that, by telling about how he cut off his pears, and the results. He further says that the fruit must be thinned. If that applies to peaches, it applies to every other variety of fruit. In the other room is a plate of apples of a variety taking its origin in Mississippi. I have only two trees, but they have fruited four years in succession, and the two plates that are in there are from the second fruiting. The fruit on these two trees was thinned twice during the season, but not as it ought to have been. The first time it was a failure. You can not hire a man to cut off the fruit as he ought, and we had to do it over again afterward, and yet there was as much taken off as was left. It is one of our choice apples, and of great value because it is one of those varieties not affected by fungus. It is a grand thing to spray, but it is better to raise those

things you do not have to spray. I believe it is the same with all fruits. If you expect to raise nice plums, apples, or pears, that will bring the highest price in the market, you can enhance the crop and increase its value by proper pruning.

Mr. Reid: The point to which Mr. Stearns refers here is this: That, inasmuch as the pollen of blossoms is the vital, life-giving principle thereof, all the strength and resources of the tree are exerted in its production, and if there is an excessive amount of blossoms on the tree these blossoms lose potency, either because they did not have as much pollen as they should, or some may have no pollen whatever; and he is unquestionably right in that. It is a principle which runs through both the vegetable and animal kingdoms and there are frequent illustrations of it. But that is the point he makes, and which Mr. Kellogg has brought out prominently in his "Cultivation of Small Fruits," and Mr. Kellogg has been very successful.

Mr. Morrill: There is only one remedy then, to trim.

Mr. Reid: Yes, except that this potency may be increased by better fertilization. If the plant is strong, it is more potent; if weakened, less so, and he urges both of these considerations as means to the end.

Mr. Morrill: Mr. Stearns is a believer in the heading-in, shortening, of other fruit as well as pears. I have discussed that matter with him, and know he thinks it best. I think I saw this same article that he refers to, and I think it would be an excellent thing to do. Many of our orchards are so closely set that the limbs lap, and it is almost impossible to get through. I have such an orchard, and my trees are thirty five feet apart, but if I were to set new, I would not set closer than fifty feet.

Mr. Reid: I have heard Mr. Stearns aver that he had twice as many trees and plants upon a given acreage, as he should have; and he cited, as instances, how much more fruitful his outer rows of blackberries and gooseberries were, as well as the outer rows of trees, which adjoined cultivated ground. That was what first attracted his attention, the fact that the outer rows in his gooseberry field would yield twice as much fruit as the inner. It resulted in his taking out every other row of gooseberries; and if he were planting orchards anew today, I am very sure he would double the distance between trees.

Mr. Morrill: And his orchards are not closer than ordinary, either.

Mr. Thos. Beal: People in this county are quite generally becoming interested in peach-growing, and if there are any questions we would be glad to hear from all.

Mr. Weston B. Porter: I would like to have some one who has had experience, give the names of the best varieties of peach for market, for early, medium, and late crops.

Mr. M. E. Williams: As to varieties of peach, we have been quite conservative, sticking to the old varieties, and we have set largely in the past few years.

Perhaps we have been so extremely conservative that most orchardists would consider us rather old fogies, but with all the criticism of that old variety, the Chili, we have set four hundred of it, and from our experience in the past we think very much of it. We hope by water and fertilizing to make a good peach of it. When properly grown it is a fair peach, and certainly one of the most productive varieties that can be grown.

The gentleman asked for early, medium, and late varieties. Now, if we are to judge by this year's experience, I think we would do well to follow Mr. Stearns' advice and steer clear of the early varieties, or set very sparingly of them, as there is no early variety in Michigan with which I am familiar that amounts to much in quality as compared with the southern peaches we have to compete with at that season. Early peaches have paid in the past, but these early varieties meet a new competitor in this southern fruit, something that has come up within a few years, and for us to throw in our early varieties in competition with the southern Crawford's is simply to spoil the market for both of us. It ruins the price for them and the demand for us. There is no demand for our peaches against that quality, and I don't know as there is much choice between those peaches. We have used Alexander ourselves, and then Hale is better than those which precede it, and begins to avoid the brunt of the competition from the south, and is really the first peach that has paid us very well, in our vicinity, this year. The fact is that, though we had an immense crop of these early peaches, it would have been better for the growers in our vicinity if some one had gone into the orchards and stripped them, just as soon as set. It would have been better for the trees, and there was so little profit that it didn't pay for the work and the care of the trees. Coming down to the peaches ripening with Crawford's, I confess I am not familiar with many of the newer varieties. We have never even grown Lewis, which is spoken of very highly, by those who have tried it. It is a large, handsome, white-flesh peach. As grown by Mr. Morrill they were certainly as fine peaches of that description as I ever saw. The time of ripening is a little ahead of Early Crawford.

Mr. Morrill: Quite a good deal ahead. It would vary, I presume, with different sections and seasons. It was the 13th of August last year, and the 10th, this year, with me.

Mr. Williams: Crawford is an excellent peach, but condemned by a good many growers. Most of the growers on the lake shore would say, "Set but very few Early Crawford's," and that has generally been the result of our experience. We think a good deal of Oldmixon, which is a fine, white-flesh peach, which is well known in the market, and generally of such fine size and appearance that it is a good money-getter. Gold Drop we have had experience with, and it has proven with us very good. Some years it would bear heavily and do well, other years, with no apparent cause, it did not seem to bear so well.

Mr. Morrill: The years in which it bore heavily, did you thin thoroughly?

Mr. Williams: It was always thinned, and we were well satisfied with it in those years; and yet other years it has not borne when other varieties would, and it has been with us troubled with the black rust, and cracks somewhat, which are objections to it; and yet, taken altogether, it is a good market peach, and I know that in some orchards it is entirely free from these blemishes.

Mr. Baldwin: I would like to know if Chili is troubled with that scab?

Mr. Williams: Yes, it is troubled, but with us not so much as Gold Drop. We plant the Chili because of its bearing qualities, expecting by fertilization, thinning, and water, to get the size. We have some

of Salway, but not very many, they are so extremely late. Smock has been a good paying peach with us, but there is a great difference in different strains of the same variety, and that is true of Chili, and of almost any variety you may name. You may take Mountain Rose, one of the finest peaches ever grown, for eating, and yet you will find that there are many inferior peaches sold by the nurserymen under that name. They will be small and inferior, but if you can get the genuine Mountain Rose it is a good peach to set. We have not had Elberta in fruit. It has a good name, and from samples I have seen I think it sustains its good name. At the World's Fair at Chicago I saw samples of Elberta. My impression of it there was that it was rather inferior, but I think that must be a mistake from other samples I have seen. I only know Crosby by reputation. It is said to be very hardy, and I suppose, also, inclined to be under-size. Late Crawford is too shy a bearer to suit us. It is a fine peach when you can get it.

Mr. Morrill: Crosby is a new peach generally. I have fruited it on one-year trees, and nearly all bore fruit. They are very much of the Barnard style of growth and color, only more brilliant, and probably of about the same size. Whether they will respond to pruning, and size up well, I do not know. Barnard responds to thinning quickly, and the tree is a fair grower, with buds of a character that show they are hardy. A man, well informed, can get an idea from the bud, when he sees its growth this time of year—small, dark, firm buds, like a kernel of wheat. Coming to Lewis, we find that a most profitable peach, at its season of the year, probably none more profitable at any season. It is a strong grower, very productive, and it is hardy enough so that, in 1885, when the American society met at Grand Rapids, when we had on the 15th of February, along the lake shore, a temperature running from 22 degrees to 30 degrees below zero, Lewis was on exhibition. This peach was mentioned first at Grand Rapids as being in the possession of Mr. N. W. Lewis of Ganges, and that it was the only peach that went through that severe weather; and he sold 900 baskets for \$900, off from thirty trees. The appearance of Lewis would indicate that it had been crossed with Hill's Chili, but it is firmer and, when thinned properly, larger. It gradually worked into favor, until, up and down the lake shore, we have come to believe there is nothing more profitable. I have two acres that have been bearing some years. This year's was the fifth crop, and I took 5,000 bushels off from the two acres. These trees have twice gone through 16 degrees or 18 degrees below zero, and this year, in thinning, I took off four peaches for every one I left on. I should place it first on the list in time of ripening, and best of its season. Next I would take St. John, a yellow peach, quite prolific, and a beautiful thing, equal to the Crawford in every respect, and laps on to the Lewis. Next following that, it is doubtful if I could find anything that would please me better than the old Barnard, if you grow it right. It is hardy, productive, and a fair grower of good fruit, and will respond so readily to thinning that you get good size. After that season there is but one white peach I would want, from the fact that the market I have to go to, after the first, demands a yellow peach. Judging from what I have been able to see (recollect, I do not pretend to advise), I would take Crosby. Following that I would take Kalamazoo, because that has borne for me five straight crops of magnificent peaches, and seems to be very hardy and productive. I would leave

Chili out, yet lots of men would not do business without it. Our experience is, that it is some years a most magnificent fruit, and the next year, perhaps, after the pit has formed and before the fruit ripens, it will dry down; and the last two years we have had the most perfect conditions for that class of peaches—dry, sunshiny weather, every condition favoring that particular fruit, and yet it has been poor. I do not know what the trouble is (perhaps some of our scientific men have a name for it), this blackened condition of the skin, but Chili is very susceptible to it. Following Kalamazoo, I should place Elberta, as head and shoulders above anything that comes at that season. But in spite of the fact that it is a great grower, and hardy, and a magnificent peach, it is quite subject to curl-leaf. Prof. Taft will tell you that they can control curl-leaf with Bordeaux mixture. Now, these are productive peaches that I have mentioned. Next, I can not name a peach that will quite satisfy me, but the Stevens has been a wonderful peach along our shore. Beers Smock we like better. It is productive, more yellow, less red, and the yellow is not of the greenish color of Smock. It has the fault that all of the Smock type have, but if you practice proper pruning you can carry a pretty big load of fruit. Most of these kinds are excellent orchard trees.

Mr. Bird: How does Gold Drop compare with Kalamazoo for season and productiveness?

Mr. Morrill: It is a later peach considerably; it is just before Smock. Smock laps on Gold Drop, and for productiveness it will out-yield anything I know of; and when properly thinned responds as nicely as anything I know of. The tree, too, is fully as strong a grower as we have, and I know of nothing hardier.

Q. What is your experience with Jacques Rareripe?

A. I wouldn't have anything to do with that. The trees seem to root near the surface, and suffer from drought more quickly than anything I have in mind, yet that might not be your experience. They are very variable in size on the same tree, and give a large proportion of culls. Take a peach like Elberta, where they are reasonably thin on the trees, and there wouldn't be a second-class peach. Kalamazoo is remarkably uniform.

Mr. J. L. Beal: What do you call a reasonable thinning?

A. Not to have any peach nearer than eight inches to any other peach.

Mr. Greening: I want to mention a peach, in the introduction of which the firm of Greening Bros. of Monroe, of which I am a member, are interested. It is the New Prolific. I wish to take this occasion to explain and describe this peach. It ripens about the 10th of September; is a very vigorous grower, more so than any variety at present grown; it seems to be hardy and an early bearer. It is of the Crawford variety, highly colored, and its flesh is golden yellow. It has a small pit, and is very delicious. It has a very large leaf, largest of any peach I ever saw, and is very highly colored. It has been fruited in different parts of this and other states, and has shown itself to be a market variety of good merit. In reference to Hill's Chili, I wish to say, in the eastern part of Michigan it is not as desirable as in the western or interior part of the state. With us it does not hold its own with Late Crawford, from the fact that it does not color up. It colors very beautifully in the western part.

Mr. Morrill: When it does color at all.

Mr. Greening: And speaking of Smock, you mention that in your locality it has less red and more yellow. In our locality it is the other way. So you see, locality has much to do with the successful growing of the different kinds of fruits, and specially is that true of the different varieties.

Mr. Morrill: Did you state the period of ripening of the New Prolific?

Mr. Greening: The 10th of September, between Early and Late Crawfords. It usually laps into that space, directly between, in our locality, and we have noticed it in other localities. It is possible it may be a little later in your section.

Mr. T. T. Lyon: I have had no experience with New Prolific, except a couple of years' growing of the trees. There has been no fruit yet, though I have received specimens from Greening Bros. that gave fair promise, and according to their representations it should be a very good market variety. It has a number of good qualities, apparently, that would commend it as a market variety. We have something like 200 varieties on the experiment grounds at our place, and several of them bore this last year, and some of them the last two years. There are so many of them that it would be hardly worth while to speak of them. It would be more interesting, perhaps, if you have some one particularly in mind that you would like to hear about, to have it suggested.

Q. Have you tested Crosby?

A. Yes, sir. Crosby has been growing two years. It produced almost nothing last year; this year it has borne a light crop. The indications, so far, are that it is not likely to be an early bearer; and as to its quality, I do not anticipate that it will prove very superior. But it is represented as having good market qualities, and I think very likely that may be true. Certainly, so far, it has proven a poor bearer with us, not to be compared with many others of the same age of trees. Elberta we have fruited a couple of years, and it has borne rather lightly. I don't think, though, that any of our trees have been fruiting long enough to determine how prolific they will be. So far, the fruit is of large size, and I have noticed that it bears evenly. We must have trees that have been bearing several years, to demonstrate what they will do. From its reputation, I expect something very desirable. There are others, though, that I would prefer for my own use at home. I am something of a stickler for quality as well as quantity. I believe many of our market growers plant too poor varieties for the profit of their business. For instance, a man sells a peck of peaches that are handsome, but poor in quality. The next time he tries to sell, to this same buyer, the latter does not want them; for, though of good appearance, they are poor in quality. There are many varieties which are handsome, but have not good flavor; they may be of high color and delicate of texture, but in the long run they will not be as profitable. Though the others may require more care in handling, yet they would ultimately bring better prices and give better satisfaction.

Q. What do you think of the table qualities of Elberta?

A. It is just fair, as it grows with us. It is to be understood, however, that none of the southern varieties we grow are as good here as they would be further south. Elberta is certainly pretty well up in quality, and is very satisfactory as a market peach. At the same time, is not productive with us as in the south.

Q. Will you tell us of a good kind of peach, one that you like?

A. There are a good many particulars to be considered in regard to that. I think I have understood that you have spoken of varieties that have to meet the competition of southern fruit. But that depends, I presume, upon the locality. Some markets would feel that influence more than others.

Mr. Post wishes to know how Early Michigan compares with Lewis.

A. That is a pretty close question. I have grown the two for a good many years, under the same treatment, and I have learned from my own observation, and also from those who have propagated the trees, that there are two varieties grown under the name of Early Michigan. A few days' difference, perhaps, in the season of ripening constitutes the variation. The one that is generally grown as Early Michigan has reniform glands, the other globose. They are certainly very much alike. I hardly know which to put first; I think perhaps the reniform will ripen three or four days earlier. I think Early Michigan is slightly superior in quality to Lewis. As to size and appearance, under the same conditions, I think there is very little difference. I don't know as there is any choice between the trees, but they generally need severe thinning to get the best results. I do not know of a better peach for late marketing than Stevens' Rareripe. We are a week later than we would be thirty miles from the lake. Perhaps there is more than that difference between the west shore and here. I have received two or three varieties from Texas that seem likely to prove desirable here, though they are too recent yet with us to speak of them with any kind of confidence, and particularly of their productiveness. I have the same difficulty that nearly all of us have to meet, from the fact that I have a great many varieties that are spurious, and the more recent ones not having been described, it is impossible to tell which is real and which is spurious. I have two varieties called Muir, and one is a very large and fine peach; and if any one is desirous of testing Muir, I would suggest it as a very promising variety for the market as well as home use.

Q. Will you speak of Kalamazoo, Barber, and Fitzgerald?

A. I am not acquainted with those—with Fitzgerald. Barber stands in the medium list, between the best and poorest. It is a very fair peach, of fine quality and appearance, for a market peach. When I say "fine market peach," I put a different meaning on the word "fine" than when I speak of home use. There are many varieties excellent in quality and delicate in flavor and texture, for home use, but they can not be gotten to the market. There are those that lack the delicacy but which go well to market. So when I speak of a superior market variety, I do not speak as I would of home varieties. Kalamazoo originated, as betokened by its name, not far from us. The seedling was originally brought to notice by Mr. Stearns, and has become very popular with us, as a market peach. Any one starting it, and wishing to get good prices, and make it do its best, will need to thin it almost always, and when well thinned and brought up to good size it is a very satisfactory market peach with us. I do not know that it has been tested sufficiently so that this can be said of it generally, though I apprehend that it is likely to succeed quite generally. Gold Drop is very similar, only with this difference: we do not know what Gold Drop is, whether it is a new peach or an old one renamed.

Q. How does Early Michigan compare with the Mountain Rose?

A. They are very different in season. The Mountain Rose is not so large, but rather more delicate and earlier in its season. They are neither of them very high flavored. Early Michigan is higher flavored than Mountain Rose, though the latter is understood to be an earlier market peach. But I do not suppose that any of us will have failed to learn that peaches, more than almost any fruit, are changed by locality. There are only a few that are successful everywhere.

Mr. Collar: I would like to ask Mr. Lyon in regard to Barnard and Hill's Chili; why they dry and blacken or become brown. Is it because of overloading, and could it be overcome by thorough thinning?

Mr. Lyon: I infer that the mark is due to something of a fungoid character rather than a peculiarity of the fruit itself. The variety has been heretofore very popular with us as a late market peach, but I think it is not so popular today as it was ten or twelve years ago. In the first place, it is of too mild a flavor to suit a good many tastes. It has a very rough, fuzzy exterior, and that is an objection in the market. It is not attractive, although, when it is thoroughly well grown, it loses most of that defect. But the greatest trouble is, with those who are not thoroughly up in the business, that it is likely to overload, and consequently the fruit is small and unprofitable. It brings low prices. Those who grow it thoroughly well (cultivate, manure, and thin) are generally very well satisfied with it. The same is true of Barnard. Under ordinary circumstances it is too small, but if thoroughly thinned and highly cultivated you can keep it up to a good size.

Mr. Collar: Is there any remedy for that brown patch?

Mr. Lyon: I don't know, sir. I have never had any of it, but I presume it would disappear under the influence of careful spraying.

Prof. Taft: I have always resorted to spraying as a remedy for curl-leaf, and I find it thoroughly effective; and in addition to the effect on curl-leaf, other difficulties have entirely disappeared, apparently from the use of the spray. We know what its effect is on apples and pears, and I see no reason why it should not have the same effect upon the spot that you speak of. It has never troubled me at all.

Mr. J. W. Helme, sr.: I think with Mr. Lyon, that these black spots are owing to lack of pruning and cultivation. Two years ago I had some Hill's Chilis, and we had a very dry season, and they were ruined by that black spot. I laid it to the drought, but last year I cut out a great deal of the top of the trees, and certainly one half of the limbs, and this year they were perfectly free, and I had an excellent crop of Hill's Chili, and it was as dry or dryer than when I failed; and not a brown spot on them.

Prof. Taft: My opinion is that, although it is of a fungous nature, it is attributable to the fact that the trees are too thick, cutting off the sunlight; and, too, poor cultivation and lack of mineral food would tend to increase the scab. It is of a fungous nature, and any one who sprays his trees for leaf-curl will have no trouble with this disease. At least that is our experience. A question was asked of Mr. Lyon, regarding the Bronson peach, and it seems to me he didn't say enough for it. It was classed by him among the medium varieties. As we have it under cultivation, so far as I can see, it is practically the same as Kalamazoo. For all purposes I believe it is as good. Regarding Crosby, I have known that now fifteen years, and I have come to value it very highly.

especially in the last few years. So far as I know, it has perhaps the highest color of any of the peaches of its season. The red is of a very dark and distinct color, and in size it is far above medium. It will average in size, if fairly well thinned, with Crawford as generally grown—not so good as Crawfords may be. But this year, on a tree which produced two bushels (set out in 1891), the fruit was as large as the average Crawfords on the market; the quality was fair—not, to be sure, very high, but it was good, and as the peach of its season, coming along the last of September, I esteem it very highly.

Mr. Morrill: Does it respond to thinning like Barnard?

A. It had two bushels, and the peaches were $2\frac{1}{2}$ inches in diameter. It was thinned somewhat, but not much. This same lot of trees bore last year and this year.

Mr. Greening: Will the Professor please tell us what he thinks of Prolific?

Prof. Taft: I have the trees growing and I have seen the fruit, and I think it is a promising peach. It is like Kalamazoo and Bronson; they are all good peaches.

Mr. Allis: I would like to know if there is danger of injuring the peach tree by putting earth around the body?

Mr. Post: I never saw injury resulting. I leave it until the middle of June, on account of catching borers' eggs on the surface, and I have never seen any damage.

Mr. Williams: If a young peach tree had made a late growth, and you were fearful that it would winter-kill, would you advise cutting it back in the fall, on the theory that it is better to cut than have it freeze off, or would it be as well to leave it until spring?

Mr. Post: So far as I am concerned, though it is merely my opinion, it would make no difference. My experience would be that, if it were cut off, it should be done early in the season; if it were late in the fall I would let it alone.

Mr. Helme: I had a little experience in that matter. I started some peach trees on very rich ground and they made three to four feet of growth each year and then they killed back in the winter. It occurred to me it might be a good idea to cut them back during September, as it would assist in ripening the wood. I did so, on the 10th of September, and found it a success.

Mr. Morrill: Supposing a tree had grown all through the season, would cutting back save it?

Mr. Helme: I thought that was what you meant, but I do think there is a good deal in cutting back in September or earlier, and it has been impressed upon me. I bud entirely from bearing trees, taking a selection of trees that are marked through the orchard, the best, and I go to these trees, one year after another, and cut off the growth in September, and those trees have improved wonderfully over other trees; and the conclusion has been forced upon me that the cutting back of growth in August or September was desirable. The buds are stronger and mature better, and even where there are but two inches or so of the annual growth left, I find the strongest buds and best peaches.

Mr. Williams: I want to call attention to this theory, to see whether any of you have had experience along that line. Growers of sweet potatoes, if they find the vines have been bitten by frost, cut the vines

off, and so with other vegetables. There seems to be theory that frozen sap, going down, will work an injury. Is that true of a tree, and would the frozen ends of these peach trees, by reason of the sap working from them back into the tree, would it be better to cut them off? I would be glad if any one could throw light on this subject. Many of the trees in my orchard, with a growth up to about the first of August, seem to mature; and then, when a new growth starts, there is that little ring, showing the two separate season's growth, and that later growth is tender.

Mr. Willard: I should favor the removal of that, providing it were done sufficiently early, but I don't think you would gain anything at this season of the year. During the latter part of August or first of September, when it might result in the stopping of that new growth and the hardening of those other buds, I think good might come of it; but, at this season of the year, I do not think it would be productive of good. I have had experience in pruning when trees were in full growth, and it has cost me something to learn that I was not always quite wise. One season we went over our plum trees about the first of July, because they were making such a tremendous growth of wood. We thought it might be a good idea, but if you do it later in the season, when you will not force the buds that are dormant, but simply harden them by checking, it would be all right, though not at this season of the year.

Q. I would ask Mr. Willard what is the range of the thermometer with him?

A. Rarely twenty degrees below zero, and we had some peaches at twenty below. We had Chilis and Early Rivers, but that is unusual. Ordinarily we get but ten or twelve below.

Mr. J. W. Helme: I would state that many years ago our peaches were at first killed when it was twelve below, but they do become acclimated. There is no mistake about that. Last winter the thermometer went twenty below, and still we had a peach crop.

Mr. Willard: Mr. Joseph Meehan of Philadelphia says he thinks oranges could be acclimated so they could be grown two degrees north of where they are now.

Mr. L. B. Rice: In relation to sowing rye, all of our sandy soil is subject to cut-worms, and the growth of buckwheat will usually kill the cut-worm. I have been trying mixing buckwheat and rye and sowing the last of July. The buckwheat comes on, and if the season is late it will ripen; and if not, it does not make any difference; it will rot down and help to hold the snow in winter. We have very little snow, and that is inclined to blow off, and I think this plan has a tendency to check the ravages of the cut-worm entirely. In fact, you may sow rye with buckwheat in June; harvest a heavy crop of buckwheat, leave your rye, and next year harvest a crop of rye. I do not harvest the buckwheat; if it ripens I leave it to the quails; if not, all the same.

Mr. Morrill: There is one thing brought out by Mr. Williams' question, of which I think a little notice should be taken, in regard to the first year's growth of trees. This fall, the trees of last year's setting have more or less fruit buds, and one of the factors which works injury is late setting. The moment the ground is ready, with the very first movement of sap, starting the leaves, do your setting. Then you are in a fair way to establish terminals before the time comes when they are

frozen. If you do that, they will stand several degrees more of cold, and a week or two may make a vast difference with the results. Another matter of which Mr. Post and some of the other gentlemen have spoken, is the sowing of rye. I have seen very little good come from that. I do not know but that is throwing a firebrand into some one's powder-keg, but I do not believe in it. I have never seen good results from turning under rye.

Mr. Rice: But it will hold the snow and the surface water.

Mr. Morrill: But I would as soon have any weed, as to let rye go to seed. I am going to adopt a different plan, and that is to sow oats. They, I know, will die out during the winter, but they will serve the purpose of holding the leaves. As they die, they will hold the leaves, and that blanket will not get away from you, and in the spring you will not have to destroy the oats. I have a neighbor who is a very progressive fellow, and he has done practically that for two or three years, and I think he is ahead of me on that idea at least. I sow the oats the last of August, so the first good rain will start them.

Mr. E. W. Allis: One of our neighbors has been sowing oats with crimson clover. Clover has "had a black eye" in Michigan, but this plan worked nicely and he raised a fine crop. This year, instead of putting oats with it, he sowed it in his cornfield, and I presume he thinks he will have a failure this year.

Mr. A. G. Green: What sort of weeder do you use, Mr. Morrill?

A. I have used another kind but shall get the Breed.

Mr. Greening: The theory set forth by Mr. Willard is good, but I believe it is better to let that wood remain until spring and then cut it back. From the experience we have in cutting back young shoots in the fall, we find they are usually frozen back, part of the way, in the spring, even if the winter is mild. It is better, in my opinion, to let those shoots remain.

Mr. Willard: There is a question that has not been touched upon this afternoon. In what I have learned here today, I have not heard the canning industry mentioned, from which I am led to infer that not much is being done about it. It seems to me that that is a great mistake, in such a state as Michigan. It certainly is a very wonderful industry as it is being developed in certain portions of the country, notably California, Delaware, Maryland, and now, to quite an extent, in New York. I know the impression prevails that New York is not much a peach-growing region, as compared with Michigan, but at the same time peaches are grown with a great deal more success now than for a great many years, because people have been learning that they can grow the hardy sorts. This canning industry is a great thing, and I am interested in it, and have been led to investigate the subject and ascertain what varieties of peach are most valuable for that purpose. Perhaps some of you know more about it than I do, and yet I am going to throw out some suggestions. I have learned by actual test, and by prices at which our goods are sold, that our peaches can be sold in all the markets we can reach at a much higher price than Delaware and Maryland and California peaches. We have learned furthermore that the best of all peaches is Hill's Chili. There is nothing to equal it. No matter how poor your fruit is, or how fuzzy, it develops qualities in canning that are ahead of all others. We have been experimenting on other varieties, and next to

Hill's Chili is Kalamazoo. I happened to have quite a crop of them last year, and I gave our establishment a couple of bushels to try, and they were found very good. We tried Gold Drop, we tried Crosby, and we tried that large southern peach, Elberta, and that stands up well. It is one of the best, but right second to Hill's Chili is Kalamazoo. This is from actual test, picked under my supervision, because we have been trying to ascertain what peaches would reflect most credit on our canning. We have \$100,000 invested, and we have to manage the business with reference to getting the greatest amount of money out of it, and we find that we can put up goods that outsell anything else in the whole country, and that is because we have the best varieties, and we will pay more for Hill's Chili, if we have to go miles and miles to get them. We have very few of them ourselves. The first orchard was mine, and I got the buds here; the next was that of a neighbor who got his buds from me, and we will not touch a Crawford so long as we can get those peaches. I do not know as that is a matter for you to consider here, but if I were a resident I think I would be looking toward that. It is not only a question of peaches but of apples, and northern Michigan produces some of the finest apples in the country. It was only a year ago last September that we sent a man to Michigan to buy, for we put up 30,000 bushels annually. And so with all these products, there is profit in canning if you put up the goods properly.

Mr. Rice: I want to ask one question. It has been said that in fall trimming of small trees they are often killed back. But in trimming large shade trees, that require the tops cut off (large elms or maples), it seems as though the autumn was the best time to trim; and yet last fall, in cutting off limbs, I found that they killed back a good deal. Now, when can we trim maples? Not when the sap will flow. Shall we trim them in the fall and stand the killing back? It follows in the same connection with apple trees and everything else.

A. There is a great difference in regard to trees. The maple starts its buds early, the horse-chestnut also.

Mr. Williams: If you do not trim your horse-chestnut in the fall, you will lose by the sap flowing, and the best time to trim the maple is in the fall. If you are going to cut a big limb off, do your amputating at the joint—make a clean, nice job of it.

Mr. Greening: My experience is, in pruning maples, if they are pruned late in the fall they will bleed badly. We have a number of maples, and we usually prune during the month of June, and we find that to be the very best time. There is no bleeding. The wound has a chance to heal and get ready for winter. June is really the best time.

Mr. Willard: If a maple tree is trimmed in June, will it develop a handsome growth after that? My experience has been that anything trimmed in leaf receives a substantial check.

Mr. Greening: With most kinds of maple, one of the reasons we head in and trim is to check the growth and make them branch out and be more compact. Our young trees in the nursery we prune very early in the spring, but the older ones we prune later, and we have yet to find that it was detrimental to the trees.

Mr. Rice: I have reference to larger trees. The tops will be full of limbs, and we wish to reduce the surface to produce growth. If we trim

after the leaf starts we lessen the growth, and if we do it at this time of year, as our friend suggests, they will bleed to death.

Mr. Greening: If the conditions are such, and the trees are very large, I do not recommend June pruning. If there are many small limbs to be pruned, I would recommend early spring trimming.

IRRIGATION AT MICHIGAN AGRICULTURAL COLLEGE.

BY PROF. L. R. TAFT.

I had hoped that, owing to the severe drouth of the past two seasons, the subject of irrigation would prove of general interest, but I infer from the remarks of Dr. Thomas, yesterday, that Lenawee has been in fact, if not in name, a wet county, and possibly, to the people of Lenawee, irrigation may seem out of the question; but I trust that to others it may be of interest to know how we, in Lansing, manage to get drinks—for our plants.

In the way of irrigation, it may be well to say that you will find, if you go among the people of the west, through the Great American Desert—so-called in the past—that they will say, "They are oh! so sorry for those poor folk at the east, who have to depend on the Lord for their water; that they have to take it when it comes—no water at all at one time, and too much at others—whereas we, here, have a supply on the mountains that we can bring down at any time and in any quantity;" and thus they feel that they are far ahead of us—at least they say so.

There is one side of the question, however, that perhaps accounts in part for the success they have obtained in raising the various crops for which they use water. We all know that the water is taken up by the plants from the soil, and, after the plant food has been taken out and used in the upbuilding of the plant structure, it is for the most part given off by the leaves. You can very well see that, if everything else is equal (supposing, of course, that the water is in the soil), if we have a dry season more water will be given off than in a wet season, and naturally more plant food will be brought into the plants, and we can expect a better growth. Also, in a sunny season, there will be more sunshine, and provided the plant food and water are supplied to the soil (artificially, perhaps), there will be a chance for a greater growth than had they relied on the water coming from the clouds, even in a wet season.

Most people would be surprised if they should accurately measure the amount of water given off by crops. It has been done with a great variety of crops, and, for the more common crops that we grow, the estimate is that during the growing season from 200 to 300 times the actual weight of the dry matter in the plants is given off from the leaves in the form of water.

Another way of putting it is that during the growing season they will give off from twenty-five times to thirty-five times their whole weight. Thus a corn crop of fifteen tons will give off 450 tons of water in the growing season, and here we shall have 4,000 barrels of water given off from a

single acre by the leaves of the crops. This does not take into account the water given off from the surface of the soil, which, depending on the character of the soil and the season and the amount of cultivation it receives, will vary in amount; but we can safely say that from ten to fifteen inches will be evaporated from the surface of the soil, under average conditions, in twelve months.

We have these two sources of loss,—from the surface and from the leaves; and we have to consider also that in the average season a large amount passes off by percolation into the springs and drains and streams; and more than this, we must not forget that, of the yearly rainfall, a large amount is lost in winter by running off the surface into the streams. So, after making allowance for all of these things, we will find that thirty-five inches of water are needed to secure a crop, and we should have the rainfall distributed through the season, with one-half of the amount after the first of March. During the last few years we have fallen short of this. Hardly a year has passed when the rainfall during the summer has not fallen short, there being an inch where we should have had two or three and sometimes four inches.

During the twelve months ending July 31, the rainfall was but about one third of what we should have had to secure full crops. We had twelve inches and a fraction, where thirty-five inches are desirable.

The subject of cultivation goes hand in hand with irrigation. Many people have claimed that by cultivation alone, good crops could be grown, and that the benefits from irrigation, provided the land was properly cultivated, would not repay the cost; but, while cultivation will do much to conserve water, it will not provide it.

For success in irrigation, we must first have an ample supply of water. Too many people go to work with a small windmill, or some other inefficient power, with which to pump the water, expecting sufficient supply to irrigate a considerable area. They may say that they have a reservoir into which they can pump, but these seldom hold more than 100 barrels, and this amount only goes a short distance.

We have during the past year established at the College a special irrigating plant. While we desire to grow good crops, we have found, in testing varieties and in other experimental work, we have not been able to secure the best results, owing to the drouths, and for that reason we arranged this spring to put in a plant to supply water to the vegetable garden, and some of the small fruits. We have not yet been able to extend this to the orchard or the raspberries, and what I can tell you today, regarding the method we have used, will apply only to certain of the vegetable crops and strawberries grown on eight acres in the garden.

This soil is a mixture of sand and clay, a moderately heavy loam, but for our purpose it is not desirable, from the fact that at from one to two feet there is a layer of quicksand, and, in a dry season, the crops suffer from want of water.

Yesterday the chairman spoke of the cost of this plant. It was given as \$1,000. While this \$1,000 was actually spent, it was not all spent for the portion used for irrigating. This included the cost of a long line of pipe, buried in the ground, for use for fire protection, which was the main used to carry water to the garden, and on this we placed three fire hydrants, all of which cost two or three hundred dollars. We have also a

steel tank, holding 300 barrels, and the expense for this, with the actual cost of irrigating pipes and putting them down makes up the thousand dollars. So, really, the irrigating plant for these eight or ten acres has only cost us about \$500, and we are able now to have it extended at a small cost to take in ten more acres. At a cost of \$700 we shall be able to irrigate twenty-five acres.

At first we were in doubt as to how to secure water. We had the river, near the garden, that would supply us with water, and we knew that at a depth of a few feet we could get a well. It was a question whether to obtain the water from the river, or drive or dig a well from which the water could be pumped with a windmill or a gasoline or hot-air engine. Finally we fixed on the plan of going to Cedar river for our water and using the steam fire-pump in the boiler-house, to which a water pipe already ran from the river.

We had to lay a main 1,200 feet to the boiler-house. We used for that three-inch pipe, which will furnish a sufficient supply for twenty-five acres, and we arranged to distribute the water from hydrants at the highest points. Had the garden been with a slope in any single direction, we could have easily brought the water to one edge of the garden, and have carried it to other parts through furrows. The garden is nearly level, except that there are a number of elevations three or four feet above the general level, and to cover the entire surface we had to locate hydrants on each of these elevations, and therefore we had to run three lines of pipe, covering the surface of the garden, east and west, and another along the west side. We then located hydrants, 100 feet apart, along each of these lines. We took 100 feet as the distance, because we have many small plots, some of which we wish to irrigate and some to leave without water, and to control the water for this purpose we thought it best to have them 100 feet apart.

We had, in applying the water, to select one or two of perhaps three or four methods. You will find that through the west, for their wheat and alfalfa fields, and many of their other crops, they practice flooding. Where the land is nearly level, they form small dykes, and admit the water to these squares, covering the ground from two to eight inches deep with water, flooding the surface. This would not be desirable in a garden; it is out of the question, in fact.

Then we could use the furrow method of applying the water; that is, make shallow furrows at intervals of from three to ten feet, across the garden, and run streams of water into the furrows and allow it to soak out into the soil.

There was also sub-irrigation or running the water in tiles. In testing this we tried two methods. In one case we placed the tiles at a depth of one foot, and in another had them barely covered. For sub-irrigation we made use of 2½-inch drain tiles placed, as a rule, with their ends close together, but we took pains to have the curved sides of the tiles up, and thus we had openings at the under side of each joint. You will find that nearly all tiles, in baking, become bent, and if you take advantage of this curve, there will be small openings between them. Have these openings as even in size as possible. The water will soak out at each of these joints, and a line of tile 100 feet in length can be easily supplied with a half-inch stream of water; in fact, the great trouble in sub-irrigation is

that you have to apply the stream very slowly. We could easily connect four lines of tile, and a $\frac{3}{4}$ -inch hose would supply all they could use. These tiles, placed twelve feet apart, cover a breadth of three rods, and for vegetables and the small fruits, where one only has a supply through the ordinary service pipe, it will water it thoroughly if given time enough; turn the water on and let it run, and it will in time soak the ground thoroughly.

Many times, if you have large amounts of water, you can easily apply it by means of underground tile, running out from an open ditch. You can pump the water or take it from a stream, fill the ditch with water, and have the tile at a depth of two feet, and two rods apart, thus carrying the water under the ground, and allow it to soak away. These tiles, if placed level, will answer for drains in the spring, and later you can use them for irrigation by closing the lower end of the ditch. But in our case we use the tile to connect the various lines, and even the $\frac{3}{4}$ -inch hose would carry four lines over 100 feet in length. This small amount of water was ample to sub-irrigate at one time a space of twenty square rods, which would make a very fair-size garden for an ordinary family; and even the $\frac{3}{4}$ -inch hose was shut off to some extent, for it ran too fast.

Be careful in sub-irrigation to avoid too steep slopes. If you have a slope of more than a half foot in 100, it will break out in the loose soil where it is not over one foot in depth. Have them laid nearly level, and don't put in too much water. Shut down the force if necessary.

In sub-irrigating, whether on the surface or with the tiles a foot in depth, we applied from five to eight hundred barrels per acre, once in perhaps two or three weeks.

In irrigating a crop of tomatoes, we had in one place the tile a foot in depth, in another it was at the surface, while in a third the furrow was used, and a fourth plot was without water at all; and in weighing the crops from these small plots, to learn as to the benefits of the different systems, we found no great difference between the first three. The total yield from the first plot was 1,445 lbs.; No. 2, 1,403; No. 3, 1,343, and No. 4, without water, 1,180 lbs.; showing a yield of from one third to one half more fruit with water than without.

While the yield was somewhat greater from the sub-irrigated plots, the gain would be more than counter-balanced by the cost of the tiles and the expense of laying them, so that it is not likely to be desirable except in small gardens or where they can also be used as drains.

In the case of a crop of snap beans, to which we applied water only three times, commencing when the plants were in their third leaf and repeating at intervals of two weeks, we found that the crop irrigated was ripe the 22d of July, with a total yield for the season of something over 76 pounds from one square rod. Without water, they did not ripen until August 1, or ten days later, and we had for the season only 17 $\frac{1}{4}$ pounds, while we picked from the irrigated plot 76 $\frac{3}{4}$ pounds, or more than four times the yield from the irrigated plots as from those grown without artificial water.

Another experiment was upon a field of timothy. At one corner of the garden we had, two years ago, a fine crop of timothy, of perhaps an acre, but in 1894 it was badly injured by the dry weather, and this year

the stools were scattered; in June it commenced to shrivel, the leaves curled, and there was a poor prospect for a crop.

On the 12th of June water was turned on that plot, covering one half of it at the rate of 1,000 barrels to the acre. That was all the water we gave it, except at one corner, which we watered afterward at two different times. Within ten hours after irrigating, the grass looked entirely different. It was green and growing again. The trial went on, and at the time of harvest the result was remarkable. We found that without water we had a head, or perhaps two heads, to a stool; using water once, we had a dozen fair stalks to a stool, and with water three times, there were still more, and they were far larger.

The measurements were as follows: Irrigating three times, the stalks averaged 3 ft. 9 in. high, and the best were 4 ft. 3 in. The heads of the best were five inches long, and on the average they were $2\frac{1}{2}$ to 3 inches. The yield was at the rate of 5,360 pounds to the acre. Where the land was watered once, the yield was 2,230 pounds, while without water the best heads we could find were only $1\frac{1}{2}$ inches long, and the hay weighed 800 pounds to the acre.

Although we did not apply water until nearly the middle of June, we had over six times the yield, by the use of water three times, and a gain of nearly three fourths of a ton by the use of water once. It took no time to apply the water, as it was allowed to run without attention, and as we used the boiler-house pump, where the steam was always up, there was no expense for pumping the water in our case. Of course, each one would have to figure up for himself how much it would cost to pump the water, but usually from three to five cents will pay for pumping 1,000 gallons, under the average conditions, using steam, and at that rate a gain of two and one fourth tons of hay would be secured at an expense of \$4.80, when three waterings were given, and of three fourths of a ton, at a cost of \$1.60, for one application.

For distributing the water the hydrants were so arranged that an ordinary fire hose could be attached if desired, but in most instances it was found desirable to distribute it in small streams, as the water, coming from a $2\frac{1}{2}$ -inch pipe, with a heavy pressure, would wash the soil. Therefore it was turned into a series of troughs which had a two-inch hole every three and a half feet along one side, and back of these were placed gates made of zinc or galvanized iron, that could be opened at pleasure. The troughs were sixteen feet long, and three were used in a series.

We used, in making the furrows, a small hand garden plow, and it did better work than the cultivator. The man would prepare furrows in fifteen rows, turn the water on, and if it was acting all right would go off and make fifteen more and then move the troughs. We could run the water in these furrows half across the garden, or nearly four hundred feet, and it would take perhaps a half hour to soak that length, and the fifteen openings, covering a space three rods wide, would make one third of an acre to which we were applying water.

The pipes are arranged so that two men can apply water to different sections at the same time; each can move his troughs, apply the water, and cover two acres per day. The next day he would throw the soil back, and within forty-eight hours, or before that, if dry enough, he

would cultivate the surface, and the water was thus applied about the same as in sub-irrigation.

Q. Were the ends of the rows next the troughs more irrigated than those far off?

A. No, we found that, in shutting off the water, what was remaining on the upper part would run down to the lower end of the rows. It kept working down, and there was no great difference that we could see. Some people have claimed that they have found they couldn't run the water in furrows, but it gave us no trouble for the distance mentioned.

Q. What kind of soil was it?

A. Medium heavy, a mixture of sand and clay loam.

A number of rows of early peas were planted without regard to irrigation, but when the drouth came on, water was distributed over one half the plot, which was ten rods in length, and sloped at the rate of a foot in three or four rods. The water was turned on and held back from the lower half by a dike of soil. The water was applied three times, in May once and in June twice. The first picking was on June 13. At that time the irrigated peas were making a good growth, they looked vigorous, and the pods were well filled. The others, without water, and yet on the moistest part of the lot, had become dry; many were brown in leaf, and the pods small and only partly filled, and yet with the water we only had $9\frac{1}{2}$ pounds, and without water 11 pounds at the first picking, from sections containing three rows, each two rods in length. Finally, however, we found that we had $54\frac{1}{2}$ pounds from the irrigated portion, while without water there was only 21 pounds, or two and a half times as many with the use of water. Figuring it for the acre, we found a gain of 3,537 pounds for the use of water three times. It cost us to apply it about \$1.75 per acre, without considering the cost of the pumping plant.

We tried it also with cabbages, upon two varieties. Of the Wakefield we irrigated 700 plants, and from these we obtained 633 heads. Every head that formed was in good condition, but the cut-worms had destroyed the buds from a number of the plants, and that accounts for the failure of 67 plants to head.

From the irrigated section we commenced to cut on the 28th June and had 1,161 pounds. Without water, the 700 plants only gave 248 heads, and these were very small, as most of the cabbages were this season. The others failed to form any heads at all. The average weight of these was 1 lb. $5\frac{1}{2}$ ounces, whereas the remaining 400 and over were too poor to use, and in fact the best would not sell for one half what was received for the larger irrigated heads.

Figuring the rate per acre, with water they would have weighed 28,000 pounds; without water, 6,400 pounds.

Potatoes were also irrigated. We had an area planted to Early Ohio, and it was divided into four sections. During the first of the season, a dam was placed across the middle, cutting off the two lower sections, and water was applied to the two on top of the hill. After the plants bloomed, we applied water to sections 1 and 3 and left sections 2 and 4 without water. We had thus given to one section four waterings, to another two waterings, before they bloomed; a third plat had two after blooming, and the fourth was grown without water at all. Before harvesting, the plants were cut off into areas 30 x 75 feet. We left margins

all around the edges, and with four waterings we had 2,201 potatoes, that weighed 635 pounds, of a marketable size. The small ones were 1,327 in number, and weighed 120 pounds. Per acre it would be 211 bushels of the large and 40 bushels of the small.

With two waterings before they bloomed, we had 1,660, that weighed 374 pounds, of the large; and of the small, 340 weighing 90 pounds. Comparing this with the four waterings, we had a third more in the latter case, and the weight was even more in excess.

With two waterings, late in the season and after blooming, there were 1,678, that weighed 398 pounds, of the large, and 1,224, weighing 77 pounds, of the small, or 132 bushels per acre for the large, 25 bushels per acre for the small.

Without any water, we had 1,110, weighing 240 pounds, of the large, and 1,530 small, weighing 110 pounds.

Comparing these, we found that by applying the water four times we gained 130 bushels, over the use of no water at all. Applying it twice, early in the season, we gained 50 bushels, and twice later in the season 42 bushels. Making the estimate in weight, we had almost three times the yield by using water four times, and almost half as many more by applying it twice, and there was no great difference whether it was twice early or twice late. It is often said that it is advisable to wait until tubers begin to form, while others advise early watering; this present season there seemed to be no great difference. Had we used it on late potatoes, it might have been well to have applied it early in the season.

I wish to give you one or two conclusions in regard to the use of water in irrigating. The first would be, if the soil is not fairly moist at time of sowing the seed or putting out the plants, provide the necessary moisture by applying it in furrows, say four feet apart, made with the plow, and give the ground a thorough soaking before planting; (2) never apply water to start the seed after planting. Wait until the plants have three or four leaves. This is of considerable importance, particularly upon clay soil. (3) In applying water, use 500 to 1,000 barrels per acre. We found the past year that 750 barrels, a little less than an inch, gave as an average the best results. Again, avoid running the water over the surface of the ground. Apply it through the furrows, and as soon as the water dries in, cultivate thoroughly, thus holding the water.

EXPERIENCE WITH IRRIGATION IN 1895.

BY MR. MANFORD E. WILLIAMS OF DOUGLAS.

It is generally known that there are several methods or systems of irrigation in use, but it is not so generally understood that these variations exist of necessity and grow out of differences in the surrounding conditions, and that a system which works admirably in one place might be an utter failure, or only partially successful, in another; and the Michigan fruitgrower or farmer will probably fail if he attempts to follow too closely the methods of irrigation in use along the mountain streams of California or Colorado or around the artesian wells of the Dakotas.

I will mention a few of the conditions which determine the method of irrigation to be adopted. First, the source of water supply. Where from natural causes the water is elevated above the land to be irrigated, and can be applied to the land by gravity ditches, as in the case of mountain streams, one of the most perplexing and expensive questions which confronts the Michigan irrigator is eliminated, because, as a general thing, water to irrigate Michigan farms must be raised by artificial means; and here again the character of the water supply has an important bearing on the method of elevating it. Where the supply is ample, power and machinery may be adopted of sufficient capacity to force the water directly to the place where it is to be used, as fast as needed; but if the water supply is not sufficient for that purpose, some plan for storing it must be devised, either by damming back natural water courses or by building reservoirs in which it may gradually accumulate until needed; and where such reservoirs can be built cheaply and effectively it will greatly reduce the expense of raising the water, as a cheaper power, like windmills or hydraulic rams, may be used to fill the reservoirs.

Another cause of variation in methods of irrigation, is the character of the soil, and this is of more importance than is generally supposed. The writer once lived in a Dakota town which had a fine artesian well. Water was struck at a depth of 1,145 feet, and the pressure was so great that it required a strong hose to withstand it, affording excellent fire protection. The streets were piped, and I had a hydrant in my yard; and with the aid of about 100 feet of inch hose and open ditches I could irrigate my entire garden, consisting of two village lots. When the ground was dry, the water would work its way down the ditches very slowly, owing to the large amount taken up by the soil, and with ditches ten feet apart I could soak the entire space between, so that anyone attempting to cross it would sink into the mud over his shoe tops. The water in my cistern, a rod from the hydrant, was ruined by the seepage, as the artesian water was very hard; and I have recently received a complaint from the tenant in the house that the cellar is being flooded from a leak in the main in the street, twenty-five or thirty feet away, and a neighbor was annoyed by water from this well working into his cistern from an open ditch on the opposite side of the street, a distance of not

less than sixty feet. This shows the marvelous capacity of some soils to conduct water laterally by capillary attraction. Early in our experience in irrigation, at Douglas, I was struck with the difference in the soil we now have to deal with in this respect. After the water had been flowing in an open ditch for hours, it had apparently penetrated the soil only a few inches, laterally, and we have often dug down a foot or more, near such a ditch, to find the ground as dry as ever; and this has led us to adopt what is known as the basin method of irrigating trees. Much of our land is sandy to the depth of several feet, with but little humus in its composition. Water applied to the surface soon disappears by the action of gravitation, and there seems to be but little capillary attraction to either draw it sidewise or to bring it to the surface again. We have heard and read with interest discussions of the dust-mulch theory, by which frequent shallow cultivation of the surface is to take the place of irrigation, and possibly of rain, moisture being supplied by capillary attraction from below, and from a limited trial we think well of it, but still I believe the efficacy of this practice will depend largely upon the character of the soil and subsoil, and that the owner of a deep, sandy soil, though he scratch it ever so diligently, will still occasionally sigh for a little rain or water to freshen things up.

Again, that method of irrigation which has been practiced with such excellent results by some fruitgrowers, of hauling water in tanks or barrels and pouring it into basins around the tree, and covering the moist earth with loose, dry dirt to prevent evaporation, depends largely for its success upon the power of the soil to retain moisture, and I question whether it would be found profitable in a dry, sandy soil.

Other causes, which produce many variations in methods of distributing water in irrigation, are the contour of the ground or the lay of the land, and the nature of the crop to be irrigated. Thus, with land that is level or nearly so, and for crops whose roots do not penetrate the ground permanently to a considerable depth, and which pay a sufficient profit to a given area to justify the expense, there is no doubt that sub-irrigation, by means of tiles or other conductors laid under ground, works well and is specially useful if the water supply is limited; for, while it is costly in money, it is economical of water. But for general orchard use there are serious objections to it. First, it is too expensive; second, there is danger that the tree roots will penetrate the tiles and clog them; and third, where the ground is undulating it seems to me that sub-irrigation must fail, as the pressure of the water in the tiles will force it to the surface at the low points, and produce such an unequal distribution of the water as to render the system unsatisfactory.

Now, a few words as to the methods we have adopted and our reasons for adopting them. The land we desired to irrigate consists of about sixty acres, elevated from forty to forty-five feet above the Kalamazoo river, which is our water supply, and about twenty acres more of bottom land along the river, from five to ten feet above the water level. The contour is gently rolling, with a main ridge running nearly through the farm from east to west, from which, generally speaking, the land slopes to the north and south. But this general slope is occasionally broken by slight ridges and ravines, which interfere seriously with the flow of water in ditches run from the main ridge. We first satisfied ourselves that

water would not sink away so rapidly in such sandy soil as to render irrigation in open ditches impracticable, by pouring water from pails into small ditches and observing how far successive pailsful would flow, and from the first we have been surprised to see how far water can be conducted over the hot, dry sand. Then the more serious question came, of how to raise the large quantity of water we would need to the height of more than forty feet.

Two general plans presented themselves. One was to use a large windmill or several smaller ones, and store the water in a reservoir until needed. The question whether the windmills would do their part gave us no trouble. We knew they would, but the building of a reservoir on that sand ridge, to hold such a quantity of water, was more than we cared to undertake. To merely scoop it out of the sand and try to fill it would be like pumping water into a sieve; and whether we could fix it by puddling with clay or by cementing the bottom and sides so it would hold water and withstand the action of frost, were questions which we could not answer; and, having an abundant water supply, we decided to force the water where we wanted to use it, as fast as needed, without storing it. We therefore procured a ten-horsepower traction engine, such as is commonly used with threshing-machines, a rotary or centrifugal pump with a capacity of twenty barrels per minute, and 2,500 feet of four-inch iron pipe, with the requisite elbows, tees, plugs, water-gates, etc. We lay the pipe through the middle of the field to be irrigated, as nearly as may be, following a ridge when convenient, placing tee-openings or water-gates every few rods. Then we make small ditches or furrows with a horse and single shovel-plow, along the rows of trees or crops. Then, where the land slopes away from the pipe, we admit the water directly from the pipe into these ditches, dividing it between several of them, as the flow is too great to be confined in one ditch, and it usually requires two men to manage the water in the ditches. They dig shallow basins around the trees, varying in size with the size of the trees, in which the water is allowed to stand until the ground around the roots is thoroughly soaked. We were at first greatly puzzled to know how to get over or around the slight ridges and ravines that actually exist in a field which appears to the eye to be quite level. It was evident that it would be impracticable to be continually moving the heavy iron pipe so as to reach all of the little elevations, and to reach them by conducting the water in main ditches, by banking up through the depressions, or by going around them, required much time and labor and resulted in great loss of water; but we finally hit upon a plan for making water run up hill, by using a home-made hose of heavy ticking or of duck, making it an inch or more larger than the iron pipe, so as to reduce the pressure of the water; and this plan works admirably. We can carry the water across small ridges and ravines with but little loss, and much more expeditiously than we could in open ditches. We make the hose in lengths of forty or fifty feet, and for couplings had galvanized-iron pipes made about eighteen inches long, a little smaller than the hose, and with a few ridges run around each end, like those around the ends of a length of stovepipe. With a little practice two pieces of hose can be quickly connected by inserting the ends of this pipe into the ends of the two pieces of hose and tying them firmly with twine. The ridges around the pipe keep the hose

and twine from slipping. We had about 300 feet of this hose in use, and it is just the thing for conducting the water over slight undulations, but of course would not stand much pressure.

Now, a few words as to the results of our experiments. We have had but little opportunity of trying the effect of irrigation upon bearing fruit trees. We first commenced pumping about August 1, 1894, and the only bearing trees watered that season were 400 peach trees; and, late as it was, these peaches when run through the grader showed a gratifying increase in size, when compared with others from the same orchard not watered. That season we also watered a young plum and cherry orchard with strawberries between the rows. The drouth had already seriously injured the strawberries, but we had the satisfaction of seeing everything within reach of the water revive and put out a fresh, new growth. Last spring we commenced pumping about the middle of June and kept it up for six weeks continuously, until the rains began the last of July. The peaches on this farm, and the bearing strawberries, had been mostly killed by the May freezing, and the only bearing fruit trees watered were about 200 pears and a few apples. The pears were very fine, much finer than they had been for three years before. The apples were noticeably larger than those in the same orchard not watered, but most of our irrigating this year has been on land set to young peach, cherry and plum trees, with strawberries, potatoes, beans, and corn between the rows. The trees have done finely, most of them having made as much growth as we wished, and the beneficial effect of the water upon the crops grown among the trees was very noticeable when compared with similar crops grown upon similar land without water. Both years we were delayed in beginning our work by unsuccessful attempts to get our water supply from two creeks which proved inadequate, and the early drouth had done considerable damage before we were ready to combat it; and if any one succeeds in putting a system of irrigation into practical operation in a new field, without meeting with some vexatious delays, and without learning some things that he did not know before, and paying full tuition for his schooling, his experience will be that much happier than ours. But we now have our machinery and fuel ready to begin operations on short notice, with an ample supply of water and with everything in excellent working order; and, while we realize that much of our work is still in the experimental stage, we are in no wise discouraged in our determination to test the practical value of irrigation in a Michigan orchard. We have upon this farm ten thousand trees—peach, pear, apple, plum, and cherry—to which we expect soon to add four thousand more, all within reach of our irrigating plant; and we believe that if the benefit to our young trees could be shown it would even now prove a profitable venture, and as our orchards come more fully into bearing we hope to be able to furnish convincing proofs of the cash-in-hand profits to be derived from irrigation by the fruitgrowers of the state.

DISCUSSION.

Q. Will Mr. Williams give us an idea as to about the number of acres, the area, and the cost?

A. The question is a difficult one to answer. It depends on what you are irrigating and the lay of the land.

Q. I would be glad if you can tell us, in your own case, of the number of acres you planned for and the cost.

A. In irrigating corn, we ran the water along the rows and between rows. With this method of irrigation, we could water, I should think, two, three, or possibly four acres per day, where the land lies very well. Just watering trees, I think we could, on our ground, water from five to ten acres per day of young trees. Old trees take more time, water, and work, and the cost of running the plant is from five to six dollars per day.

Q. The point I was especially anxious about was the first expense. I wish to compare it with other figures. For instance, Prof. Taft told us that the amount properly chargeable to ten acres is \$500. If you are irrigating twenty acres, what would be the total cost of your plant, ready to irrigate those twenty acres?

A. We have a plant that is ready to irrigate about eighty acres. Twenty are bottom land and sixty acres are upland. The cost thus far, for engine, pump, and pipe and appliances, would fall between \$900 and \$1,000. We obtained our engine cheap. It was a second-hand engine, and the owner was willing to dispose of it reasonably, and we took a mechanical engineer there and he said he could make it as good as new. The repairs cost us more than the engine, but altogether the expense was not much more than a third the cost of a new one, and we have 2,500 feet of pipe that will go clear to the other end of the farm; and by the use of this hose we can reach every foot of ground on the farm.

Q. A thousand-dollar plant, then, with its appliances, can irrigate eighty acres of land?

A. Yes, but that does not include the work, and there is much work that must be put into the first cost of the plant. If you could just have a plant set down on your farm, that would be the cost of it. If you are going to put it there yourself, it will cost something to do it. That would be a considerable part of the cost of the plant with us, because of those experiments that I have mentioned, where we undertook to get our water supply and save a few hundred feet of pipe. The experiment cost us five or ten times what the pipe would.

Mr. Fifield: At what time is it best to make this application for surface irrigation—what time of day?

A. O, any time of the day, but don't apply water to the foliage; we do not do that at all.

Q. Wouldn't you prefer, as a matter of economy, the latter part of the day?

A. We have followed the habit of having a cultivator follow after the irrigation and keep the surface stirred; just as soon as the water sinks out of the way, to have the surface soil stirred.

Prof. Tracy: I would like to call attention to one fact, that I think those who have not had experience lose sight of. It is not a question so much of the contour of the land as it is of the character of the soil. Many of our Michigan fields which lie level, people think because there is a stream near they can be easily and cheaply irrigated. That is not necessarily so. So far as my observation has gone, upon the irrigated plains of southwestern Kansas and California, the question of the character of the soil and its availability for irrigation is an important one, and in order to decide what soil can be irrigated—well, it is a question

which can not be answered except by some such experiment as Mr. Williams reported. It is a matter that must be examined carefully before any expenditure can be profitably made.

Mr. Vandervoort: Is it possible to irrigate a few acres with a driven well, where you have to draw your supply from seventy feet?

Prof. Taft: I think so. If one well will not do, drive four or five, and pump from all, and have reservoirs to provide for the dry season. Store up in advance, and use the water as necessary; but seventy feet are rather more than I would care to pump. If you can get water within thirty to forty feet, you can get twice the water with the same power that you can at seventy feet.

Mr. Morrill: Many of these tubular wells find water at seventy to one hundred feet, and it rises readily to within twenty or thirty feet of the surface. It is the water level that counts.

Prof. Taft: By the use of gasoline engines, something of that kind, that you can rely on to furnish power, you can irrigate sandy soil and get a large amount of water upon it. In this section there are a number of pumping plants, using in some cases traction engines, and pumping perhaps, in one case, a thousand gallons per minute—thirty barrels, perhaps, per minute. That comes from several driven wells fastened together. Smaller plants have a smaller number of wells and apply directly to the surface.

Mr. Tracy: In southwestern Kansas, near Garden City, the majority of the farmers have individual irrigating plants. Those plants are, without exception (I have seen hundreds of them and examined many of them), run by windmills of the ordinary size seen on farms, or perhaps a twelve-foot mill, and they use a pump made especially for the purpose, of greater calibre than the ordinary pump. The ordinary pump is seven inches—that is, the tube is seven inches in diameter, and they pump the water into earthen reservoirs, built by scraping out the soil, the man doing it himself during the winter months; and they line these reservoirs with puddled clay and with brick laid sidewise, and then covered with cement or clay; and then are careful to keep this full during the winter to prevent injury from frost. In one case I found a man had protected his by covering it with coarse manure; but those plants are to be seen everywhere near Garden City, and they have revolutionized the whole country. I would say that thousands of dollars have been spent by eastern capitalists in that same section, running irrigating ditches from the river, and these individual plants which pump up the water are evidently going to lead to disuse of the ditch almost entirely. These individual plants have been proven to be the most profitable way and the cheapest, to solve the problem in that section, and I have often thought that in Michigan, with all due respect for the possibility of irrigation on those desert plains, that there is no state in this country where the possibilities of advantage and of added profit are so great, from irrigation, as in the state of Michigan. As I pass through the state on the cars, it is rarely that there is not in sight from the car window some field which, if the soil is suitable, is so located that it is perfectly possible to irrigate it and make it profitable. I believe that in the future this question of irrigation will come to be one of the factors which will help greatly in solving the problem of profitable farming in Michigan.

Mr. Morrill: Professor Tracy, in speaking of Garden City, I think there is one thing that you perhaps omitted to mention. You know the conditions there. Their water supply is almost inexhaustible, and only from twelve to eighteen feet below the surface. It is a subirrigated country. I know that I have seen the plains near the Arkansas river, with the sand driven over them in clouds by the wind; then there would come a drove of cattle to the spot, three to five hundred head of them. They would stop and soon be drinking the water around their feet. They would leave that and go on, and in two hours the sand would be flying again. You will understand that that is the case in Garden City, that the power required is slight.

Mr. Tracy: The supply is apparently inexhaustible, but hardly so near the surface as reported. Most of the wells need to be dug twenty or thirty feet. Most have to raise water twenty feet to bring it to the surface. Their reservoir is usually nine feet high, making thirty feet to raise the water.

Mr. Collar: There are some lands not susceptible to irrigation. How can we find out what is best to irrigate?

A. Every man will have to determine that for himself, from information gained from books, and at such gatherings as this, and so on.

Prof. McCleure: There is one place in our state (Illinois) where irrigation is being tried to a considerable extent—at the asylum for insane at Kankakee. It was started this year. Their source is the Kankakee river. They had their own pumping plant for supplying the asylum with water; and for irrigating, the pipe was simply extended to the farm. They did not do any experimenting; they had a man from the west, familiar with irrigating, to do it for them. I happened to be there this fall, when they were putting water on one field, and was much surprised at the apparent amount of water they used in irrigating the cabbage field. They had the rows banked up and were running a furrow of water between every two rows; the rows were perhaps forty inches long; and while they did not know how much water they were putting on, it could not have been less than six to eight inches at one application. I asked the man about this water, earlier in the season. He said that when they began they put on enough water to start the tiles to running, and that means a good deal of water. They had watered their fields from one to three times. I was there in September. That is not very often, but they said it was often enough. They didn't keep an account of the results, but, in a general way, there was no doubt that their crop of this year was at least double that of last year, the two seasons being somewhat similar.

Q. Do you mean that for an entire covering of the surface?

A. Yes.

Q. That would mean six or seven thousand barrels to the acre.

A. It means lots of water, but the water was covering half the ground, as I saw it. The furrows were forty rods long and the water standing in these furrows the full length; and the man didn't know exactly, but it looked as though it had been standing there some time, and you couldn't have gone on to the ground at all.

PROPER IRRIGATION.

BY MR. J. N. STEARNS OF SOUTH HAVEN.

From my observation I have no doubt that more trees are killed every year by the improper application of water than are saved by right application.

How often we see the newly planted tree treated to two or three pails of water on the surface, and then left to its fate for several weeks, until perhaps the appearance of the tree warns the planter it is suffering for the want of moisture; and then the same mode of watering is again used.

Water should never be applied to the surface about a newly planted tree, unless the tree is mulched with some coarse material or the water put on just at night, and then the soil thoroughly stirred the next morning. My mode of planting, if the weather is very dry, is, when the roots of the tree are covered, or about two thirds of the hole filled, to tramp thoroughly, and then turn in a pail of water. When this has settled away, around the roots, fill in the rest of the soil and never tramp this.

A tree so planted will stand for weeks without suffering for moisture, if the surface is kept stirred with cultivator or steel rake.

If it should become necessary to apply water, never put it on the surface, but make a hole near the body of the tree and over the roots, of sufficient size to hold a pail of water; and when soaked away about the roots return the soil and leave it loose as it is raked in.

As I suppose this topic is to deal more with bearing fruits, I will simply give my experience and practice along this line. The four past seasons have been extremely dry, so much so we begin to think that we, like California, will have to depend on some plan of irrigation; and I have been practicing this more or less four years, and I am fully satisfied. In respect to plums alone, for the past two years, I have had from 500 to 1,000 baskets more by this means, as I have had four good crops in succession, which is a rare thing in plums, as they bear so heavily that, in such dry seasons, the trees are taxed severely to mature the crop, and, unless they can have some help, in the way of water and fertilizers, they will make no new wood and fruit buds for the next season.

Now, what is true of the plum is true in a measure of other fruits. But I will say here, if I had just the right soil (and that would be a good sandy soil) and plenty of well rotted manure and ashes, with the proper amount of cultivation, I could grow a good crop of plums and peaches if we had no rain from time of blossoming to that of maturity of the fruit, and without irrigation. Here comes in the importance of intensive cultivation, at which I have only time to hint. But it so happens that a large portion of my orchard is planted on heavy clay soil, and with all the cultivation I can give I can not keep up the proper amount of moisture without the application of water; and having so much to do I have made it a study to make the least amount of water do the most good. I have found this to be accomplished by keeping the surface pulverized, and as fine as possible, up to time of commencing the irrigation, which is done by hoeing the soil away from the tree, down nearly

to the roots. This forms a dam out nearly as far as the branches extend. Then turn in from thirty to fifty gallons of water, according to size of tree and amount of fruit it is bearing. When this water soaks away, the soil should be immediately hoed back into place. This fine soil acts as a mulch, holding the water about the roots, and it is of much benefit if the surface can be stirred as often as once each week afterward. I have found this moisture plainly discernible two and three weeks after application.

To derive the greatest benefit from irrigation, it should be commenced as soon as there is any danger of the trees suffering from drouth, and should be repeated in two or three weeks, if sufficient rain has not fallen in that time.

While I have not been able to materially increase the size of the fruit by irrigation, I am fully satisfied I have added quite materially to the quality, and kept up the vigor of the tree, thus enabling it to produce a good crop the next season; and I believe if we commenced soon enough, and applied often, it would increase the size considerably.

I have to haul water about one mile, and with two men and team can irrigate about eighty trees per day. With water on the farm, and an additional man, this number could be doubled.

IRRIGATION IN 1896.

BY MR. S. S. BAILEY OF EAST PARIS.

The subject of irrigation has lost none of its interest during the great drouth of the past season. People have felt as never before the necessity of availing themselves of all the accessible water that can be husbanded and utilized for watering crops.

The question of cost is the main one hereafter to be considered. Where water is available without first elevating it, the cost is a mere fraction compared with the benefits derived. The extra crops in one year of serious drouth often pay all the first cost of the irrigating plant. Such has been my experience in several instances, and besides paying all expenses they leave a large profit.

By a little engineering, small streams and spring brooks can be carried around and along the feet of hills and turned upon land where the crops are suffering for want of water; or conveyed into reservoirs or ponds, to be used when wanted. After establishing the grade with a level, so that you know just where the line is to run, the necessary excavation can be made mostly with the plow and scraper, at a very small cost.

Where the water must first be elevated and the supply is ample, and the plat to be irrigated is not too extensive, a large hydraulic ram can be used, if there is sufficient fall from the source to where the ram is located. An arrangement of that kind once established may be considered a permanent fixture, for the ram never tires and seldom gets out of order if properly set up and well protected.

If windmills or steam or electrical power are to be used, the cost will necessarily be increased, and crops must be selected that will warrant the investment. Intensive culture must be resorted to to make the investment pay.

Two great mistakes in irrigation are made, one in not commencing soon enough, expecting rain to come in time to prevent serious drouth; and the other is in giving too much water without long enough intermission. Such has been my experience, this season, especially the first. The length of time needed between the waterings depends very much on the nature and porosity of the soil and the subsoil. Plants want air to breathe as well as water to drink, and they get it mostly through their leaves; but they need air at the roots, and the ground should be allowed to dry out to a certain extent, so that the surface may be cultivated and the air allowed to find its way to the roots of plants, conveying with it such fertilizing elements as it may contain. The fertilizing elements in air, question it as much as we may, are a very potent factor in the growth of plants. Experiments with the feeding of roots in connection with other foods, shows that better results are obtained than the nutritive elements in roots would warrant. So it may be with a good supply of air mixed in with the food of plants. The nutritive elements may not be great, but such as they are they seem indispensable, and we should practice airing as well as irrigation.

Wherever I have irrigated judiciously the past season, as well as the year previous, the crops have been more than double those on similar land not irrigated. Late planted corn for silo, on land where it could not be watered, gave very poor returns; but of such as was irrigated, planted at the same time, the yield was all one could ask. Rye sown the last of August, for fall feed, where irrigated, got an enormous growth in a very short time; while that not watered made slow and feeble growth and gave very little fall pasture.

On my brother's farm adjoining my own is a flowing well about 150 feet deep. This gives a continuous stream through an inch-and-a-half pipe. The water has been utilized the past summer for irrigating the vegetable garden, with most decided benefit. He never had such a productive garden before. This well will pay big interest on its cost every year, for the garden only. This well, including piping, cost less than \$75.

This state is well supplied with water, within as well as around it. The surrounding waters are of vast benefit to the state, without any effort or outlay on our part. The waters within the state, a vast amount of them, are at our service, and can be made to contribute to our pleasure as well as profit, so soon as we can by experiment and intelligent investigation learn how best to use them, at a cost warranting the expenditure for their control and distribution.

AN EXPERIMENT IN KENT COUNTY.

BY MR. M. HUNTER OF LOWELL.

As I experimented some during the severe drouth of last summer, I will state my mode of doing the work and the benefits I received from it. We have two peach orchards, one of them on as good soil as there is in Kent county, the other on light sand with a sand subsoil. As the dry season continued, we found we had to do something for our sandy orchard, if we were to get any fruit fit to put on the market. The fruit was all drying up and becoming badly withered and shriveled. First, we uncovered the roots of the trees, made a basin or reservoir large enough to hold a sufficient quantity of water. We used a tank that would hold all the water a good team could draw from a brook half a mile away. We use from fifteen to twenty-five gallons of water, according to the size of the trees. The next thing we did, as soon as the water soaked in, was to put the dry sand and dust back, level up nicely around the tree, stopping evaporation and holding all the moisture we had put in, and in from twenty-four to thirty-six hours our withered and shriveled peaches were plumped nicely and looked all right, and when the time came to market them we had nicer and larger fruit of all varieties in our sand-hill orchard than we had in our best orchard on good fruit land. The latter was well cultivated but not irrigated nor watered. I wish to make one more remark, and that is, on examination of the trees we watered I never found that the water we put in entirely evaporated or came nearer than within about three inches of the surface. This is my first experience with irrigation and it netted me a large profit.

TWO IRRIGATION EXPERIMENTS IN ALLEGAN COUNTY.

BY SECRETARY REID.

Concerning this matter of irrigation in actual practice, I chance to know of two experiments which have been made in Allegan county, each so successful as to be worth noticing.

The first relates mainly to farm crops, but it no less demonstrates the feasibility of the principle applied to fruit plantations. It was made by Mr. Alfred Lonsbury of Watson, who applied water to a field of about four acres. Much of Mr. Lonsbury's farm may be very easily watered from a spring brook, and all of it may be irrigated without great expense simply by damming the brook and making it operate a ram or wheel and pump. There are hundreds of acres along the valley below him which may be almost as readily treated. The result of his experiment this year has caused him to determine to clear a lot of about fifteen acres for irrigation next year if the season requires. In the field he had this year three varieties of corn, but mostly two kinds of dent, one known in the county as "Pony" (having small ears of very hard grain of excellent quality) and

the other Early Mastodon, a kind having exceedingly large ears, originating in Yates county, New York. During the last week in August, Mr. Lonsbury brought to my office stalks of the latter, which were only a fair sample of the whole, which were then eleven feet high, and the "Pony" kind was not much shorter. Every stalk in the field, practically, had a well-developed ear upon it, many having two. Planting was done May 15, and on the 12th of August the kernels were so far matured as to show their dents.

The field was irrigated by two methods, part of it by running the water over the surface, between the rows, the other by simply stopping the ditch (a flowing brook) and letting the water soak out through the soil. There seems to be no difference in result between the two treatments. Five applications of the water were made, the first June 17, the others at intervals of about two weeks. Cultivation followed as soon as possible after the first three waterings, but after that the pumpkin vines prevented. Another portion of the irrigated land was in cabbages and potatoes, both of which crops grew wonderfully. The corn was planted only three feet apart between hills, Mr. Lonsbury thinking that sufficient in view of the advantage of irrigation. The soil is a dark loam, not mucky.

In the autumn, Mr. Lonsbury brought me samples of the crops. The pumpkins, to begin with, were of the common variety, but of most uncommon size. The cabbages were Burpee's All-Head Early, and produced many heads ten to fifteen pounds in weight, although it is not a large-growing sort. I have not learned as to the yield of potatoes, but it was very large and the tubers were in fine condition and quality. At the time of bringing the samples, Mr. Lonsbury had not husked the Early Mastodon corn, but the Pony kind had been found to yield at the rate of 160 bushels of ears per acre. The result was on the whole so satisfactory as to convince Mr. Lonsbury of the practical utility of irrigation, in his case, at least. He will next season convey the water to his field of strawberries, and use it if necessary.

The second experiment was made by Messrs. George E. and Perry P. Weed of Saugatuck township. Adjoining their peach orchards is a brook, and a small one, too, it seems to be for the accomplishment of so much good as it is capable of doing. A dam makes a pond, and from this the water is taken by means of a hot-air compression engine of a few horse-power. Water is taken along the highest land in the orchards by means of 3,800 feet of two-inch pipe. At distances of eighty feet are plugs for use of hose and troughs. By use of these they practice the basin system of irrigation, the same as that of Mr. Stearns of South Haven. The earth is scraped back from the tree several feet and about ten barrels of water applied to each tree, the earth being replaced so soon as the water disappeared. This was done each two or three weeks, and this is deemed sufficient for such a dry season as that of 1895, although the watering should have begun earlier and therefore been applied once or twice more in the fore part of the season. It was not applied till the middle of June, by which time the very light soil had become exceedingly dry. This equipment is sufficient for ten to twenty acres of orchard, but in the case of these gentlemen it can be extended simply by use of more pipe.

They applied the water to their strawberries, using hose and practicing surface irrigation. Two pickings had been made before application of the water, and the fruit had grown small in the heat and dryness, but

increased in size so much afterward that the last picking was better than the first. The berries were watered during two weeks. Next year an earlier beginning will be made, should the season require it.

The cost of operating the plant was found to be but \$2.40 per day.

The owners of this plant were so well pleased with the results of its operation that they will extend it another year. Their peaches, which must certainly have been very small, in the light soil, were as large as in favorable years, were more highly colored, and in quality left nothing to be desired, according to their kind.

SHADE TREES.

BY MR. GEO. B. HORTON OF FRUIT RIDGE.

"A place for everything and everything in its place," is the maxim of the good housekeeper and the successful farmer. In fact, this principle is at the bottom of all successful operations. Shade trees give protection from the hot suns of summer and the cold blasts of winter; they please the eye, they gratify and refine the tastes, and they ornament the fields, the lawns, the parks, and the roadsides. To make them useful and pleasant to the fullest extent, their location must be carefully studied and their care adapted to the needs of each.

Dame Nature, in her profuse decoration of the earth's surface, does not to the casual observer seem to follow the rules of order very much; but if you study, and learn to understand her ways, you discover a kind of careless adaptability of everything to the place it occupies, that is really charming. Every tree, shrub, and flower seems to be perfectly located, and surrounded in a way to give the best effect. Who has not peered out from the car window, when riding along through rustic parts of the country, and noted, as the ever-changing panoramic views flashed across his vision, how appropriately the trees skirted the brows of the hills, while others stood guard along the winding streams, and the foliage was all so beautifully blended? The little evergreens and vines cling to the creviced rocks, and so gracefully hang as if to hide from view the source of the little rill of water that courses down. How we would all like to roam through woods, over hills, and along streams where the despoiler, man, has never trod, and witness for once the unbroken works of nature! Man destroys and then attempts to replace and rebuild, but he always falls far short of the original. Genius is lacking and life is too short. He can not, however, do better in all his efforts at ornamentation with trees than to study and carefully observe nature's ways, in their location, and then let time and nature do the perfecting part. It takes many years after planting to secure a perfect effect with trees, for some of them should be sufficiently large that the buildings may be seen through under the lower branches for best effect.

What a ruthless destroyer is man, to cut down a fine shade tree from the roadside or garden, that he may raise a few more hills of corn! The only blame I lay at the feet of the pioneer is that he did not anticipate the

beauty of the country fifty years ahead, and so leave here and there, in out-of-the-way places, more trees that nature had planted and rooted. It could have been done in so many places, with no material disadvantage to the cultivation of the soil.

Shade trees about the home speak of refined tastes within. As you ride through a country naked and barren of trees about the buildings and other favorable places, you are at once impressed with the thought that the people are behind the times and lacking in progressive spirit. In such localities we naturally look for poor schoolhouses. True, that natural conditions have much to do with this. A low, flat country that needs all of the warmth of the sun, and thorough drainage, to make it productive, is at a disadvantage; but even there a man can with his own labor so build and elevate by grading that his lawn and farm yards can be beautified with trees, and thus add comforts and value to the home. Shade trees in the fields should be placed around watering-places, along lanes and short bluffly places that can not be cultivated. It is also useful and ornamental to set trees in a thicket, and of such kinds as will make dense shade from the ground up, and so located on the north and west sides of barnyards that they may serve as a shield against the cold of winter. Great improvement has been made in the general appearance about barns, the last few years, and chief among them was moving the straw stacks and stock from the front to the rear of the barn, so that the front yards may grass over. Now, by setting out two or three trees in suitable places in such a yard, still further attractions will be added to the place.

Those who have shade trees in lawns must make the best of them where they are, and so surround and fill in the margins as to give artistic effect. In preparing for new lawns with trees, take plenty of room. The ground is not wasted, and a large farm lawn can be more easily cared for than a small one. Properly grade the ground before setting out the trees. Like a picture, a lawn must have a background. Of all the attractive places one sees in riding through the country, none is more pleasing than the home built on the side of a hill, and the rise of ground back of the house covered with orchard or woods trees. It does not give a good effect to have the row of trees by the roadside in front of the house, so that the passer by looks under and through them out into nothing beyond. The rows of trees should be back of the house and set quite close together, for a background to the scene; and then in front set a very few in irregular order, so that the term "careless adaptability" will apply.

As to the kinds of trees each one must set, use judgment in accordance with location, soil, etc. Trees must be healthy to look well. Common forest trees that are natural to the place will always thrive best. In a fair-size lawn, two or three evergreen trees set a little at one side and back will give a pleasing variety. No improvement about the premises is so perpetual in dispensing satisfactory results as growing shade trees. As you sit in old age under the branches of the maple or elm you planted when a young man, with your children and even to the third generation about you, what field work of your life will give you more pleasure?

We answer, none.

GARDENS FOR TOWN AND COUNTRY HOMES.

BY PROF. W. W. TRACY OF DETROIT.

In the very beginning of the history of our race the edict was pronounced, that henceforth man should live by the sweat of his brow; and ever since then he has been trying to escape it, even trying to find some way to live without labor. And has he succeeded? The regular click-thud of the spinning jenny, doing under the guidance of one hand that which formerly required an hundred, and doing it better than they could possibly do it; the clitter-clatter of our mowing machines and reapers, taking the place of aching backs and stiffened arms in the cutting of our grass and grain, all answer, yes. But the weary, tired look on the faces of the men who pour out of our mills at night after their ten, twelve, or fourteen hours of labor; the shortened lives of our professional and business men; your experience and mine, all give a far more emphatic, if not a louder, negative answer. And this must always be so, for he who uttered that edict was not a man that he should lie, or the son of man that his words should come to naught; and whatever might have been, we are so constituted that no sooner do we by wit or wisdom contrive some plan by which we can do in one hour that which formerly required an hundred, than some new want or desire, the gratification of which is absolutely essential to our happiness, to our comfort, even, springs up to demand the labor of the remaining ninety-nine.

The great question, then, is not how to escape labor, since that is impossible, but how may we get the greatest good from our labor? In considering such a question it is well to look at the past and see how the labor of man has been expended. Beneath the desert sands of Egypt we find buried cities, the monuments of the labor of those who lived thousands of years ago. If we examine this work we will find it replete with ornament, and evidence everywhere that these workers aimed to please the eye. Travelers tell us that modern towns of Greece and Italy are built of the fragments of sculptured marble that formed the ornament of the ancient cities. Surely, if we judge of what our predecessors valued by the products of their labors which they have left behind, we must conclude that a large part of that labor was for the sake of the beautiful.

But ours is a utilitarian age, and in it and among our busy, money-making, money-loving people, we shall find no such foolish waste of labor for the sake of appearance. Are you sure? Think of how large a proportion of the labor necessary to convert the wool into the clothes you wear was spent to please the eye. Look about you here, or in the plainest home, and see how much of the labor, the evidence of which you see, was spent for looks' sake. No, man always has—he does and he always will—spend a large proportion of his labor, over and above what is necessary to supply his mere animal wants, those he has in common with the brute, for the sake of the beautiful.

Let us go higher and look at the work of the Almighty, as we see it in nature. A leaf is a contrivance to expose a large surface of matter to be

acted on by the atmosphere without hindering the circulation of the air or liability to injury by wind and storm. For this purpose a simple disk hung on a pliant stem is the easiest made, and as good a form as any. Are all leaves made that way? How much of the labor we would have to expend to clothe the earth as it is with plants, would be saved if we would make all trees and plants alike so far as form is concerned. And doesn't the extra labor necessary to give them the varied and beautiful forms they wear indicate that their maker cared for the beautiful? Was not the beauty of the lily, exceeding that of Solomon in all his glory, cited in proof that God cared for it? Can we look at God's work anywhere and escape the conviction that he loves beauty? There is not a mother here but has seen her baby smilingly stretch out its hand for the bright ribbon at her throat. Was there ever a child that was not pleased with a bright flower? But how often the beauty-loving child grows up into a man who cares nothing for beauty, who thinks any time spent for the sake of beauty is time wasted!

Why should this be? Is it not clear that it is the result of want of exercise of the faculty of seeing and enjoying beauty? We are told that were a man of the highest intellect shut up so as to have absolutely no intercourse with his fellow-men, and no chance for the exercise of his mental powers, it would be but a short time before he would become insane. Is it strange, then, that a child growing up and never hearing beauty referred to, with no opportunity to express and develop his love for it, should lose that love, should become a man to whom

"A primrose by the river's brim
A yellow primrose was to him,
And it was nothing more"?

But you say that there are no fixed principles nor rules of beauty; that it is a matter of taste and not of education. The belle in Africa bores a hole in her nose from which she dangles her ornaments, and covering her neck and breast, for modesty's sake, dances with bare arms and legs and body in the sunshine, proud to be so beautifully dressed. The belle of Adrian bores holes in her ears from which she dangles her ornaments, and covering her body all but her neck and breast, for modesty's sake, dances beneath the electric light satisfied that she is dressed so as to show her beauty to the best advantage. Everywhere men make things which they think are beautiful, but which others look upon as hideous. But does this want of unity of opinion as to what is beautiful prove that there is no such thing as absolute beauty? The thugs of India believe it is their duty to rob and murder. In my own city there is a group of people who believe it is the right thing to do what other people consider wrong. Everywhere some men consider certain things wrong that their neighbors consider right. Are we because of this to sing the song of despair, and cry out

"There is no God, there is no good,
And faith is a heartless cheat
That bares the back for the devil's rod,
And scatters thorns for the feet"?

No, the want of an universal conception of what is right does not prove that there is no such thing as absolute right—no need of studying its prin-

ciples. No more does the want of a universal conception of beauty prove that there is no such thing as absolute beauty, nor advantage in studying its principles.

But how shall we educate our children in these lines? It is a fact that the human heart is naturally so selfish and vain that it is always the tendency of the leaders in any branch of human knowledge to so formulate the statements of it as to magnify the importance of their own specific knowledge on that subject. Thus, the doctrines and dogmas of the church all tend to magnify the importance of the clergy; our laws are so shaped as to give increased importance to the lawyer; and when artists try to educate people in knowledge of beauty, the tendency is to direct attention to the art rather than to the beauty of which the art is an expression. Ruskin tells us that all beauty has its origin in some thought of the Creator expressed in natural forms. Certainly every form and shade of beauty finds an expression in the plants which one may grow even in the temperate climate; and as a horticulturist I naturally tend to magnify the value of the garden as a school of beauty.

But a child's moral character is developed far more by the daily influence of those about him than from a study of the doctrines of the church. A man's habits of lawlessness or law-abiding are more the outcome of his daily experience than of his knowledge of the statutes, and I am not sure that a large garden is the best place to develop a boy's love of the beautiful, especially if he is asked to do most of the disagreeable work of caring for it.

Did you ever think how everything that is really worth anything in this world is free to everybody, is the free gift of the Creator, thus showing the brotherhood of man and the fatherhood of God? How much is honor worth as compared with love? Can you buy love? Is it not just as possible to the beggar as to the king? How much is wealth worth, compared with health; and can anybody own, accumulate, any more health than he can use? Can the health of the world be "cornered"? George Vanderbilt may own a Carolina landscape to the horizon, but can he get any more of its beauty than the poorest man that looks at it? My neighbor may, at the cost of hundreds of dollars, establish a beautiful garden; but after he has enjoyed is beauty to the utmost, there is just as much for me. Love, health, beauty, are the gifts of God to his children, and he gives them so lavishly that every one can have all he can enjoy, and no one, be he ever so strong, ever so shrewd, can take a single iota more than he can enjoy.

What I plead for, then, is that we strive to develop the capacity for seeing and enjoying beauty, with which every child is born; that we give the baby the bright ribbon; that we let it pick the flower, and, as it grows up, we talk to it of the beauty he will find everywhere. Our boy comes to us with a beautiful snow crystal upon his sleeve, and we ignore it, and gruffly tell him he had better sweep off the path. Charmed with the beauty of the spring, he asks to go Maying. No, he must stay and dig the dandelions from the lawn.

Are God's works so inferior to those of man? Is all floral beauty centered in our cultivated flowers—the tulip, the rose, the canna? Is there none in the plants of the field and wood—the trillium, the sweet briar, the cardinal flower? Are we to look for beauty only where man has spent his labor, and so laid claim to special rights, and ignore it in the

millions of common things that God scatters so lavishly, so freely, on every hand?

Pardon me if I have spoken earnestly; but, friends, I once knew of a child born into a community of deaf and dumb people. It grew up and was supposed to be deaf and dumb. It had no chance to use those senses, and, like those about it, learned to depend upon others. It was not till a friend who could hear visited the family, that it was discovered that the child could hear, and it soon learned to talk as well as any one. What a crime it would have been to have let that child grow up as a deaf mute! Yet are you less blamable if you let the sense of beauty, with which your child is born, die out because of neglect?

"He prayeth best, who loveth best,
All things, both great and small;
For the good Lord, who loveth us,
Hath made and loveth ail."

DISCUSSION.

Dr. Beal: When I was a boy I used to like to hunt squirrels, rabbits, and such things so well that I would take my gun out to the woods and shoot a few squirrels while the rest were at their dinners or resting, and then I would return with them to the harvest field and think I had had great sport. Since then I have learned to study botany and zoology, and my pleasure in hunting has disappeared. I have something better. I have friends who, every time they get a little tired, spend several weeks up north, fishing for trout or shooting deer. It seems to me—maybe it isn't the thing for me to say—but it seems to me that I have reached a little higher point in enjoyment.

I don't brag about it, but I have had the opportunity to study these things, and it has taught me to enjoy the things right around me—trees and shrubs and little animals. If I am obliged to wait for hours in the day time at a depot, for instance, it is not tiresome. I can walk up and down the track and find pleasure in studying the weeds and find new varieties of plants. I can go out into the woods and swamps, and all my troubles are lost for the time. I am overwhelmed with the beauty on every side. It seems to me, as Prof. Tracy says, we are often likely to lose sight of some of these things. I wish to speak of a subject in which most, perhaps, take little interest—something about trees and shrubs and forestry. When I was a boy, teaming up and down the roads here, to Adrian, the old men who helped clear off this timber said, "The timber is growing scarcer. After awhile we will not have enough for firewood. There won't be enough for the railway engines." We have now found coal, and wood isn't so high now as it was a few years ago. We wondered what we would do for railway ties, after the forests were cut off, but we shall use steel. We can dispense with the use of trees to a great extent. But notwithstanding this, trees will always be useful for ornamentation and also for timber for furniture and many other things. I notice, as I pass around the country, that many are interested in preserving some of this timber. I don't advocate tearing up good land and planting out trees, neither argue keeping trees for trees' sake. I wish to make use of them when they are ready to cut, as much as the man who raises trees for other purposes, but once upon a time this was a fine timber state. I

don't expect to make any impression on these older heads, who have looked upon trees as their enemies, to be cut down to make room for wheat and barley, but I am talking to the young men who will be hunting some day for a quiet spot in the forest where they may go and study nature. These spots are coming to be very rare in this state, in the southern part especially. As we go north, where they have cut off so much pine and hemlock, and other forest trees, many of these kinds are disappearing. The railroad comes in, and the fire from the locomotive throws sparks into the young growth, and it is swept off in almost no time. One point I want to make is in regard to this young growth. It is left often in an exposed condition, with rubbish all around, and after having gained perhaps twenty or thirty years' growth it is swept away by fire. What I am pleading for is some scheme by which these young groves may be preserved for future use. A large percentage of the fires spring from the railways, and this is one of the hardest things we have to contend with—to see what can be done to prevent the locomotives from setting fire, in dry times, to the forests. At the last meeting of this society, at Traverse City, I offered a resolution something like this: "We, as a society, should not be satisfied until the state has a forestry commission, somewhat like the one of 1886-1890." The society voted unanimously to sustain that resolution. I call your attention to it today, because we have some new members here, two new members of the executive committee, and I wish to remind them of what the society has committed itself to, and I trust you will sympathize with the sentiment, and do all possible in urging this matter upon the next legislature. A forestry commission would cost but little, five or six hundred dollars per year. You don't realize, perhaps, that one third of the wealth of the state is coming each year from the trees of the state. Is it not clearly worth while, then, with such a vast amount of wealth in question, when it is such a vast interest in this state, to look after it? We spend considerable money in the protection of game. We have our game wardens, and that is popular enough. Can not we do the same thing for this industry of forestry? I mention this much more freely than I should if I had an axe to grind; than if I expected to push this bill through and get to be commissioner and receive a salary. I held this office once for four years, and the newspapers said that the only reason for having this office was on account of the salary received. The fact was that there was no salary accompanying it, and I had to do lots of work. Germany and many of the European countries have been through this same wasteful process that we have in the United States, and they have learned to husband their resources and try to save what is left. I hope every time this society meets it will discuss this question and get the sense of those present. Any one who has travelled through our state and seen the immense amount of barren land, that for years is not likely to be of use for agricultural purposes, will see that it might, by a little care, be retimbered, greatly to the advantage of the state. I never travel through the northern part of the state without feeling a little indignation at the destruction created by a good many lumbermen. I remember that one of the pleasantest calls I made, while at Los Angeles, was spoiled by a statement made by a friend whom I had known in childhood. He probably took out of this state somewhere in the neighborhood of four or five millions of dollars. He lives in a palace at Los Angeles, and he made this

remark, as emphasizing the beauty of that particular climate, which was pleasant enough; he said that if any one had the power to say to him that he might have one year in California or ten years back in old Michigan, he would take the one year in California. I wanted to tell him, that I considered him extremely ungrateful. I hope, my friends, this will be a question freely discussed until something tangible shall grow out of it, to retimber the state of Michigan, especially in certain localities where nothing else is likely to grow for some years. Last winter, at our farmers' institute, Gov. Hoard was with us. He said, "We have had in Wisconsin some ten to twelve thousand dollars to carry on our institutes." I asked how that happened. "Well," he said, "about six or eight years ago, six men in Wisconsin put their heads together, and they said, 'we will pull together until we get these institutes.'" It shows what a small body of earnest men can do in such matters. The more, of course, the better; but if we are in earnest and pull together, we can accomplish ever so much.

CULTIVATION OF THE CHRYSANTHEMUM.

BY MR. ELMER SMITH OF ADRIAN.

The chrysanthemum derives its name from the two Greek words *chrysos*, gold, and *anthos*, a flower; hence the literal meaning, gold flower.

Thinking it might be interesting to many present, I have taken the liberty to depart somewhat from the subject by giving a few historical notes.

From almost prehistoric times the Chinese and Japanese have cultivated this famous flower. The chrysanthemum, or kiku, as it is called in Japan, is one of the crest badges of the imperial family, and is used as an official seal. The hilts of the swords forged by Emperor Go Toba, in 1186, had the kiku figured upon them. All Japanese manifest the greatest enthusiasm in their culture, looking forward with pleasure to the coming of these flowers, and the Chinese are no less ardent in their devoted admiration. It is more than two hundred years since the first plants were introduced into England. In 1754 it was first cultivated by that celebrated gardener, Miller, at Chelsea, but by accident was lost, being again introduced at London in 1795. As it is known today it appears modern to many, but the foregoing assures us it has not been recently introduced. It is simply the improvement in cultivation and varieties that has given them such popularity the past few years.

They were introduced into this country in 1826, and in 1830 such varieties as Quilled Flame, Curled Lilac, Tasselled White, and Changeable Buff were exhibited at Boston before the Massachusetts Horticultural society.

I will first give the method generally employed by the florist, and follow with a few hints to the amateur. The old plants that have nearly passed their usefulness for this season are sending up new growth at the root. These are taken off in the form of cuttings, inserted in sand which has a gentle bottom heat, and if kept well watered will in ten or twelve

days be sufficiently rooted to receive their first potting. Planting usually takes place in June and July, so it will be necessary to have ample stock ready before beginning this work. Selecting the strongest plants, they are planted rather firmly from eight to ten inches apart, on tables or benches containing about four inches of good, pliable soil, followed by a copious watering and the first important step has been taken. Constant attention will be necessary from this time until the flowers are developed, giving abundance of air at all times and attending closely to the watering. They are lovers of water, yet should not be treated as aquatics, or the soil will become sodden and the foliage assume a yellow coat. A moderately moist condition is what they enjoy. As the plants advance in height they will require staking and tying.

To produce specimen blooms the plants are restricted to a few flowers, generally from one to three. After the middle of July, all growth except that intended to flower is removed as fast as it appears, to concentrate all the energy of the plant to its flowers. By the end of August, many varieties are in bud, and then begins the task of removing the surplus and retaining the most perfect.

This is disbudding, and will need to be repeated several times till all are removed except the one at the apex of the stem, which is usually the most perfect.

The next important step is the application of additional food, which should be given in the form of liquid manure or chemicals that are soluble in water, beginning with a weak solution and gradually increasing until the limit is reached. A half bushel of fresh manure to forty gallons of water, and five ounces of concentrated chemicals to thirty gallons, are considered maximum doses. When the flowers are half expanded all watering should be done in the early part of the day, to secure as dry an atmosphere as possible for the night, as the dew, which is very heavy under glass at this season, is very injurious, causing the petals to damp-off or decay. A slight ventilation over night, or the application of a little heat, is also a good prevention, but I prefer the former as long as there is no danger of freezing.

To those who are not favored with greenhouses, are not desirous of having well-grown plants, I will give a few suggestions, beginning with the pot system. Procure the desired number of plants the latter part of May, which, as they are generally bought from the florist, are in the smallest size pots. These should be changed at once into the four-inch size, and plunged to the rims in the open garden, or in some light material like sawdust or tanbark in an open frame. By the first of July they will need another shift, using an eight-inch pot for those which have made the strongest growth, and a six-inch for those less vigorous. The watering, staking, and feeding should be attended to the same as when grown under glass. Should the wish be for nice, symmetrical plants, with abundance of bloom, pinch out the tip of the plant at the first potting, repeating this from time to time as the new growth is four inches long, continuing until August 1, by which time the plants will have from fifty to one hundred branches. When the buds are the size of small peas, rub off all but one at the end of each branch. This will make the flowers larger and of better quality. If specimen blooms are desired, defer the pinching out of the tip until July 1 to 15, and allow the two or three shoots

which follow to grow on, removing all others as fast as they appear, and disbud, leaving but one to each branch. They may also be very successfully grown with somewhat less care by planting into the garden. The same care will be necessary as when the pot system is used. They should be lifted and potted or boxed, not later than August 1, to allow them to become well established in their new quarters before the buds begin to form. Lifting after the buds have set, and subjecting the plants to frost, are the principal causes of deformed flowers.

The chrysanthemum is partial to low temperature, but the varieties now grown will not endure severe frosts. It does not kill the plant, but blackens the buds. At the approach of frosty nights, a snug harbor can easily be prepared by setting four posts, to which an ordinary hotbed sash is fastened on the south side, with the other sides closed up with boards or heavy cloth. Such protection is generally ample until November 1, and sometimes later.

American homes are not blessed with this beautiful flower as are those of our English cousins, where nearly every household has at least a few plants. Repeated failure in their cultivation no doubt is the cause of their being so sparingly grown by the amateur. I think you will have no further trouble, by remembering these few simple rules: Give abundance of sun and air, keep roots moderately moist, stake, tie, and attend to the feeding and disbudding; never disturb the roots after the buds are formed, nor allow Jack Frost to get at them, and success will crown your efforts.

DISCUSSION.

Mr. Morrill: The cultivation and improvement of the chrysanthemum has been making wonderful progress in the last few years, and the gentleman who has just spoken to us is one of the most wonderful propagators and improvers of this flower. Many of you perhaps have a particular liking for the chrysanthemum, and I hope you will take this matter up and ask whatever questions may be on your mind.

Mr. Vanderwert: I have tried to raise chrysanthemums without a greenhouse and there is an insect that tops them a little too soon and keeps at it a little too long. After they get to be a foot high, I can do no more with them. The insects which attack them are about two thirds the size of a lady-bug, and flatter than that, and unless you look pretty sharply you will not see them. They slide off and disappear. How to manage that insect I have never learned.

Mr. Smith: I had some talk with Mr. Allis on this subject, and since then I have learned that the tarnish bug is very active (and they are as you describe) and so quick in their motions that you can scarcely catch one. The best remedy I know of is either tobacco in the liquid form or dry tobacco. But if you plant them out in the garden and do not watch the bugs very closely, they will destroy every chrysanthemum. They puncture the plant and extract the sap, which checks the growth and they will keep on until there is not a leaf. The best remedy I know is tobacco.

Mr. Reid: Mr. Smith, I understand some of the specimens here are your own productions. Will you give us a little talk on these, and tell us something of your processes?

Mr. Smith: Of course all of these new varieties are obtained by fertilization, or applying the pollen of one flower upon the pistils of another.

If I had a chart here, I could show you more plainly. At the base of every petal, there is a little pistil. It is extremely small. We take the plant when the flower is in a half-developed condition, and with a pair of scissors shear it all off closely until we get to the pistils. Then we allow them to stand a day or two; at first they come up closely, then they spread out, and then they are in condition to receive the pollen. The next consideration is, what do we want? Of course there are some varieties, some forms, more popular than others, and those we wish to increase and perpetuate. So we look around. For instance, we have a loose flower, this one, for example (taking one from those on exhibition); and yet I would like to have one in this form, for it is larger (displaying another flower). Some bright morning I will open this to the center. There are a few cells in there which produce pollen; we then take a fine, camel's-hair pencil, collect the pollen and apply it to this. This one is the staminate parent, and this the pistillate parent. Most of us keep a record of the parentage of all our seedlings. In fact, I can tell you the parentage for five or six generations of every seedling we have produced. This (showing a flower) is a variety that was awarded the silver cup at Denver. It has also been before the committee of the Chrysanthemum society of America. Perhaps I might better tell you more of this. We have (just as our nursery-men have) a great many men who have not the best of scruples in sending out new varieties. They send out a thing under a glowing description, and it is not half so glowing when you come to grow it. People are getting tired of buying new varieties; and so, with this idea in view, the society has appointed five committees, at Cincinnati, Boston, New York, Philadelphia, and Chicago, consisting of prominent chrysanthemum-men. To them we submit our seedlings. We have a scale of points, embracing color, form, and size of stem, and all things that are necessary to a good bloom. This variety has been submitted to five of these committees. Last night I received the last report. It has received at least eighty-five points before each of the committees, and more than that before most of them. At Boston it scored 100 points, at New York 85, Philadelphia 95, Cincinnati 87, Chicago 93; an average of 92.

A FEW WORDS ABOUT TOMATOES.

BY PROF. W. W. TRACY OF DETROIT.

National and family resemblance in character is a universally recognized fact. We expect a Scotchman to be serious, earnest, industrious, frugal; and we are not surprised if a negro is happy, careless, lazy, shiftless. In like way, there are race and family resemblances in plants. All the grass family are quickly affected, as to quickness of maturity or earliness, by the climatic conditions under which they are grown. Corn taken from Vermont to Florida will in a few generations become later and larger, and if taken back to Vermont will hardly mature at all. But cultivate it there a few years, and it loses its size and regains its earliness. Wheat, oats, and grass are similarly affected. On the other hand, I have known of watermelon seed being taken from Michigan to Georgia and grown there for five generations, and then brought back to Michigan, and mature just as early as seed that had been grown here the same length of time. By taking special care I have grown a very late-maturing Persian melon here for six generations, but without gaining an hour in earliness, and I have never known of an instance of plants of the cucumber family gaining a single day in earliness through cultivation at the north.

Now, I think the tomato family (the tomato, egg-plant, pepper and potato) have a characteristic which has an important bearing on their cultivation. It is this, that in order to produce a full crop the plants must grow at a steady and uniform rate from the starting seedling to the maturing crop. Perhaps I can make my meaning more easily understood, and enforce its importance, by illustration. A few years ago I took 100 tomato plants, about two inches high, they having just made their first pair of true leaves, and divided them into four lots, as uniform as possible in the size and character of the plants. Two lots were set in a long box and the other two in another, and the boxes set together on the side bench of a greenhouse. One box was turned end for end every day, thus giving each lot in it an equal chance. The other was not moved; and the result was that, when it came time to set the plants in the open ground, the two lots of plants in the box that had been turned were uniform in size and character, while in the other box the lot at one end were nearly twice as tall and much softer than the other. The four lots of plants were set and given an equal chance. In six weeks they all seemed equally large and healthy. The crop from the four lots was picked and weighed separately, and between the two lots from the first box there was less than two ounces per plant difference in weight of crop; but between the other two there was a difference of over 20 ounces per plant. Last summer, Mr. E. A. Starr of Royal Oak started a lot of tomato plants. When fit to prick out into cold-frames, he divided with a neighbor. Mr. Starr's plants were set in a cold-frame and so managed that they grew slowly and steadily up to the time of setting out. They were carefully set out, so carefully as to be scarcely checked at all. During the season they were so cultivated that they made a steady but not rank growth up to the time of fruiting. The result was a yield of over 700 bushels per

acre of excellent fruit. His neighbor set his seedlings in a hot-bed and induced a rapid growth, so that before it would do to set them in the field they were nearly twice as tall as Mr. Starr's, and had to be held back for want of room for further growth. When set they were checked, so that Mr. Starr's plants caught up with them in size. They then took a start, and, the ground being very rich, they outgrew Mr. Starr's and were larger at the time of ripening than his. The result was only a fair crop of less than 300 bushels to the acre. I am sure that any one familiar with the plants, soil, and other conditions of these crops, would believe that the difference in yield was chiefly due to the greater steadiness of growth of Mr. Starr's crop.

Our experiment stations have made a good many experiments as to the best fertilizer and method of treatment for tomatoes, and while these are very valuable, the results are often contradictory, and I think they are so because of the fact that difference in the steadiness of the growth of two lots had more influence on the crop than the difference in fertilizing or treatment.

Now, as to a practical point in growing tomato plants. Mr. J. H. McCotter of Pontiac has developed a method which gives the most satisfactory results. The soil in his cold-frames is packed hard and smooth, and on the sides of the frame he makes marks three inches apart. He finds a bit of tough, thin sod in some old pasture, and with the aid of a marked board and a sharp spade he cuts bits of turf about $2\frac{3}{4}$ inches square. These are taken to the bed and, by the aid of a strip having pegs three inches apart, and the marks on the side of the frame, they are arranged in rows across the bed so as to be three inches apart from center to center. They are then covered with about an inch of rich soil and the bed is ready for the plants. In setting the plants, a strip three inches wide, having pegs three inches apart, is placed in line with the marks on the side of the box, and pressed into the soil, thus making a hole over the center of each bit of turf, in which to set the plants. All this, as I have told it, seems a fussy and a slow job; but in practice it is easily and quickly done, and Mr. McCotter finds that the plants root into the turf so that they transplant fully as well, often much better than from plant boxes, and the whole operation, including cutting and placing the turf and setting the plants, takes but very little if any more time than the filling of plant boxes and removing of them at the time of setting, with a net gain in the cost of boxes.

DISCUSSION.

Mr. Allis: In regard to the tomato question, we have a tomato-canning establishment here in our town, and last year our people saved selected seeds, with the desire of planting them; but the manager of the canning works obliged our people to use the seeds that they furnished, and after these had been sown and some little time had elapsed, some of these other seeds were sown, and they went clear ahead of the others. But now it is understood that the late seeds are used for canning purposes to a certain extent. These others were selected, as Prof. Bailey says, for the quality of the tomato and for the time in which they ripened. They were not those late in the season, but those which did the best, and the offspring did much better than the others. Now, I would like to ask

Prof. Tracy if he would attribute it to better method in the growing, or would he consider that the selection of the seed would have anything to do in producing a better tomato?

Prof. Tracy: I have no hesitation at all in saying that the selection of seed does make a material difference in the maturity, the quickness of development; but I would also say this, that from the same plant I would as soon have a seed from the last-ripening tomato as from the one first ripened. We have observed in our trial cases a certain tendency. For instance, here is a tomato plant which branches out in three or four branches. When that fruit has five per cent. of crooked, irregular fruit, most of it is upon one branch and most of the smooth fruit is upon another branch. We have been selecting with more reference to saving seed from that branch which produced the best fruit as a rule. But what I wanted to say was this: From the same plant, I would as soon have seed from the last-ripening fruit as seed from the first-ripening fruit, and any process of selection by which you secure seed from the best plant, and not from the best fruit, will surely result in improvement in your general stock.

RELATION OF GLASS TO COMMERCIAL GARDENING.

BY MR. SQUIRE JOHNSON OF ADRIAN.

Having had a working experience in some of the departments of market gardening, from my earliest manhood, I am far more at home in its manual operations than its literature. All gardeners do not use glass in the growing of vegetables, but nearly all vegetables require the aid of glass if they are placed upon the market when the people want them, and are willing to pay good prices for them.

The starting of plants under glass, if properly done, will cause those plants to mature from one to three weeks sooner than if the seeds were sown in the open ground. To illustrate, we will compare two men who are in the business, both calling themselves gardeners, and selling their produce in the same market. Mr. A uses glass to start his plants, and in some cases to mature his product. Mr. B has no glass, but grows about the same varieties of vegetables, and is fully as well posted in the business as Mr. A is, so far as knowing when to plant and how to tend the crops. When the cold winter weather begins to give way to warmer, spring-like weather, people in the city want spring vegetables. The enterprising dealer has perhaps imported some lettuce, radishes, and spring onions, and had them on sale through the fore part of the winter; but the demand is usually light at that time, and the growing of them for a small market usually results in a loss to the grower. Mr. A. has these products about ready for market, and soon comes to town with a load. He finds ready sale, and his home-grown products are much fresher than the imported produce and takes preference over it. He is plied with questions as to how he grows such things so early, it being some time in February. People supposed that all green stuff was shipped into their market from the south. He tells them that they are grown by

himself near by, with the aid of glass. That is surprising. The ground is yet covered with snow and frozen hard. Mr. B has not yet been able to plant any seeds. Mr. A will have the market to himself a long time yet, before he has any competition from B. All he has to compete with is the commercial drummer from the wholesale house in the larger city, which does not amount to much, as the people will buy the fresh produce at an advanced price before they will the imported. So, week after week, Mr. A comes on regular days with his load of fresh, home-grown spring vegetables. The dealers buy his produce at a good price. The people keep using more and more, and Mr. A, knowing that as spring advances he can sell a large quantity, has prepared himself for it, and brings in all they want, taking care not to overstock the market. If he has a surplus he ships it off and takes what he can get for it.

But what of Mr. B? Where are his spring vegetables? It is now the month of May and he has not yet begun to sell garden truck. He has been very busy ever since warm weather came on; has plowed and planted and worked hard to get early vegetables to market, but they don't grow fast enough—too much cold weather, winds, and rain for the young plants to thrive. However, he manages to get a few baskets of lettuce and onions, toward the last of May, and takes them to market. He finds that Mr. A has supplied the dealers for some time back, and that they are slow to buy this out-door produce, which is much inferior to that grown under glass. The consequence is, he is hardly able to get enough for it to pay for the gathering and hauling to market, let alone the cost of growing. The people have been eating these vegetables that came from Mr. A's garden for some time, and they are getting tired of them. Well, Mr. A has something new by this time, young beets, and in a few days will have new cabbages. With the aid of his glass his are several weeks ahead of Mr. B's, which were planted in the open ground; and when the latter brings his to market he will not realize nearly the price that Mr. A has obtained. And so it works through the whole season. Nearly all vegetables, by the aid of glass, may be forced ahead of the natural season.

Thus we see that glass is indispensable in the growing of garden vegetables for market. If the home gardener has no glass and relies wholly upon the natural season for his market produce, the dealers in his town will not wait for him, but will import the vegetables from other cities. Mr. B and Mr. C, and all engaged in the business, come into town about the same time with the same kind of produce, and the city lot is in with the same, and down go the prices until it is hard work to get people to buy at any price.

Still, it would not do to put up more glass than the market would support, unless we are pretty sure of a place to ship to and realize paying prices. Glass is costly, and the man who fits up a market garden with hot-houses and hot-beds should be reasonably sure that he will have a home market for his produce before he undertakes it. We think there are many cities in this state where the business could be made to pay well. About most of the large cities the business is already overdone. Years ago there was big money in growing vegetables under glass, at such places, but every year adds to the number of men in the business, and the consequences are that garden vegetables, both early and late, are sold very cheap.

A city of 8,000 to 10,000 inhabitants will support a good market garden with 5,000 to 8,000 feet of glass; and when the second garden of the same capacity starts in on that market, down will go prices, and the third will have the same influence. The city people gain by it; the gardener loses. But it can not be helped. If one man has a good thing at the start, others soon see it and try the same plan.

In this particular line many fail because they have not sufficient knowledge of the handling of glass. It requires constant and close attention and is a business, we think, that can not be learned without practical experience. Most men learn by beginning with a few sashes, and increase the number as they get to understand the requirements of the trade. But let no man deceive himself by supposing that he can attain a profit by investing in glass without steady personal application.

Commercial or market-gardening has grown to wonderful proportions in the past thirty years, and in these days of keen competition the gardener is taxed to his utmost ingenuity to get at the most expeditious and economical methods to produce the finest crops. Glass bears an all-important relation to the business. By the use of it our northern markets are supplied with lettuce, parsley, radishes, green onions, cucumbers, and many other green vegetables through all of the winter months. The south ships to our markets like produce that is mostly outside grown. But the home-grown hot-house products always take the preference and sell for the highest prices.

RESULTS FOR THE SEASON AT THE EXPERIMENT SUB-STATION.

BY HON. T. T. LYON OF SOUTH HAVEN.

I had hardly expected to be in attendance at this meeting, and my other duties have been such that it has been impossible for me to prepare a paper for the purpose, and hence I can only state, on the spur of the moment, what has been done, in a short time. If there are any questions, it will be a pleasure to answer them.

It will be understood that the commencement of planting the station at South Haven was in advance of the purpose to use it for such a work as this, hence the arrangement and the varieties that have been tested there to some extent are not new, but old; and it is as well, perhaps, that it should be so, because we need something about which we know to make comparisons with those things with which we are not acquainted.

It is the practice there to plant, as a rule, about two trees of a kind, or a half dozen to a dozen plants of the small fruits, for experimental purposes, and only that number.

To commence with the earliest planting, the strawberry. It has been the custom, so far, to set about two dozen plants of each kind, one dozen being kept in hills (the runners kept entirely off) and the other dozen allowed to form a matted row of the same length. The fruit from those two rows has been gathered separately, each dozen by itself, and

regarded distinctly according to the weight of each picking, we finally computing the full weight of the product for the season; and in the same manner the other dozen which were allowed to form matted rows. How long it may be thought best to continue this process may be a matter of doubt. It will require more than one season's trial, you will readily understand, to secure a result that can be relied upon as an average for the variety. Consequently it has been continued during several years, until more recently the single year's crop has been harvested and then the plat has been kept clear of weeds, and another year compared with a similar plat planted a year later. In other words, a comparison between a first year's plat and a year-old plat.

This has been rendered difficult, on account of a good many visitors, and in addition to that the tramping of pickers, to keep the ground in good condition, and this last year it was almost impossible to prevent the ground becoming so packed that at the time the ripening was in progress it was impossible to cultivate the soil without making it disagreeable; and consequently, with the effect of the drouth and the heat at the same time, the results have been very little modified from what they probably would have been under more favorable circumstances. I think I will hardly be going beyond the probabilities when I say that from one to two thirds of the crop has been ruined by the drouth and the inability to take proper care of it on account of the peculiarity of the season.

That is practically the case with other small fruits as well as strawberries. We had, three years ago, a very wet spring in that locality, and the ground on which the plants were growing had not been fully tile-drained, and consequently some of the plants, then just coming into bearing condition, were very seriously injured, and up to the present time the plat of small fruits has been so uneven that it has been impossible to make anything like fair estimates, either by weighing or otherwise estimating the crop, such as we could rely upon as giving the real character and capacity of the varieties as compared with each other. During the last spring that plat was replaced, or rather a new plat made upon adjacent ground, and it is hoped to remove that difficulty after the coming year.

So much for small fruits. With the larger fruits there has been less injury on account of drouth; and in fact, with the constant cultivation we have been able to keep up, keeping the soil constantly mellow, I can hardly think that there has been any real loss in growth or productiveness on account of the drouth. In fact, during the past season, when the drouth was more severe than ever before in my recollection, the growth of the trees had been very satisfactory, and they have done well, especially the peaches, which produced a large crop.

With the ripening of peaches, since many of them are entirely new, and nowhere described, even in the catalogues, it has been the practice to watch not only the blossoming, but also the ripening, and to make a complete description of each variety as it matured. In doing so we have met this difficulty, which ought not to exist to anything the extent it does, that, as the trees come into bearing, a large percentage, more than ten, and I guess more than twenty, of fruit would be spurious—not the varieties purchased or sent for trial; and inasmuch as most of these varieties are without any kind of description, either in catalogues or books, it is

sometimes exceedingly difficult to detect which is spurious and which is genuine, or if either is genuine.

As an illustration, by accident rather than by intention I planted four trees, instead of the usual two, under the name "Muir," two received from one source and two from another. One of the varieties under that name proves to be a very small, indifferent fruit; the other a large, very fine, and promising fruit. Which is the correct one we can only infer because one is better than the other.

This is only one case. A great many similar ones occur. Two trees, planted as the same, have proved one good and the other poor; one of one class of flower, another of a different class, showing that they are either partially seedlings, or that there is a mixture of varieties.

These are some of the difficulties we have to contend with in testing the varieties, for the reason that our books on pomology are all of them more or less stale. Downing's last edition of "Fruit and Fruit Trees in America" must be now about twenty years old. The consequence is that it is only the older varieties found there described, and that is true to a greater or less extent with all books on the subject, except possibly one or two small ones of recent date. So there are some pretty serious difficulties in the way of arriving at a certainty in regard to a great many varieties.

In making these descriptions we have found this difficulty, that anything like an expression of size is hardly more than a guess. We speak of two apples, if you please. One of them is large, another is small, and another is medium, perhaps, and the consequence is that we are quite at sea. There are hardly two persons that would call an apple "large" of the same size. Some would call it medium, and some small; so there is a great degree of uncertainty when expressed by the ordinary pomological programme.

For the purpose of avoiding that difficulty, and arriving at something more accurate, a couple of years ago the Division of Pomology proposed to adopt what they called the displacement of water as a means of measuring the actual capacity of each variety. Of course, that would require the use of a graduated vessel in which the fruit could be immersed in water, and the difference in its level represented by the graduation; but the difficulty with this is that few of us will be likely to have such a graduated vessel ready for use, whenever we wish to determine the size of the variety. There are other difficulties and objections. Some have large, open cores, and the size includes that core, which is worthless, and some apples, on the other hand, and different classes of fruit, are dry, light, and spongy, and comparatively worthless when reckoned by size.

It is proposed then, with the concurrence of Prof. Taft, who is really in charge of the station, and we have adopted the process of weighing, taking an average specimen of a variety as nearly as we could arrive at it, and noting the number of ounces or fractional part of an ounce; or, with cherries, the number required to make an ounce, and then determining the value, comparatively, by weighing, and with the idea of, ultimately, if accepted by the public, dispensing entirely with the idea of size, and substituting weight. But enough of this.

In the first variety of tree fruits ripening, the cherry, there are quite a number of trees obtained from Iowa which form a part of the importation made by the Iowa Agricultural college from Russia. These have now

arrived at such size that they are bearing quite freely. I think, with an exception or two, they have proved to be most admirable growers and are very much superior to our Morellos, and generally they are very late; and notwithstanding that, so far as I have observed, they are not much subject to the attack of worms, and consequently promise to be of considerable value. They are quite acid, to be sure, but good for canning. It strikes me, from the experience we have had so far, that several may be quite desirable in place of some that have been very popular.

Quite a large number of varieties of sweet cherry are also on trial there and perhaps I might as well say, as some of you know, I have a great preference for what we may call low-branching of trees, and more especially so at the lake shore, where we have very high winds, and everything, whether cherries, apples, pears, plums, or peaches, are branched quite low compared with the general practice of the country.

The collection of cherries embraces quite a number of the Dukes as well as the Morellos, and nearly all the varieties planted, with the exception of a few are now bearing more or less, and it would perhaps be premature for me to say which are better and which poorer, but they will be classified in the report, when it shall come out, in such a manner that every one can form some estimate, from the results given there, as to which are likely to be most productive, and also something of their character.

In the case of peaches, they were the first fruit taken off this year, with the idea of making a description of each variety. The first item of description has generally been their season of ripening; the next, their weight; then a description of the form, of the color, and of the quality, expressing the quality and also the weight in figures, the weight being in ounces, the quality on a scale of one to ten, one being the highest, ten the lowest. That is adopted because that is the common scale, generally used in cases where a scale is deemed desirable. In the case of descriptions transferred from the books, a scale of one to five is almost a necessity, for the reason that it translates the original mode of expression so much better. In the case of peaches, as I said, there must be about 200 varieties on the place, and perhaps 150 have borne this year, enough so that we have had descriptions of them.

In plums, there are some dozen or fifteen varieties of the Oriental or Japanese plum, and perhaps fifteen or twenty varieties of the Americana (that is, our wild western plum) that have been picked up for use in the region west of the Mississippi and also in Wisconsin, where our domestic varieties are not successful. The Oriental varieties, nearly all of them, have borne this year, all except one or two, and they have proven themselves to be, so far, enormous bearers, so much so that it has been necessary to thin them severely, and even after that, to relieve them to prevent their being broken down. This is not true of every variety. One, the Yosebe, was ripe this year on the 13th of July, fully ripe, and they drop about as soon as they are ripe. But this is a comparatively thin bearer; is of tolerable but not of the highest quality, but so early that it may be desirable where people want something out of season. But with the exception of that and perhaps one other, all of the Japanese varieties have been exceedingly productive. It is claimed, and I think it is true, that their tendency to bloom very early may make them a little more uncertain in our climate, but that is not so much an objection near the

lake shore, where we are located, for the reason that everything is kept dormant there a little later. We are perhaps a full week later with the same varieties and under the same general circumstances, than would be the case ten to twenty miles away from the lake. But I think it may safely be stated that, with that exception (the danger of early blooming) these are very promising market varieties. I can not feel safe in saying that I think they are superior to some of our best domestic varieties, or that they are even equal to them; but they are very pleasant in flavor, generally; and more than that, their color and general appearance, and their apparent ability to withstand rot, is quite in their favor as market varieties, and it is my opinion that several, among which I might name Burbank, Mara Chiros, Mono, Red Nagate, and Satsuma, are quite sure to be abundantly productive, and their appearance is such as to render them popular. There is just this difficulty in excess of the same difficulty with others, and that is that just as soon as they are fully ripe they leave the stem upon the branch and drop. They must be picked rather unripe or else picked from the ground. They keep very much better, apparently, than the average domestic varieties, after they are ripe.

In addition to these, there are quite a large number, not only of the well-known varieties but also comparatively new ones, that have borne the past year, and a few that have not yet borne.

There are a few varieties that perhaps I might name, that have come to be quite superior as market varieties, and I will mention one received from western New York as the Kingston, which is a very large plum, somewhat like the Yellow Egg plum, which we all know so well, and of somewhat that form, but of a very dark purple or black. Another comparatively new variety, a little later than that, is Grand Duke, which has borne a heavy crop for a young tree. It has the same general form, but is a little later in season than Kingston, and I apprehend, if they continue as they have begun, that they must prove desirable as market varieties, from their large size, fair quality, and attractive color, besides which they come late in the season, and that in itself will render them very desirable in the market.

We have from sixty to eighty varieties of pear on the premises, on trial. A few only, perhaps twenty or twenty-five, have borne yet. I find an extreme difficulty with them, in getting them properly pruned. It is impossible for me to do all the pruning myself, with the other things I have to do, and unless I can direct almost every case of cutting I can hardly get them pruned as they should be. Their tendency is to run up very tall, although I aim to branch them close to the ground. Despite this, they run up so high that in that windy climate it is becoming necessary to head them back severely.

There are among them a half dozen or more varieties of the same batch of importations from Europe of which I have already spoken, the Russian varieties. Not one of them so far seems to be worth keeping, in comparison with what we have. They are indifferent in quality, though claimed to be hardy. They are good bearers, but not attractive in appearance, as a rule, and very inferior in quality. One variety, as an illustration of the difficulty we have in making sure of varieties, I received with the name of a common market pear of ours, and it proved to be one of the older European varieties.

The ground has been taken up so fully with trial varieties that there is very little room left, enough perhaps for 100 trees, and what shall be done in the future, for the trial of varieties still to make their appearance, is something of a problem. We must either dig out or regraft, or have additional territory on which to work.

There are still more than two thirds (yes, more than three quarters) of the apples on the place yet to show their fruit. Among them are quite a large number of varieties, from that Russian importation, and not long since, some three years ago, we received quite a number of scions from Bohemia. None are fruited yet, of course, and quite a large number were received in scion from Mr. Hathaway, who is engaged in the effort to find something that in his estimation will be hardy enough for southwestern Michigan, where they are a little out of range of the lake, and get more or less of the climate of northern Illinois and Indiana. Those will be worked and planted, and that will very nearly fill up the ground, when we get them all into the orchards, but it will of course take quite a number of years to produce fruit from them and test them thoroughly.

IN CALIFORNIA WITH THE AMERICAN POMOLOGICAL SOCIETY.

BY HON. C. J. MONROE OF SOUTH HAVEN.

At our last annual gathering I was elected a delegate to the meeting of the American Pomological society, to be held in Sacramento, California, Jan. 16 to 18, 1895. It is the purpose of this paper to give a brief report of that journey and the meeting; also, some observations which I trust may be of service.

To one taking the trip for the first time, across the continent, the temptation is strong to say something of the vast plains, the grand scenery of mountain, gorge, and canon; but this has been frequently written and spoken of in well-rounded sentences, and more eloquently than I can do, so I will simply say to those who have not had the pleasure of this trip that I hope you may some day take it.

I had a chance to realize the pleasant transition "from snow to flowers" in a few hours. Just before our descent from the mountains, I looked out of my window and saw winter scenes where the houses and trees were nearly buried, and the storm raging at a lively rate, so that the trains following us were delayed several days. Two or three hours later we were in the midst of flowers, growing shrubbery, and the ground was carpeted with grass as green and fresh as on a June day with us.

The hall where we met was large and comfortable, trimmed with a profusion of evergreen, smilax, and flowers in endless variety, with displays of fresh and preserved fruits of all kinds on a scale to sustain California's World's Fair record.

One unique feature was the dried fruit, which was bountifully served by five or six young ladies, who gave the varieties and the manner of

preparing and cooking. It was greatly relished, and was a good advertisement for the dried fruits.

The address of welcome was given by one of their most eloquent speakers, who was evidently accustomed to such duties.

He said he wanted to talk to us "about the days of old, the days of gold, and the days of '49." He mentioned the days of gold, the great rush from all parts of the world, how it advertised the state; the days of cattle, when the valleys were filled with herds exceeding anything previously known in this country; then the days of wheat, wherein the large fields have only been rivaled in later years by the Dakotas and the Red river valley. I will digress to say that about the only farm operation witnessed by us in traveling through the state, was putting in wheat. I saw in one field eight eight-horse teams, each drawing a four-gang plow, a seeder on the plow, and a plank behind to cover the grain, so that about thirty acres were completed each day. Some of the larger ranches have a traction engine which draws a gang of eleven or more plows, with seeder and plank, putting in from twenty-five to thirty acres per day, requiring one extra man and team to supply fuel and grain. In harvesting, this engine is hitched to a header which puts the wheat into bags, the straw and chaff furnishing most of the fuel, conveyed by machinery to the engine. It is coupled to several wagons, and the bags of wheat taken to the elevator. No buildings or fences or horses are to be cared for; and the engine is left by the wayside without shelter, food, or drink until needed to repeat next year's operation. Little hope for us in Michigan to compete with this sort of wheat-raising.

Our speaker assured us the days of fruit were the most important of them all, and that they had come to stay. As we traveled about the state, we could better appreciate why Pomona received his highest praise.

The days of gold brought few permanent settlers to the state. The same was true of the days of cattle and wheat, which were controlled by large ranch owners living in cities, or in other states or foreign countries. This encouraged no building of houses and barns, or other homelike surroundings. A few cities and villages came into existence, but the country remained unoccupied.

It was the days of fruit which gave birth to Riverside, Redlands, Orangevale Colony, Chula Vista, Fresno, Santa Rosa, Ontario, Napa, Colton, Pomona, and many other places around which cluster vineyards, orchards, and the small fruits. It has greatly augmented the population of the commercial cities of San Francisco, Los Angeles, Sacramento, San Jose, and San Diego, increasing their trade and stimulating their prosperity.

The greeting was not only cordial and enthusiastic, because it was addressed to pomologists, but it was the horticultural industries which were attracting emigration, settling the state, improving its lands, erecting houses and barns, school-houses, and churches. People, these, who verily made the "desert blossom as the rose," building cities and villages with model houses and grounds, embowered in trees and shrubs and flowers, with all the social equipment of a refined and intelligent society.

A hearty greeting and a generous welcome were accorded us by all classes, the governor and state officers giving a reception at the capitol,

showing us through all its departments, and the citizens tendering us another at the Crocker art gallery, supplying lunch and an opportunity to meet many pleasant people of Sacramento.

A railway ride took us to the state's prison and mining camps.

We visited old forts and the ruins of mission buildings, many of which have been partially restored.

The governor provided a steamer, and members of his staff, city officials, business men, and others, with their wives, cruised with us about San Francisco bay and out through the "Golden Gate" for a turn on the Pacific ocean.

We were escorted through Sutro park, had a pleasant call upon Mayor Sutro, who lives in the midst of this magnificent park, which he is fitting up for the city. His private secretary conducted us through what is claimed to be the finest and most complete bath-house in the world.

For nearly three weeks, by special train, we visited most of the prominent fruitgrowing sections of California, from Sacramento to San Diego.

The foremost topic, whether with the pomologist, the day laborer, the merchant, banker, man, or woman, was the fruit interest. It seemed well-nigh universally recognized as the crowning business or industry of California. It was this which gave the greatest impetus to its late boom. It attracted people with means who could purchase land and plant orchards and vineyards, thus giving a more substantial growth and prosperity to the state.

The topics considered at the Sacramento meeting were mainly of interest to the Pacific coast.

Among those of general interest were two papers upon spraying, the mixtures similar to those recommended here. The Bordeaux seems to be the most favored, and used for the greatest variety of purposes. Strong claims were made for the necessity and the good results of the applications; and it was shown that spraying is more relied upon as it becomes better understood. I think the growers there use it more frequently and thoroughly than with us. Their warm and genial climate favors the propagation of diseases and insect enemies of tree and fruit, requiring more persistent and diligent warfare to destroy or keep them in check.

Prof. Ragan of Indiana sent a paper entitled "Place of Pomology in Horticultural Classification." He claimed that pomology should stand first. The schedule of the Columbian Exposition, which was dictated by the California commissioners, placing vine culture at the head, was severely criticised by him. The applause and favorable comments showed that his views were shared by many, although one of the commissioners was present and protested against it.

G. B. Brackett of Iowa discussed in an interesting manner the "Modifications of Fruits by Changes of Locality," claiming very marked alterations by change of place and soil. The substance of his paper emphasized the helpfulness of experiment stations to determine the varieties most desirable for particular sections. Luther Burbank, of potato fame, of Santa Rosa, California, had an exhaustive paper upon "New Fruits and Flowers and How to Grow Them." It covered a wide field, and showed great care in its preparation.

"Dried Fruits as Food," was the title of an excellent address by Prof. Allen of San Jose. The dried fruit, already mentioned as being served by the young ladies, was under his supervision. He pointed to this as a practical object lesson. The audience had a chance to sample sun-dried apricots, peaches, pears, prunes, nectarines, cherries, and many of the small fruits. He claimed that fruit was very digestible and economical, that its medicinal qualities were not properly appreciated. He declared, "If you would retain the bloom of health upon your cheek, the elasticity of youth in your step, the vigor of manhood in your brain and brawn, eat fruit." Quoting from another, he added: "Fed by the best milk drawn from the breast of old Mother Earth, fostered by the pure rains of heaven, ripened by the glorious, life-giving sunshine, it is not a symbol or type, but the very embodiment of a perfect food for the human race."

I have given prominence to the pleasant manner we were received and shown about the state, and to how our attention was frequently called to the productions of each locality as displayed in some room or building in every village and city we visited, the fine appearance of their orchards and vineyards; and even in their royal hospitality the possibilities of horticulture were constantly spread before us in fruits and flowers and after-dinner speeches.

The overshadowing importance which Californians attach to their products was strikingly illustrated in their wonderful display at the World's Columbian Exposition. The state has shown its appreciation by making liberal appropriations for the encouragement of fruitgrowing, and in passing stringent laws for protection against disease and insects.

A month's contact and observation with this sort of enthusiasm impressed me more than ever before with the like importance of our own horticultural interest, recalling political conventions, Fourth of July orations, and many other gatherings where state affairs are considered; and you will remember our frequent boast, "Michigan: first in lumber, copper, iron ore, and salt." How little we have to show for the rapid disappearance of what was once the grandest forest on the continent! True, it built up villages and cities, gave employment to men, stimulated railroad building, and the establishment of boat lines, but its great wealth has mainly gone out of our state, leaving vast areas of barren land with little permanent improvement of value. With what pride we talk of our immense deposits of copper and iron ore! The mines are principally owned in other states, and not much of the profit remains for the development of our own commonwealth. It seems to me we shall repeat California's experience in finding that horticultural pursuits lead in the production of home wealth, in occupying and improving its vacant lands, building homes, school-houses, churches, and the usual equipment of a progressive state.

I remember selling many parcels of land for eastern owners to those who bought for the timber, the purchaser often remarking there was little value after the timber was taken off. Of many notable examples, I will mention one in Allegan county, near South Haven. Eighty acres sold for \$10 per acre; the timber brought a good price, and five acres of it netted \$51 per acre for the timber. The purchaser declared this would be the most valuable crop it would ever produce, and was pleased when he sold it for \$7 per acre. Soon after, ten acres, which included the said

five acres, were set to peaches. For twenty years it has borne crops, except three years, and these have brought the owners from \$100 to \$300 per acre, and more than one third of the orchard is still alive. While this is better than the average, there is abundant proof that, for the past twenty-five years, there are hundreds of acres of fruit, vegetables, celery, and other horticultural products which have given a better average profit for the same money and time, than the timber or any other business in our state, when we consider the amount furnished as food to our people and the money left in the community. In most places the locality gets the benefit of labor and money put into the production, up to the point of delivery at the cars; and, where the boats are owned by residents, the cost of transportation remains in the place. I wish to enlarge on this point.

Take the manufacture of furniture or wagons. Most of the material and much of the living of the men has to be imported to the place of manufacture, and the money sent out. In horticulture, the clearing of the land, preparing for the trees or plants, the growing of the trees in the nursery, transplanting, subsequent care and cultivation, preparing for market (including packages), and money paid out is mostly retained in the immediate vicinity. The horticultural product tributary to Grand Rapids, the celery at Kalamazoo, the small fruits and vegetables at Benton Harbor, the grapes, plums, and peaches in Allegan, Ottawa, and Van Buren counties, and the apples generally over the state, are notable examples illustrating this point.

Much has been written and said about California fruits in the past few years. Their great advantages are the climate, permitting the growers to work the year round; irrigation, which is pictured as doing away with drouths and floods, or the interruption of work, it being only necessary to turn the gates, and the water is supplied at the right time and in proper quantities; the push and co-operation of the people, as shown by the extent of their marvelous exhibits at the World's Fair, in which individuals, companies, towns, counties, cities, and villages, and the state as a whole, spent over half a million dollars; their enterprise, which sent fruits in carload lots to more than fifty cities in 1893, ranging from Spokane, Washington, to Boston, Mass., and from Houston, Texas, to Winnipeg, Canada, in spite of long distances, steep grades, and sharp curves, obtaining cheaper rates and about as quick time as Florida. For these and other reasons, it was evident that, if California possesses unusual facilities in production, then we might expect a competition which would make us hustle to meet. Hence it seemed to me the problem of production was of vital concern to Michigan fruitgrowers.

I gave most thought and time to the peach, apple, pear, and plum, as these were of greatest interest to us. I improved every chance to examine and inquire as carefully as possible into the details of the cost of the trees, the price of water, including the land, the preparation for planting, subsequent cultivation, trimming, thinning, care of insect pests, and diseases of tree and fruit, of picking, packing, and marketing. After the most careful consideration of advantages and disadvantages, it seems clear to me that the cost of production is about the same in the two states. In marketing it is decidedly in Michigan's favor, for all the above named fruits, and many others, especially in the fresh or natural condition.

There is probably no place on the continent where the producing territory is so near the consuming territory, as Michigan, or where land specially adapted to producing the tender classes of fruits is so limited compared with the large number of cities, villages, and country within easy reach, by means of excellent transportation facilities.

Having these natural advantages, it only remains to use equal intelligence, energy, and business management to profitably compete with the world.

In conclusion I feel warranted in saying that the officers of the State Horticultural society believe in the fortunate location of Michigan, that they will use all the means they can command to gather the latest and most accurate information in all lines of its work, ever aiming to give this information the widest possible distribution to horticulturists, that the state may reap larger benefits from its golden opportunities.

HONESTY IN FRUIT PACKING FOR PROFIT.

BY MR. D. WOODWARD OF CLINTON.

This is one of the subjects that is not only threadbare, but the bottom has dropped out. Nothing new can be said to the old grower. Yet the new beginners are numerous, and, regardless of what may be said, many of them suppose they can fool the public by facing packages regardless of all the poor fruit at the bottom. I am sorry to say that many of the older ones have not learned, and never will learn, that honesty in the end pays a profit.

What pertains to one kind of fruit would, if the packer did by others as he would be done by, cover the whole ground.

As the many fruits are largely grown by different parties, I shall commence with berries; and they of all others are the most difficult to get on the market uniform as to size and color. They are largely picked by children at a stated price per quart. The pickers are after the quarts. Size, quality, and condition are to many of them of no account. Berries picked by the quart must be inspected, all rubbish and inferior berries removed, and put into clean, well-filled baskets if you would get a profit. A case in point I found in the Rural New Yorker of Nov. 30. "A. A. Halladay, near Bellows Falls, Vt., says: 'My raspberries brought twenty cents per basket all through the season, and my strawberries eighteen and twenty cents, while other growers about here were having hard work to get ten and twelve cents for berries that were just as good, as they grew on the vines. The difference was in putting them on the market; and between baskets scant, even full, just as they came from the pickers, and baskets heaping full and all carefully assorted, every berry guaranteed a good one or money refunded.' Mr. Halladay reports sales, 1895, from his farm of six acres, \$1,200. That must represent honest packing and profit, worked by himself and two boys."

We now come to the peach, which has this year given the most bountiful crop ever grown in Michigan; and on trees properly pruned and

thinned, it was of good size and quality, even beating the extreme drought. The market was glutted from start to finish; prices low, considering other years, yet what abundant crop can you name that is high? To pack good peaches you must prune and thin; to get a profit you must grow to good size, and pack honestly. You will make more clear money by throwing small peaches to the pigs than stuffing your baskets with them. Your small ones, such as will not pass through a $1\frac{1}{4}$ -inch slot up to $1\frac{3}{4}$ -inch, will sell. Those of $1\frac{3}{4}$ to $2\frac{1}{4}$ inches, will bring as much money per bushel, as a rule, sold as they came from the trees. Above $2\frac{1}{4}$ inches will always sell at a fair price, and that without peddling. Use clean packages, give full measure, make the bottom as good as the top, or better, avoid saving those extra fine specimens for the top, let them mix in, or put them at the bottom—when you empty them out, you have a customer “for keeps,” provided you remain honest. This is honesty in packing for profit. I do not have to peddle.

It does not seem necessary at this time to speak of apples, it is so long since we had them. Yet I have faith like a grain of mustard seed that those that have their lamps filled and burning, or have their apple trees in good condition, will next year get their reward, provided they faithfully fight the enemies. It is expected you will set the head with good specimens. It is hoped you will fill the barrel with good apples, clear from worms and scabs, brand with your name, and call them No. 1. Make No. 2 the same, except of smaller size. I personally know what that means. I have standing orders, and carried them over for several years, for many barrels of such apples, at any reasonable price. The small ones are the best keepers. Treat pears the same as apples.

Let your light shine, show your fruit, make your reputation by honest packing for profit. You can spoil it by stuffing one shipment.

DISCUSSION.

Mr. Tracy: I am greatly encouraged. Our speaker says that the bottom has dropped out of the berry boxes, and that is a blessing for which to be devoutly thankful, because, in my experience, the bottom has been creeping nearer and nearer the top for several years.

Q. In packing your peaches, would you put the sunny side at top or turn them over?

Mr. Woodward: This year I have been using a patent sorter, and that is why I spoke of the slots. Anything that will drop through a $1\frac{1}{4}$ -inch slot goes to the pigs. From $1\frac{1}{4}$ to $1\frac{3}{4}$ will bring medium prices, and 2 to $2\frac{1}{4}$ will bring more money than the majority of peaches from the orchard if sold as picked. What won't go through the $2\frac{1}{4}$ -inch slot are No. 1 peaches, and to get more of them through I have placed on the side of this picker, as it runs along, blocks with a piece of rubber packing on, to turn some of them. Occasionally a peach will not go endwise, and it won't drop through; but I want it turned endwise so it will go through.

Q. Mr. Woodward didn't understand my question exactly. In finishing your basket, do you pay any attention to which side up you place your peach with regard to color?

A. Yes, in some cases. When I am putting up the early peaches, I always turn them right side up, but when it comes to the later peaches, they go to the baskets as they come from the sorter. The size will sell

them, and if they turn them over they won't find any fault if they find the bright side down. I can not stop to do it when I am putting up a hundred bushels per day. But I shake the baskets down; they are shaken as the peaches go in, and again when they are ready, but they will yet settle somewhat when you put them on the train. When they get to the dealer I say, "Turn your basket over carefully, if it don't look quite full, and then you have a full basket and the best peaches are on top.

Mr. Hamilton: Perhaps that is why the gentleman packs his peaches with the best ones in the bottom. [Laughter.]

COLD STORAGE WITHOUT ICE.

BY MR. JOSEPH H. BILLMEYER OF HOLLOWAY.

The room used is situated beneath a portion of the barn running toward the north; is 35x35 feet, and eight feet high, and has repeatedly carried over 1,100 barrels of apples from storing time till ready for disposal; the object being to hold fruit so late as desired, until markets advance in spring. The doors are cut in two between top and bottom, and situated on east and west sides. There is no stone wall above the ground, and the floor is on a level with the ground. The sides are composed of three thicknesses of board with building paper and air spaces between. Windows are of double sash, triple glazed; doors constructed same as sides—no sawdust.

One or two kerosene lamps are seldom needed, and never more, to carry the fruit through the coldest winters without injury. I have never had a frozen apple, mildew, or mold.

I control the temperature by opening and closing doors during cool and warm times. The room has not been above thirty-eight degrees since apple picking. I have an entrance way with tight doors at each end, to prevent air escaping during ingress and egress. The floor is of brick. If kept close the room will not change one degree per week during warm weather. The barn bay floors, above this room, are double and filled with mortar at the end of each board.

BY MR. W. C. SMITH OF WESTON.

To obtain the very best results in storing fruit it is desirable to begin right. Care of the fruit must begin the moment it is gathered. A very practical way in picking apples is to place the fruit in barrels so fast as taken from the trees and leave it in the shade till the next morning, entirely uncovered and exposed to the night air; and in the morning remove it to the barn or storehouse while yet cool. In this way a lower temperature may be obtained than in any other that is not expensive. This will rid the fruit of the heat of an October afternoon, which sometimes unfits it for keeping. I consider this quite as important as anything in connection with storage, where outside air is depended on. Piling apples on the ground under the trees is principally objectionable because the fruit is

so often left there too long; also on account of the warmth of the ground at that time of year, which ripens the fruit, the one all-important aim of cold storage being to keep the temperature as near to freezing as possible without freezing the fruit, thereby retarding ripening.

In construction of storage house, the more nearly air-tight the room the more readily an even temperature can be maintained. The walls should be frost-proof. A ready means of changing the air when the outside air is cooler than inside is necessary. This is readily done when the basement of a building several stories high is used, by means of a flue to the roof that can be opened and closed at will. I use an exhaust fan run by steam power, pipes from the upper part of the store-room conveying the air to the fan.

Shutting off the ground heat is an important feature. This can best be done by planing-chips eighteen inches deep on a cement bottom. There are other important features to be kept in view in construction, such as convenience in storing and removing fruit and safety from fire.

The use of such storage from October to April is nearly equal in its advantages to storage with ice, but is of no use, or but very little, during the summer. A warm time in the winter will raise the inside temperature, and with no cool turns for a week or two the fruit must suffer in condition. At such times the difference in care and management the first few days after the fruit is gathered is very marked, Greenings and other varieties likely to scald showing the brown skin in January, in the one case, and in the other keeping the bright green color till April in spite of the rise in inside temperature in the winter time.

The owner of a good storage-house for his crop is not obliged to market his fruit at once, but can take his choice of the fall or winter market.

DISCUSSION.

Mr. Willard: My idea of cold storage has always been that it was worth more in the cities than in the country.

Mr. Morrill: You have the key to the whole thing.

Prof. Bailey: I have given a good deal of attention to this for a few years, because people are asking a good many questions. I have formed some opinions which may be correct or they may be wrong. One is this: If we are to store fruit with ice or any artificial means, it is chiefly valuable for the middle-man or the man who sells in the city. I do not believe that, as a rule, the man who grows the fruit can afford to put in a plant of that character. There are some exceptions, as where a man desires to grow a special fruit for a special market. In general I think it is better to move the fruit quickly and get it into the hands of some one else who takes the danger of shrinkage in value and of decay. There is a feature of co-operative storage which is valuable in some cases. In central New York state the country is hilly, and half of the apple orchards, perhaps, do not produce enough to warrant a man in taking any particular pains in marketing his fruit, nor is there enough fruit at one point to attract many buyers. There has been some talk in New York state about co-operative buildings erected at railway stations in country towns, to which every one shall subscribe who desires, and this shall be a sort of clearing ground for all the fruit of that community, so that there will be enough gathered together in one place to attract the buyers. The buyers would then com-

pete, and it is supposed that better prices might be realized, and a man who could not attract a buyer with his own product might be able to do his share toward attracting a buyer in the corporation. Some years ago the creamery business was in something this same condition, but since the co-operative creameries have been established the buyers have come to these regions, and at Little Falls and other places people come from the old world to look after the market. As regards attracting buyers, co-operative storage has a good deal in it, but I do not think that the ordinary grower can afford to go into true cold storage. There is a new system going into execution in Chautauqua county, which proposes to pack the grapes of the persons forming part of the co-operative society. It is figured that by having a co-operative plant there they can save in handling and shrinkage about a cent (I think) per basket on the packing of grapes. This comes from the economy in handling a body of workmen at the co-operative establishment, and by the baskets being bought in large quantities. How valuable this plan will be, time will tell, but in respect to the saving in cost of packing, there can be no question.

A Member: There was in Mississippi, where they ship quantities of tomatoes and early vegetables, sometimes seventeen carloads in a single day leaving the little town of Crystal Springs—you will see in riding through that section, at every station, immense sheds which have been used for the co-operative packing of vegetables, but I am told that the arrangement has not proved successful, and they are all abandoned. They found so many difficulties in the way of properly dividing and arranging the crops, as brought in by different customers, that it was not feasible to continue it, and it is not now carried out in any of the stations along the Illinois road, where it was in years past a popular method. It is exactly the plan suggested for Chautauqua county.

Prof. Bailey: This is not an established practice in Chautauqua county, but within the last year or so this other method has been proposed. There is always difficulty in managing these affairs, because jealousies creep in and it is difficult to control the growers, and those who bring in a poor product are likely to object if their product is thrown out; but theoretically, at least, it ought to work, and I believe that one or two of these institutions have worked pretty well so far during the present year.

Mr. Morrill: Just one sentence of Prof. Bailey's last remarks brings out something that I don't want anyone to try to answer, because it opens up too large a subject; but I wish someone, sometime, would tell me why farmers can not or will not trust one another; why they will not do those things they should do, to economize, but always, when they attempt it, fall out with one another, while men we are pleased to call thieves at every stage of the game can do these things—put millions of dollars in and make fortunes, and we can not put together twenty dollars apiece, to make a hundred, and trust any one in the neighborhood. I don't want any one to try to answer that, but why are we so constituted? It is a stumbling-block in our way for pretty nearly everything, from the fact that you have to fight fire with fire; everything else is combined today but farming. Co-operation, in many things, establishes an outlet; and, as Prof. Bailey says, theoretically it is correct. Why can't we do it? Can not ten honest men in one neighborhood combine? Has it ever been done?

Dr. Thomas: I think all there is of it is jealousy. If you hadn't said you didn't want any one to answer that, I would try. The great trouble with the farmer is lack of business experience.

Mr. Morrill: With one another?

A. Yes, and with the world. That is what the farmer lacks. A man who has had business experience, of course can enter into these things, and with a different spirit; but I think the farmers are becoming more like business men and more intelligent and broader. Ignorance and jealousy go together, and they always go with inexperience, and with those who have not had the opportunity for reading and acquiring the intelligence they should have. Young men come to me sometimes and say, I don't want to go to college; I am going to be a farmer. All the greater reason you should graduate. Get an education, and I believe when that becomes general you can go on and trust people. It is a lack of intelligence and business experience. What we want to do is to broaden the views of the farmer. The trouble is it has been the other way all the while. We must get our country school-houses and keep them up, and then we will have no trouble, and the farmers will take care of themselves, and they will unite and combine and find it for their interest.

Mr. Baldwin: Business men can communicate with each other. They have the telephone and telegraph; they are posted every day and every night as to all that is going on; if there is a frost on my crop they know it. Farmers, in order to unite, must travel on foot or horseback to reach each other, and how are they going to do it? That generally is the secret of the whole thing. If farmers could reach each other and combine they could bring the world to their feet.

ENGLISH GOOSEBERRIES IN MICHIGAN.

BY JAMES L. KIRK OF ADRIAN.

About thirty years ago I received some seeds from England of the Crown Bob variety. I raised some plants from those seeds. When they began to bear, for a few years I had trouble with mildew. I tried various things but could not stop it. I found it would have to be done by cultivation. My ground is a sandy loam, which is not so good, I think, as heavier soil. They need a rich soil to start with. If the ground is in good order the leaves will be larger to protect the berry from late frosts in the spring. Then cultivate as you would any plant or tree. Manure freely. Top dressing in the fall, is, I think, the best.

About the last of May or the first week in June there will be formed sprouts or suckers from the roots. I cut them all out clean to give a good circulation of air, which they must have, or they are likely to mildew. Put hellebore on for worms. Keep them clean from weeds, give them a mulch of straw or grass through the summer. Follow this treatment and you will not have any mildew.

Crown Bob is the best for cooking and canning purposes. They are a thick-meated, solid berry. Industry is of finer grain, but I find them more tender. I have had them die under the same treatment.

I should give all gooseberries the same treatment. They will not take care of themselves any more than will any other plant. I have known persons to get plants from me and put them in the sod where they had to cut the grass to find the gooseberries. That is not the way to raise gooseberries.

DISCUSSION.

Mr. Willard: I was much interested in the paper relating to blackberries, for he showed conclusively that somebody could make lots of money growing blackberries. I figured it up, and our friend Mr. Kellogg is getting \$500 per acre. Blackberries are a good crop. It is dollars and cents we are after, and I think he is getting more than his share. The gooseberry crop is one of the best paying crops I ever raised in my life, and yet many are led to believe that it is difficult to grow; but I think, from what we have learned, that the use of a good Michigan spraying-pump will enable us to do it. I don't believe I have ever made as much money from any one thing as from the gooseberry. My experience may not correspond with others, but I have found that they do best on a cool, low, heavy soil, and the only instances where I have suffered severely from mildew has been on high, gravelly land. Of course there are new gooseberries coming out, the Triumph, Columbus, etc. Every one, however, that is large, has more or less English blood in it, if I am any judge. Many of these English gooseberries we don't like. The American people want to go forward with a rush, and hence they are not always pleased with the English gooseberries, because they are slow growers. Columbus is sent out by Elwanger & Barry, and it will be a fruitful plant, and I don't know of any of the tribe that make wood so readily and so well as Columbus.

Q. How is Red Jacket?

A. Pretty good, and Triumph is good. I think the best of the English gooseberries is Whitesmith; they are all of the same breed, impregnated more or less with English blood. It isn't a question of quality with us so much as it is with the English people. In this country we want to market and ship them, we want to pick them green and run them through a fanning-mill, shovel them into peck baskets, and we don't think so much about the quality.

Q. How do you regard Houghton?

A. Too small—we are always told that it is too small.

Q. How about Downing?

A. Downing is too thorny, but it is good. There is, however, a growing demand for the large English gooseberries, and sooner or later we will have to supply them; hence the effort, all over the country, to give us an American gooseberry the same size as the English.

Q. Can they be grown for \$1 per bushel?

Mr. Morrill: They have not succeeded very well in this state, Mr. Willard.

Mr. Willard: I know, you have a warm, gravelly soil, and that is why I threw out a word of caution. We had a piece of land which I thought

was the best plot of ground we had. I imported 2,000 English gooseberries and put them on that land; they cost us \$11 per hundred in Geneva. Well, we took one good crop from them, and from that time they mildewed until the bushes rotted. They were on the wrong land. I had raised them ten successive years, to the admiration of every one, and we continued to raise them on the land where they were at first successful, but I have learned to keep them off of the dry, warm, gravelly knolls.

Mr. Morrill: You are an expert market-man. What about the thick skin of the Columbus, when we get to putting it on the market—would it be objectionable?

Mr. Willard: They use these English gooseberries for canning, green, for turkey and duck sauce, so my wife tells me, and in my opinion it will not make very much difference, the thickness of the skin. If they were to be allowed to ripen and to be used as they do in Great Britain, I think it would make some difference. They are the prettiest crop in the world to handle, and they always bring in four or five hundred dollars when my pocket-book is empty.

Q. What about the practice obtaining in this state of picking gooseberries by putting on leather gloves, and stripping berries, leaves, and all, and running through the fanning-mill?

A. I believe it is injurious. If they can not do business on business principles, I would say quit. You simply take off the fruit buds that you want another year. Every particle of the foliage should be left on that is possible. The English gooseberries, I think, need trimming, and I think those suckers should be taken out. They need thinning and trimming, and we are always careful to do it before snow comes. You need thick mittens.

Mr. Collar: How does Columbus compare with Downing?

Mr. Willard: I can not answer that question, because we always pick them when they are green. I procured some of Elwanger & Barry, when they first came out; I got four or five dozen and paid \$6 per dozen, but we have to be fooled with the rest of the fools, and misery loves company. But, as I say, we pick them when they are green; we never allow a gooseberry to ripen, so I couldn't say as to the quality, and they always taste and look, and are, pretty much alike in that condition.

Mr. Reid: There is a difference in green gooseberries. It is a mistake, in my judgment, for people to eat all of them green, and it is our practice at home not to pick them so green as they are found on the market. They will rush Downing on the market when it is half grown. Such gooseberries are watery and sour and lack the flavor they will have if left until you can see the color of the seeds. For our own use, we let the berries stay until that time. Aside from Downing, I have Smith. I don't like it except for its quality. It grows in a straggling fashion, and pruning won't keep it back, and neither does it bear well. But when it comes to cooking, it is decidedly superior to Downing. It will form a jelly in cooking, and have a very superior flavor and consistency. With the same amount of sugar, it will be richer.

Q. You mean Smith's Improved?

A. Yes, and if one wants to grow them for sake of the quality, there is a marked difference in favor of this gooseberry.

Mr. Morrill: Columbus is not as good in quality as Smith or Downing. I have tried them two years, but I think they are far superior to any large gooseberry of that type that I have ever seen.

Mr. Ellis: Whitesmith, is that the one you are speaking of, the English?

Mr. Willard: There has been a confusion. The Whitesmith is an English gooseberry. They are shaped somewhat alike, though the Whitesmith is the larger.

Mr. Ellis: Our local society, over forty years ago, raised Whitesmith and Grand Bordeaux, and for two or three years they were tested, with thirty or forty other kinds of fruit, and they were finally discarded on account of mildew. In this locality, I think Mr. Kirk is the only man who has succeeded in raising it and ascertaining the method of raising the English gooseberry to perfection and getting a crop nearly every year. It is done, practically as he says, by pruning in June and at other times, without the use of Bordeaux mixture, which will have practically the same effect. In reference to the red raspberry, the crops which Mrs. Trine had were due largely to her methods of keeping the plants in the hill and trimming them back.

Mr. Helme: I believe our society is forty years old, and in early times we took up all of these English gooseberries—Whitesmith, etc. We bought a quantity and distributed them among ourselves, and we pronounced them a failure because we couldn't keep mildew off.

THE ROSE.

BY MISS HELEN NICKERSON OF ADRIAN.

If you had attended the June meeting of the Lenawee County Horticultural Society and seen the display of flowers, table after table loaded with wealth of beautiful roses, you would have exclaimed, as did one of our ladies,

Roses, roses, everywhere;
What with roses can compare?

And I ask you, what can compare with our beautiful Queen of Flowers? In history the rose dates back to the garden of Eden. It figures largely in poetry, song, and legend. The ancient Romans made great use of roses on their festal occasions. There is a valley in the vicinity of Jerusalem that is called "Solomon's Rose Garden." A notable period in history is known as the "War of Roses," when the rival Dukes of York and Lancaster had the rose emblazoned on their shields—the Duke of York choosing the white, that of Lancaster the red.

Tradition states that all roses were originally white, and how the red rose originated is not fully known. One legend is that at Bethlehem a fair maiden was falsely accused of crime and sentenced to be burned at the stake. She cried unto God for deliverance, the fire was quenched, and from the brand sprung the red rose. Another legend is that Cupid,

dancing among the gods, upset a cup of nectar upon the rose, which changed its color not only then but ever after.

We find roses growing wild in our own country, from Maine to California. They are scattered nearly all over the globe, but those of Persia, Spain, China, and India are especially noted. Australia is said to be entirely destitute of roses.

Roses are divided into classes as China, Bourbon, Noisette, the climbing varieties, hybrid perpetuals, hybrid teas, and we must not forget the Polyanthas, the babies of the rose family.

These are again divided into two great classes, the hardy and the tender, or, as some say, the June roses and the perpetuals. For my part I greatly prefer the perpetuals. Last year we were not without some roses from June till November, and I gathered quite a number the day after Thanksgiving. But June is certainly "rose time," and all rosedom is out in holiday apparel. Roses, white and black, pink, scarlet, crimson, yellow, in clusters and solitary, moss, damask, Noisette, perpetual, and China, the wild rose in the hedge-row, the sweet briar, with its delicate pink blossoms and sweet-scented leaves, and all others, hang in their beauty. Then one resolves that next year he will raise some roses.

All right, begin right away. The long winter evenings are just the time to make a start. Send for some catalogues of florists that make a specialty of rose-growing. Select your roses. Do not be induced to invest in too many novelties, but select some varieties in the standard list, something that has been tested and proven true. Make out your list. There will be plenty of time to alter it before the time to order roses; and any time in the winter when the ground is not covered with snow, put on your shawl and overshoes and go out and select your ground. If possible to have any other place, don't select the front lawn, and don't plant single specimens, but choose some place at the side or in the garden. Be as careful as you can not to have it where the horses have to come to turn around with the plow or cultivator.

Having staked out your bed, you can have it plowed or spaded this fall, and well enriched, because roses need good feed. I forgot to say, don't choose a place where the water stands during winter, but of course you are all expected to have your garden drained, if it needs it.

Having your bed staked out, you can have it plowed or spaded as early in the spring as it is possible to work the ground. Have it enriched, and when you think the weather favorable, about the 10th of May will generally answer. Having corrected your list, cut down one half, probably, send in your order, and while waiting for it to be filled, have your bed spaded again, or spade it yourself. It's lots of work to raise roses. You can order plants by mail or express, getting larger plants by express at a much higher price. Each rose will have a label bearing its name.

Take them from the box, carefully remove the moss, or the most of it, put their roots in a large pan of water, with the chill off or slightly warm. Spade up your bed again, or perhaps hoe it up, raking it this time. Then take a trowel, or a kitchen fork, and proceed to set your plants. Dig a hole with the fork, set in the plants, cover a little dirt over the roots, pour in a little water, and proceed to set the rest, taking pains to place the taller-growing varieties at the back of the bed. Now go back to the first

one, finish covering, packing the soil quite solid with the hands around the roots, and covering a little higher than it was before, as you can tell by the dark lines on the bark of the plant. If you have the large-growing kinds, plant about four feet one way and three feet the other, although I would not set them in such regular order myself. Cover each plant with something, as a plant-crock, paint-pail, basin, or box for ten days or more, or until you see some new growth, when the covering may be dispensed with.

If it is cold at night, with danger of the ground freezing, they must be covered. Usually the middle of May is the best time for putting them out.

Now, this bed, with such small plants in it, will look rather bare this summer, so I would sow some annuals, or bed out my geraniums or other plants. It will help to keep the weeds out, and add much to the looks.

You may sprinkle the plants at night a little, and when they commence to grow, keep the ground well cultivated.

You will probably lose some plants, but don't be discouraged. You won't have many roses this year; I don't care what the catalogues say, I know. Along toward fall some one will say, "There is a bud on one of the little roses." Don't let more than one bud develop on a bush the first season, and pick that off before it is fairly open, put it in a small vase of water, and, my word for it, you will enjoy it fully as much as if it were on the bush, and the bush be much better off. The most that is necessary now is to keep the weeds out, and the soil loose till cold weather.

Hardy roses, dealers tell us, need no protection, but it is well to see that the roots are well covered, the earth being drawn up a little around the base of the plant, and when the ground has frozen it would be well to cover the bed with leaves, straw, evergreen boughs, or whatever is most convenient, and leave till spring.

As the weather grows warmer and the frost is out, gradually remove the covering, give the bed a good coat of manure, spade it in well, and trim off all the wood that is winter killed, and when your roses begin to grow, you may be on the watch for—not roses, but slugs and bugs, and all the other enemies of the rose.

For slugs, aphids, and worms we have found nothing better than hellebore, taking a tablespoonful to a large pail of water. Place the hellebore in hot water, add three or four spoonfuls of molasses, and fill up with cold water, keeping it well stirred, and apply to the bushes, taking care to get it on the under side of the leaves. We use a rubber sprinkler holding half a pint. It is quite a job, but it pays. By the first of June you can cut roses for yourself and friends. Notice, I say cut. Cut with a knife, slanting. They will keep fresh much longer. Pick at night, if possible, or before the sun shines on them in the morning. They will keep fresh much longer.

I presume you will have rose bugs to contend with. The best remedy we have found for them is to take a dishpan filled with water, and pick them off and throw them into the pan. We generally go over the bushes a couple of times in a season. This year we did not have any to speak of.

If you have chosen well and wisely, you can have a rosebud to wear occasionally from June till cold weather comes again.

AMERICAN NURSERY INDUSTRIES.

BY MR. CHARLES E. GREENING OF MONROE.

No special subject having been assigned to me, you will not take it amiss if I select a topic which naturally occupies my thoughts. It is one of vast importance to all in any way connected with the interests of horticulture. I refer to the nursery industry, one of the most important industries of our country, which has kept pace with the wonderful progress made throughout this country. The nursery business is one of the great factors in commerce, giving direct employment to thousands, and indirectly to millions, of people. Nurserymen ought to be considered benefactors of the country, for they not only promote a healthy movement of the nation's circulating medium, but contribute naturally to the health and happiness of the people, creating an appetite for refreshing, healthgiving fruits, and furnishing the plants that bear them. Do they not deserve appreciation and the meager profit so grudgingly bestowed by many?

Seriously speaking, you will agree with me that the nursery industry is worthy of our earnest consideration. Permit me for a moment to glance back at the industry as it was carried on in the years gone by.

The first impressions of nursery life are still vivid in my mind; not only the impressions made by the famous birch rod that never decays, but more so of the impression made by father's work among the trees. The work at that time differed, not so much in principle as in method, the tools and working material being behind those of today. The scions for grafting, I remember, were cut principally from bearing trees. The bandage cloth for grafting was prepared in the primitive way, on the kitchen stove, the sticky mass giving off volumes of smoke and odor not much relished by the more delicate members of the household. And thus it was in many other respects a slow, plodding kind of work.

As to the varieties of fruit, the list was small, the few better sorts having a high price. When the Concord grape was first introduced, one-year vines sold at \$5 apiece, and they were well worth this price. Today the price of Concord vines has dropped to almost nothing; still, the Concord is today the standard all-purpose grape, and has the esteem of the people.

Some of the fruit varieties of earlier days are extensively planted today because of their standard qualities. Although varieties are changing, and excellent new sorts are being brought into the market, yet many older sorts, such as the old and tried Baldwins, Spy, Wagener, and others, still bear comparison with our best sorts of today; and among the pears, Bartlett, Anjou, and Angouleme are holding their own.

Formerly many new varieties were imported from Europe. I remember well when my father imported some German sorts for introduction, among which were the famous Borsdorfer apple and the different sorts of Bergamont pears. This experiment taught us that most of the foreign varieties must be improved here in order to be of any value. Our home varieties are superior to the foreign kinds, and should be preferred by

all nurserymen and dealers who desire to furnish their customers with the best sorts.

In former years fruit was considered a luxury and was not grown to any greater extent, generally, than for domestic use; even then, however, there were seasons of over-production, and large quantities went to waste for the simple reason that the value of fruit, the art of preserving, and the method of marketing it, was not known as today.

The demand for ornamentals at that time was equally small, as the new settlers had their hands full in getting land cleared up for the raising of the necessary grain. But with the influx of educated emigrants from all parts of Europe, who had been taught to love plants and trees and beautiful surroundings of their homes, this gradually changed. Today you will scarcely find a cottage that has not some kind of ornamental tree, shrub, or climber.

The nurseryman's business methods were in accordance with the times and his means. The beginner had to undergo all kinds of hardship and trouble. All soliciting of orders was done by the nurseryman himself. The orders were small, as commercial orchard planting was then unknown. When delivering trees, they often had to be carted for many miles into the country over almost bottomless roads, the fastest conveyance in those days being the historic ox team.

Very little office work was required in those days. Few letters were exchanged, some of which contained something of the humorous, and helped to keep up the humor of the business. I recall a countermand that caused much mirth. It was a postal card, and was directed to the postmaster, who was requested to hand it to the man who sold trees to Maria Jones.

As to advertising, very little could be done under the limited means of the nurseryman. He had to do the greater part of it himself, while soliciting the orders.

And today, what a change in the conditions of the nursery business has taken place! The country in general, and our own dear Michigan in particular, has developed wonderfully. Improvements everywhere, railroads in every direction, forests cleared, and fine farms with large fruit orchards everywhere; fine residences in city and country, with modern conveniences showing the prosperity and intelligence of the people, who have been educated to appreciate fruit as a food, to see the profits in fruit culture, and to cultivate their tastes in beautifying the surroundings of their homes.

Our government has also been doing its part to encourage fruitgrowing, in the dissemination of desirable varieties, and has established experiment stations where new varieties may be tested as to their merits. The results are published in various bulletins which are issued at different times and distributed gratis among the people.

But where was the nurseryman while such evolutions were going on? He was not sleeping, I can assure you; nor is he idle today, for he was one of the principal factors in effecting such a wonderful change. Believe me, my friends, it is not all sunshine and profit that falls to the lot of the nurseryman. It is hard work, constant care and worry; more risks to run than in any other business, and more grumbling customers to pester one's life than in any other business of which I know; and for all

this the nurserymen of this country are investing their capital regardless of the existing uncertainties, with a vim almost to be envied.

No piece of land requires more constant and expensive care than nursery grounds. To grow first-class trees and plants, the soil must be kept in first-class condition all the time. If the soil deteriorates, the product of the soil must deteriorate also, and failures are the consequences.

To be successful the nurseryman must consider the demands of the fruitgrower. He should raise the kinds of tree that are in popular favor, and at the same time he must educate the people regarding the value of the different sorts. He must also improve the work of propagating trees, and the caring for them, using only the best implements and methods. Formerly the varieties were propagated mostly by grafting; today, budding is generally practised, and with the most satisfactory results.

Much improvement has been made in the quality of stocks used for propagation. Formerly small stocks were used; today, only the best selected stocks are planted. Instead of the single straight root, nurserymen now use the branched root-seedlings of which only the heaviest, of extra-large calibre, are selected. The bulk of these seedlings are grown in France and imported into this country, the soil and climate of France being adapted to the growing of a better class of seedlings than can be produced in this country. Unfavorable seasons cause much anxiety. More than once has the dreaded frost destroyed the prospects of several years' labor, and what the frost does in a few hours the drought accomplishes in a longer period of time, but with equal results.

Then there is a great army of insects and diseases that threaten the life of the nursery and the welfare of its owners. Although our professors have arrayed themselves on the side of the planter against the bugs, with all the science at their command, yet the bugs are with us and it is a constant battle. As to diseases, we profess to be more fortunate than our eastern and southern neighbors, and further venture to say (although Brother Willard may not agree with me on this point) that Michigan trees are among the best in the world.

All this will convince you that it requires unceasing care and great outlay to carry on the nursery business successfully, and with so much to harass the mind of the nurseryman, it seems quite a task at times to keep the mental balance.

To be candid and give credit and honor to whom it is due, I must pay a tribute of thanks and respect to the professors at our agricultural colleges, who, by their diligent researches, have enabled us to overcome some drawbacks in our way; and I would acknowledge the great improvements we enjoy in facilities for shipping, and reaching the public through the mails; the excellent publications through which we bring our goods before the people; and though there are always some very queer people to deal with, who have no idea of the difficulties of the trade, who also ask impossibilities and offer advice which may be worth something in Africa, but which is behind the times here, I must say that the majority of our patrons are cultivated people, with whom it is a pleasure to transact business.

But how about the nurseryman's profits? It seems to me that the most of the nurserymen must be carrying on the business only for the pleasure

there is in it; for how it is possible to get any profits out of the nursery business at the prevailing prices, I fail to comprehend; and still farmers and prospective fruitgrowers are protesting our prices. Why, it takes about all the ingenuity of the modern nurseryman to make ends meet. This will eventually have but one result. Some will be crowded to the wall, while others will profit by the experience of their brethren and put the business on a paying basis.

Many vexed questions are being considered, to effect that end, one of which is, shall nurserymen be specialists in growing certain lines of nursery stock? Many are doing this, but planters and growers do not approve of this plan. They dislike dividing their orders, and usually purchase where they can get what they want. Whoever will tell us just what varieties to grow deserves not only the thanks of the trade, but something more substantial, in a big lump.

Public favor is a fickle thing; it is as variable as the weather. The Michigan planter wants Hill's Chili; the Ohio planter, Smock or Salway; while another, in Indiana, clings to Crawfords. In one locality nothing but Golden Drop or Early Michigan is wanted; in another, the leaders are cast aside and sorts of local reputation only are in demand. After all, it is a lesson from experience, that nurserymen must use their own judgment, and grow a general line of leading and best-recommended varieties, which usually find their markets.

As to what trees are best for orchard planting, we learn from experience that two-year-olds are most in demand, and hence are considered best for transplanting. If I remember correctly, Brother Garfield advocates the planting of one-year-old trees. He no doubt refers to the one-year-old budded, which are indeed very desirable for transplanting, provided the trees have attained sufficient growth from bud the first season so they can be headed in at the proper height to form a desirable head. All things considered, I believe that apple, pear, plum, and cherry trees are at their best for transplanting at two years old.

What shall I say of the future of the nursery industry? May we not expect a change sooner or later? The brisk trade of the past two seasons has encouraged nurserymen throughout the country to greatly increase their plantings, under the impression that the present demand would continue. I venture to say that, should this great impetus for orchard planting in any way diminish, we will experience the greatest overproduction in nursery stock this country has ever seen. What results may we expect from such an overproduction? In my opinion, very disastrous ones to the nursery industry of this country.

And now one more word about our meeting. We hail with delight any means that helps to enlighten us on horticultural matters. It was a happy thought of our government to appropriate so liberally for the scientific and practical experimenting and testing of fruits, and for horticultural meetings and institutes held under the auspices of our professors and societies, for the special benefit of those who are engaged in agricultural and horticultural pursuits. It is easy to point out people who attend these meetings. They are a more intelligent class, and better posted in horticultural matters, and hence more pleasant to deal with. The organization of horticultural societies is also in keeping with the progressive spirit of the times, as these gatherings are excellent opportunities for the interchange of knowledge and experience.

It is useless to mention that the nursery business has been much abused, and that the confidence of the people has been seriously tampered with, especially by those following the jobbing trade.

DISCUSSION.

Mr. Watkins: I take great pleasure in the opportunity for interviewing a nurseryman who has made a very frank and candid statement of the condition of the nursery business. What I want to learn is this: In tree planting, which has been extensive about my place, there have by some means gotten into our plantings many spurious trees, and if Mr. Greening can explain to me how, among trees coming from first-class nurseries, there can occur these spurious trees, I would like to know. The indignation of our people is intense, and they asked me, if I ever had an opportunity, to find out how these trees came in those collections. For instance, one man planted, three years ago, 1,800 trees. He has 500 trees on which the peaches never ripened at all this year. They are all of one kind, and a kind I never saw or heard of. They were cut off in the first frost, half green. How do such things as this occur?

Mr. Greening: I think that is very easily explained. It occurs through mixtures in the nursery, no doubt; there can be no other way. It is probable that mistakes occur in every nursery; we do not claim that we do not make mistakes; no firm can claim that. Every tree can not be handled by our own hands, and sometimes serious mistakes occur.

Q. What puzzles me, is how such a variety of fruit ever came into the hands of a nurseryman; of course there might be mistakes in putting them up and handling them, and labeling them, but how that class of peaches was ever introduced into a nursery, is a singular thing. I know the firm that put them out.

Q. Was the order placed direct?

A. No, they were bought through an agent.

Q. And the agent isn't here, is he?

A. No, but those trees were sold by an agent of the Greening nursery at Monroe, having all the documents, and they were apparently shipped from there in that condition.

Mr. Collar: I had some that were two thirds green; they ripened the year before, but this year they only got about half their growth; it was pretty dry, and it may have been that same variety.

A Member: I would say that the Salway ripened nicely with us last year, and this year was frozen before it was ripe. We had a severe frost at a much earlier date than last year. Those things will occur with the late varieties. The latter part of the season was dry. Of course the early peaches ripened nicely, had some rains to help them on, but Smocks hardly ripened, and the Salways did not ripen at all. It was the dry soil and also the variety.

Mr. Helme: Some of the older men here know Ward's Late, a white peach, which is hardly as late as Smock, and every year I have had only one tree that ripened well, and this year it never ripened at all; they grow large but remain green, and stay on the tree until they are frozen. Just so with the Smocks I had. They didn't ripen at all this year. There are some peaches in there on the table now, that were sent from Ohio, that were frozen on the tree. But about these different trees. All nursery-

men make mistakes. We have some pears now that are different from what we selected; the man came to us, showed his documents, his catalogue, etc., and said that he was agent for a certain company. I gave him an order, knowing the reputation of that house, and when the trees came I refused to pay for them, for they were in bad condition. By and by we compromised for a small sum. Those were forged papers that he had shown me.

Mr. Willard: We have all been there. I was a little interested in what Mr. Watkins had to say. I should assume that the variety of peach of which we spoke was Salway, because they were so late, and that was the condition of the Salway all through the country this year. We usually get big prices for that fruit, but this year they were good for nothing. I can see how mistakes, such as he refers to, might occur, and anyone in the nursery business could understand that. In budding any fruit, the different varieties, there is often a point where two rows are going to stand side by side, two different varieties, and it is the easiest thing in the world, at the time of digging, for a mistake to occur—by accidentally getting into the wrong row. They are staked and recorded, of course, and yet the stakes may have been knocked down. He says to himself, "There are six rows of that variety," whereas there were only five, and he will dig up, unwittingly, a different variety from what was intended; mistakes will occur in that way. So far as mixtures are concerned, they frequently creep in. A man will get a bill of trees, and there may be several that are not right. As the gentleman says, he can not do everything himself. Any one who has employed labor knows that it is easier to hire muscle than brains. I know of instances where every care was taken, and yet unintentionally there has been, perhaps, one or two or three naturals left in a row. A few months later, a man cutting buds goes in there. He assumes that those are correct, every one of them, and so in cutting those buds, working upon that assumption, he does not study every tree, but lo and behold! he has struck one of those naturals, and before he knows it he has put in fifty or sixty of the mixture. The best peach-grower in the United States has been mixed up in that way. I am not going to mention his name; but he has had his stock mixed up in that way, so that from time to time he and others are forced to go and get something in the way of buds from bearing trees, to straighten up. You say, why not cut all the buds from bearing trees? It is not always the best thing to do, because in doing it you may get blossom buds that won't develop into good trees. You go into someone's peach orchard, to cut buds, and in many cases you get blossom buds, and they are not good. So you may go through with the whole department. Some years ago, when I cut my own buds, I did this: I was cutting buds in pears and cutting between two varieties. It was hot and I was working hard. Some one came along in a carriage, at the end of the row, and said, "I want to see you, Willard. Come here." I turned, and in order to have a few more buds for the boy, I cut some, but by mistake, out of the row opposite. There was a mixture before I knew it. Suppose there were twenty, thirty, forty of those buds that went into the next year's budding. Before you know it, you are all mixed up; and yet those things are constantly occurring, and it needs a great deal of care.

Mr. Beckford: Now, both of these gentlemen have owned up that mistakes of that kind do occur, and that if I buy an orchard of them I

might be about as likely to get an orchard of seedlings as anything else. Now, what is my remedy in that case? I buy 500 trees and pay for them, and get 400 seedlings. What am I going to do? They say, "You bought of an agent." I say, you sent me papers, saying you had received my order, and you get my money; and after all that you turn around and say, "If you had only dealt with me instead of my agent." I want to know if the farming community has no rights in this world which the nurseryman must respect. If ever there was a fraud on top of the earth, it is a nurseryman selling me five hundred trees, four hundred of them being worthless. After years, when the fruit ripens, I find that a man with a hammer couldn't get the peaches off the stones. A man couldn't eat one of them in a week. I know what I am talking about; I have some of them; I am in the same boat, and know all about it. If this gentleman can go into an orchard, or into my orchard today, and tell me which of those trees are seedlings and which are not, so I can go in there and pull out the seedlings and start in the spring anew, I wish he would do it.

Mr. Willard: Any nurseryman can do that.

Q. Well, of they can tell the seedlings in my orchard, and utterly refuse to come and tell me, what kind of men are they?

Mr. Willard: You will have to decide that. I think I stated that case quite clearly—the extreme care taken by nurserymen, to root out these seedlings. I know it is done. The gentleman is not quite fair in taking me up on one point. I don't undertake to say that you would get a whole orchard, but there are those little mixtures that will occur. If the gentleman has bought of Mr. Greening, or Mr. Harrison, or myself, a bill of trees, and they do not prove to be correct, he has his reclamation. I don't know of any instances to the contrary. You have a just reclamation on anyone that has in any way deceived you in regard to that thing.

Mr. Beckford: They say, "Here is what you signed, and if those trees should not prove good, we will replace them; that is the contract."

Mr. Willard: That is your contract, then. You make that contract and accept it as a contract. Now ask them to do it.

Mr. Beckford: I wouldn't give a cent to have them send me more trees.

Mr. Willard: You shouldn't make that contract, then.

Q. Is there any possibility that the dry season we have had has made these trees bear clingstone peaches?

Mr. Morrill: I have known of two or three instances where, under certain conditions of soil and moisture, varieties that are known to be all right, and bearing freestone peaches, would cling for a season. I think almost every large fruitgrower has seen something of that kind. Sometimes certain trees, of a known free variety, will cling, and the next year you can throw the stone out.

Mr. Beal: When I arose a few moments ago, I had another thing on my mind, but I find some of these questions have been very well disposed of. For instance, the honesty and integrity of the nurserymen; that is, of the proprietors of the nurseries. They have disposed of their matter all right. Mr. Greening agreed that they ought all to get together and see that they do what is just and right, but a slight allusion was made, laying the blame off upon the agent. I don't know what agent is here to answer to that, but I might just as well be a fruit tree agent as any one

in the room, and I would just as soon go into that business and furnish you with some good fruit—just as soon go into it as not. What do you suppose, if I had gotten my commission, would I care whether you called me a scamp or not? But you need not lay all of the blame on the agents. An agent comes along and offers me some fruit. He can supply me with anything I need. Now, some of you have found a great deal of fault because your fruits don't ripen. If I buy a Salway peach, I buy it because I want a late peach.

Mr. Watkins: I don't wish you to think that I called this matter up believing that Mr. Greening or the Greening Nursery company ever put out a peach tree that they did not believe to be genuine, because it costs just as much to put out an inferior quality of peach as a good one; but there has been a serious wrong committed to the planters of fruit, and in their behalf I know of no better way to stir this thing up. I have the utmost confidence in Mr. Greening, and believe he is worthy of your trade, but there was a gross wrong committed, and I was asked, if I had an opportunity, to look it up and see how these things occur. The planters want to know. We know that it costs as much to grow an inferior peach as a good one, but where and how does this error come in, and how will the planter find protection?

Mr. Woodward: I want to ask Mr. Willard a question. A friend of mine who had set a thousand trees, for yellow peaches, about five hundred of which bore this year, all white peaches, asked me what to do with them. The first thought was to pull them out, but after a while I said I would saw them off and let them sprout, and in the fall bud them, three to every stem; let the buds grow one year, and then thin them. I will ask Mr. Willard what kind of trees they will make.

Mr. Willard: They will bring peaches two years sooner than if re-set, but I think the man that sold the trees ought to be called upon to make them good; not only to supply the trees, but to pay something.

Mr. Woodward: I have taken trees of my own, after they had stood two or three years, and sawed off the top and worked into the wood. It is as easy to bud a peach as to cut your finger.

Mr. Greening: We are more likely to make mistakes on peach trees than any other kind, from the fact that we can not tell the different kinds apart if they become mixed, except seedlings; and we can tell a Smock, sometimes, from a seedling, but the second or third year we can tell them apart. Other trees we can tell at a glance, but not peach trees. With them we are left entirely in the dark; that is the reason there are so many more mixtures, and sometimes serious ones, in peach trees than other kinds of fruits. We can easily detect a seedling when it stands in the nursery rows, but when two or three varieties of peach become mixed, we can not tell them apart. We can recognize them in bearing condition or in the nursery. They grow upright, have thin limbs, the leaf is somewhat different, but there are some varieties that have identically the same leaf, and it is very hard to tell them apart.

Mr. Morrill: I don't like to leave this topic without mentioning something that has not been touched upon. I think all this has shown the necessity of close relations between nurserymen and planters. There has been something said in favor of the agent. The agent may be all right or all wrong; he is a man; he may mean well and he may mean ill. You

don't know, and I have heard of circumstances in this state, where agents have taken the order-books of reputable nurseries and have gone out and taken orders on these books, and have sold trees, and have purchased their stock wherever they could get it cheapest, and filled those orders; and, so far as you know, you have bought trees from Greening Brothers, but they may have been grown in Georgia and Greening Bros. known nothing about the transaction; still, his order blanks have come to you, and if there are a number of pages missing in that book, who can say that the man didn't tear the order out or spoil it? I don't believe it possible for a man to avoid mistakes. The only man who makes no mistakes is the man that does nothing. The nurserymen do deliberately substitute; there is no question about it. Mr. Willard touched on one point that I have always thought a poor practice. That is, budding from nursery stock. I do believe there is a loss in blossom buds, but I believe that the nurseryman ought not to take the risk of propagating a mistake. He should propagate from bearing stock if it is possible. For instance, I was talking with the superintendent of one of the large nurseries of Bloomington. I said, "How do you know when your varieties are correct?" He said, "We get our stocks from reliable parties." I said, "Where do you get your grafting stock?" He said, "I don't know; they were in the nursery when I came here." I asked him how long he had been there, and he answered, "Thirty years." Now, if ever a mistake came in, it had been continued thirty years. As I have said before, perhaps many of you are corresponding with Tom, Dick, and Harry to see who will sell you trees for the least money. You are throwing out the temptation, and when you do that, look out. When you go to the man who has the best stock, and pay him a fair price for it, you have a right to call him to order, if anything goes wrong, and most nurserymen are as jealous of their reputation as any man that lives in the state of Michigan. I know they will do all they can to right a wrong. Of course, there are exceptions. I would like to ask in connection with this, whether there is any deleterious effect on the bearing qualities of the fruit, from cutting from nursery stock for thirty years instead of going to the bearing tree to get buds.

Mr. Willard: It would take an older man than myself to answer that question. Mr. Harrison may be able to.

Mr. Harrison: I don't know why a peach should change its nature, whether it is one, two, or ten years old. If any one can see why it should, that would answer the question. It seems to me it should retain its individuality as perfectly as if you never allowed a tree to get more than one year old. Take a Crawford and cut from that, and put it in a stock and keep doing so, on through all time. It would still be a Crawford peach and it would still be true to its original.

Mr. Morrill: While it would still be true to its original, would it not deteriorate in quality? Some years ago a discussion came up in regard to getting apple grafts from nursery stock, and I remember the nursery people said they got their grafts from bearing trees; it seems to me you get better results to cut from bearing trees than nursery rows.

Mr. Slayton: In the study of botany, we learn that that thing has come so near to animal economy, as to make some plants produce the blossoms of another genus. In other instances, they have produced

different flowers on the same plant. Again, it produces the same flower. Reasoning from analogy, if we propagate by budding from the nursery row, we would be propagating from buds; that would be just the same as attempting to produce a brood of animals from very young parents, say four- or five-year-old children; if we propagated the human family for a great length of time from as immature specimens as that, the race would deteriorate. Isn't that the same reasoning? My thinking is that a mature individual of the human family bears the same relation in the propagation of species that the mature bud does, from fruit-bearing trees.

Mr. Harrison: If a bud don't mature in one year, when does it mature?

OFFICIAL REPORTS.

ANNUAL REPORT OF THE SECRETARY.

To the Officers and Members of the Michigan State Horticultural Society:

The year which is so nearly passed has been to Michigan horticulture one of most peculiar experiences, and has not been without notable and advantageous results. So far as this society is concerned, it has marked what we all hope will be the beginning of a new era of great usefulness, because it is the beginning of new strength. While there has not been more than the usual spirit and energy manifested by the local societies, they have maintained their organizations, with the exception of one, that of Eaton Rapids, which has succumbed to lack of interest there in purely horticultural work, and has become a farmers' club. On the other hand, new societies were formed at Gobleville and Ludington, the latter taking the place of one which had become extinct. There are now eighteen societies in the state in active operation, though some of them should manifest a little more life than they seem to possess. That at Ann Arbor is inactive because of unfortunate complications arising from co-operative shipment of fruit to Detroit, differences of some kind arising which should be harmonized without so far-reaching results as the disbandment of one of the oldest and most useful societies in the state. Such was the unlovely condition of things at last advices. All but two of these recognize auxiliary fealty to the state society. It is hoped that these will do so under the new conditions.

The conditions referred to are the waiving of fees from the local societies to this organization, so that auxiliary membership carries with it nearly all the benefits heretofore conferred, while exacting no tribute in return. The only difference is that such membership does not now carry with it the right to vote at these annual meetings in the choice of officers. It was deemed best to keep a membership fee for the state society, and this right of suffrage was necessary as a recompense. It simply is a return to the original state of the society before the auxiliary plan was developed.

This change, this relief of the local societies from helping maintain the state organization, has been made possible by the action of the legislature, last winter, in giving the society an appropriation of \$1,500 per year for two years, for its expenses in holding meetings and publishing its reports. As is well known, up to this time the society has had to bear all expenses of this kind except the printing of the volumes. It was deemed but right that Michigan, with its all but unequalled horticultural advantages, should treat its horticultural society in some degree as do other states. That we show forth fruits meet for the expenditure is a part of our duties at this meeting.

At the meeting at Traverse City, in September, it was determined to change the time of our annual meeting back to the first week in December, the departure, a few years ago, from that date, being due to an effort to secure reduced rates of railway fare common at the holiday season. But it was found that the plan would work but once in seven years, when Christmas falls on Sunday.

The treasurer's report and accompanying papers will show that the funds of the society are well invested and in proper condition.

With the exception of apples and the grapes (and small fruits in some sections), the year 1895 was a productive one, although a time of unequaled drouth and possessed of some other untoward features of climate. The principal of these was the severe cold and heavy snow of the middle of May, which came when the trees and plants were in bloom or filled with young fruits. The grapes succumbed at once and the crop in the state was exceedingly small, a few localities near the lake, in the southwestern part of the state, alone excepted. A little fruit was obtained from the secondary buds, especially in cases where the frozen foliage was stripped off at once. Currants and gooseberries were badly hurt in most localities, and the crop shortened. The same was true of the other berries, though in less degree. In the fruit belt north of Allegan and Kent counties, the injury to peaches and plums was such as to entirely kill the latter and leave but comparatively little of the former. This was the general condition in the region referred to, though there were a few exceptions. But in Kent, Allegan, Van Buren, and to a somewhat less degree in Berrien, the peaches and plums escaped injury and bore the largest crop in the history of the state. I can only give figures of the crop of two counties, as to peaches, and none as to other fruits, so hard is it to get reliable statements as to each kind of fruit, and in many cases nothing whatever can be obtained from pier, dock, or transportation companies. But it is a well-based statement to say that from Kent county were sent 300,000 bushels of peaches, besides a part of the consumption of Grand Rapids, while the great orchards of Allegan county turned out not less than one and one half million bushels of peaches, plums, and pears combined. I am unable to separate the kinds, as all go together, as so many baskets of fruit. But more than 1,000,000 bushels were peaches.

Instead of loss of fruit, the cold, which went several degrees below the freezing point, worked a loss of insects, a disaster which was borne with astonishing equanimity. Curculio were troublesome nowhere. The cold came just as they were beginning their work, and seems to have exterminated them. The codlin moth, canker worm, and all the rest shared the same fate in greater or less degree. It is humiliating to admit that the great yield of plums and peaches is largely due to this cause rather than to the enterprise and intelligence of the fruitgrowers; for it may be as well here admitted that the average fruitgrower of Michigan jars but little, sprays less, and thins with a niggard hand. But the place where fruitgrowers universally do otherwise than this is a locality of which I have not yet heard.

The pear crop was a good one throughout the state, but the apples were very few. However, the apple trees have been free from the blight of former years, and no doubt are ready to give us, another season, an old-fashioned crop of Michigan apples, though the day of thousands of old apple orchards in Michigan is passed.

Owing to these conditions there was not so much practice of spraying in the state as would otherwise been made, though I know of some examples of marked benefit to apples in the northern part of the state, where the crop of winter fruit was better than anywhere else. Apples were not harmed by the May cold. The trees were in their off year and did not bloom.

Since the method of cutting out black-knot of the plum and cherry has come into general practice, we hear of but little spread of this disease, and there is no occasion for much fear of it. That scab of the apple, and the codlin moth, may be subdued by spraying, is now so well demonstrated that rarely can a doubter be found. But there is as yet no cure for yellows, nor any way found for abating the disease save extermination of the affected trees. The new law as to yellows is generally commended by growers of the peach, and it was better enforced than ever because of the apparent increase of this disease. But the present season has witnessed not half so much as became apparent in 1894. The large number of affected trees found that year, it is now understood, was due to the unfruitfulness of the preceding year, which permitted the disease to become established in its first stage, in many cases, and as there was no fruit there was no chance for detection. So there was a double portion in 1894. A new disease of the peach has become manifest in Allegan county, which may become as dangerous as yellows, though it does not as yet show so much power of contagion. The affected trees grow from year to year, the fruit and leaves growing continually smaller; the fruit is of poor color and insipid; there is in some cases a little of sprouting about the tree,

but the shoots are clearly distinct from those of yellows. I have not heard of a tree dying from this cause, but the growers have this season taken them out. They are of no use (except that some thrifty souls shipped the fruit this year and got something for it, while spoiling the sale of healthy fruit), and therefore the best growers do not propose to further dally with them.

This disease and yellows do not deter men from planting the peach, however. More trees will be set next spring, both on new ground or in places where trees have been removed, than ever before. Nor will the planting (I am now speaking of the western part of the state, the "fruit belt") be confined to the peach, but all other kinds of fruit will very largely be set, the growers in the peach regions deeming it wise not to confine their attention and land to one kind. In other portions of the state the setting will be large, of everything but the peach. There has been a great impetus to the planting of the currant and gooseberry. These seem destined to be an important part of our annual product hereafter. They are purely northern fruits. We shall never have a southern crop in competition; they need not be picked all in a day nor a week; they can be carried in perfect condition from one end of the country to the other, and remain unsold a long time without serious decadence in condition or quality.

One effect of the excessive crop of peaches was the shipment of that fruit much further than it was ever sent before. Peaches were taken from western Michigan to Winnipeg in the one direction and Montreal and New York city in the other. It had been thought that, because of their delicate quality, Michigan peaches could not be sent so far. But refrigeration is found to be as practicable with them as with the same kind of fruit in any state east of the Mississippi. While the prices received were small per bushel (though some sales were made of strictly first-class fruit for \$3 or more per bushel), the aggregate was so great that the peach and plum lands paid at the rate of \$50 to \$100 net per acre. No fault can be found with such yields of cash as these. The average of the fruit, after the early white varieties were passed, sold for ten to twenty cents or a little more, per fifth basket.

Certainly, all things considered, there is only hope and cheer in the future for the Michigan fruitgrower.

The receipts and disbursements of the year, from the society's funds, have been as follows:

RECEIPTS.

Balance on hand.....	\$104 33
From local societies	94 50
Interest on life membership fund.....	105 70
Annual memberships	19 00
Total	\$323 53

DISBURSEMENTS.

Orders Nos. 1 to 5.....	\$191 39
Expenses of treasurer	28
Balance on hand.....	131 86
Total	\$323 53

EDWY C. REID,

Secretary.

TREASURER'S ANNUAL REPORT.

Of life members there are 205, who have paid \$10 each; and the money is loaned on real estate security—\$300 to Jacob Snell in Oceana Co., \$250 to A. Newman of Grand Rapids, \$1,200 to A. A. Whitman of Grand Rapids, and \$300 to S. Geer, Grand Rapids. All the interest has been paid up to date.

We have received from Lowell horticultural society the sum of \$50; the Port Huron, \$5; the Covert, \$19.50; Saugatuck and Ganges society, \$10; the Gobleville, \$10; for annual membership dues, \$19; interest on mortgages, \$105; interest on deposited interest, 70c, from former treasurer, \$104.33; total, \$323.53.

Expenses: Cash to Secretary Reid, \$150; to President Morrill, \$4.90; to C. J. Monroe, \$5.20; to T. T. Lyon, \$5.20; to R. L. Hewitt, librarian, \$26.09; expressage and postage, 28c; total, \$191.67.

Balance on hand, \$131.86.

HORTICULTURAL BULLETINS

OF THE

AGRICULTURAL EXPERIMENT STATION OF MICHIGAN.

FRUITS AT SOUTH HAVEN.

Bulletin No. 129, February, 1896.

BY T. T. LYON.

In submitting this, my annual report of operations at the South Haven sub-experiment station, during the year 1895, I take occasion to state that this and the previous season have proved exceptional, from the prevalence of a severe drouth during the summer of 1894, followed by inadequate rainfall during the autumn; while that of the spring of 1895 was also comparatively slight. With the advent of growing weather, on May 6 and 7, copious showers occurred, with more or less rain during the next ten days. From that date forward only very rare sprinkles or slight showers occurred prior to September 11, while even this and subsequent rainfalls have been scarcely adequate to the needs of vegetable growth.

Under such conditions, resort has been had to the frequent stirring of the soil by the free use of the cultivator. This has proved effective for the maintaining of a very satisfactory growth upon trees and deep-rooting plants generally, excepting those recently planted, and such others as were carrying heavy crops of fruit. In such cases, resort was had to watering, which was done by opening a trench about the tree, to receive the water, and replacing the earth after the absorption of the water. This proved to be a tedious and expensive process, since it was necessary to haul the water from lake Michigan, the village waterworks not being within reach and the capacity inadequate.

While yet dormant, the entire plantation was sprayed with a solution of two pounds of copper sulphate in fifty gallons of water. On account of the early starting of gooseberries and currants, they were sprayed March 18. April 1 to 10 the same was applied to raspberries, blackberries, strawberries, grapes, and tree fruits generally.

Subsequent sprayings will be noticed in connection with the several species of fruit.

So far as practicable, the "Rules of Pomology" of the American Pomological Society and the National Division of Pomology are applied in the correction and simplifying of the names of fruits. Under these rules, in cases in which the sup-

pression of a redundant or objectionable word or part of a word in the name of a fruit would, by possibility, occasion ambiguity, such word or part of a word is temporarily retained, in brackets, with the purpose to wholly omit the same when (if ever) the suggested change shall come to be generally recognized.

Throughout this report, the *weight* of a single average specimen of a variety of fruit is given, instead of its *size*; the same being assumed to be the more accurate indication of its value and at the same time more readily arrived at; the thought being that such weight, rather than size, may ultimately be employed as the medium for the comparison of values between varieties.

The several classes of fruits will be considered as nearly as practicable in the order of their maturity.

STRAWBERRIES (*Fragaria*).

The strawberry plat which produced its first crop of fruit in June, 1894, was kept in good condition, and again fruited in 1895. A record of such second crop was kept, as usual, and compared with that of a plat producing its first crop at the same time; the product of the same variety, in each plat, appearing in parallel columns. The two plats received the same treatment, as nearly as practicable, there being of each variety twelve plants in hills, and a matted row grown from twelve original plants, in the older plat, against ten plants of each respectively in the newer plat. It will also be noticed that many vacancies occurred in the record of the older plat, for the reason that many newer varieties, which appear in the newer plat, had not occurred in the older one; while a few varieties in the older plat were so seriously injured by drouth or winter that their record is omitted.

Both plats were sprayed July 8, after they were out of fruit, with a solution of three ounces of copper sulphate in fifty gallons of water. The plants generally have been almost wholly free from the depredations of either insects or fungi.

The vigor and fruiting capacity of the plants, in both plats, was doubtless injuriously affected by the drouth of last season, the older plat probably the more seriously. Following this came the drouth of the past spring and summer, which became serious at so early a date as to essentially affect both the quantity and quality of the current crop of fruit. As a necessary consequence, several varieties, especially in the older plat, showed more or less deficiency in the stand of plants, as well as in the show of fruit. For such reason, several varieties contained in the older plat are omitted in the tabulation.

The weight of a specimen in ounces or fractions of an ounce is given, instead of size, as more accurately expressing actual value, while vigor of plant is expressed upon the scale of one to ten, graded from one downward.

TABULATION OF STRAWBERRIES FROM ONE AND TWO YEAR PLATS.

Number.	Names.	b—bisexual, n—nearly p—pistillate.	When received.	Earliest bloom.	First picking.	Last picking.	Ounces.				Vigor of plant, 1-10.	Weight of berry in ounces.	
							1st year.		2d year.				
							Hills.	Matted row.	Hills.	Matted row.			
1	Accomac	b	1892	May 2	June 10	June 29	9½	9			3	5	¼
2	Afton	p	1892	May 2	June 2	June 7	20½	21½			5	5	1
3	Allen 5	p	1894	May 6	June 3	June 17	8½	12	6	22	6	1	1
4	Allen 6	p	1894	May 4	June 5	June 21	12	14½			6	1	1
5	Allen 13	p	1894	May 1	June 1	June 17	16½	14½			3		½
6	Aroma	b	1894	May 6	June 10	June 26	14½	6½			5	6	½
7	Auburn	p	1892	May 6	June 3	June 19	8½	8½			6	1	1
8	Augwick	p	1892	May 3	June 3	June 24	5½	18½	7	14	7	7	1.5
9	Australian (Crim.)	b	1891	April 30	June 3	June 3	1	8			3	5	½
10	Australian (Everbear)	b	1890	May 2	June 3	June 21	13	12½			5	5	½
11	Banquet	p	1892	April 29	June 3	June 21	20	37	24½	43½	3	3	½
12	Barton	p	1891	May 2	June 1	June 26	20	39	20½	18½	6	6	½
13	Beauty	p	1892	April 30	June 1	June 24	34½	41½	8	38	3	3	½
14	Beebe	b	1894	May 2	June 5	June 24	18½	17			2	2	½
15	Beecher	b	1894	May 9	June 12	June 24	18	20			2	2	½
16	Belt 3	b	1892	May 4	June 5	June 26	10½	29	89½	32	3	3	½
17	Beverly	b	1892	May 3	June 5	June 26	14½	7½	5	15	3	3	½
18	Bickle	p	1894	May 1	June 5	June 24	25	20			2	2	½
19	Boytton	p	1891	April 29	June 1	June 14	29	28½	48½	46½	2	2	½
20	Brandywine	b	1893	April 29	June 1	June 24	8½	12½			3	3	½
21	Brunette	b	1893	May 2	June 1	June 17	11	19			2	2	½
22	Bubach 5	p	1888	May 4	June 1	June 26	22	28½	14½	34½	2	2	½
23	Californian	b	1891	May 2	June 10	June 26	3½	13			2	2	½
24	Cameron 2	b	1894	April 29	June 1	June 24	18½	8½			4	4	½
25	Cameron 6	n p	1894	May 8	June 10	June 24	5	8			1	1	½
26	Cameron 13	p	1894	May 6	June 10	June 30	24	22			2	2	½
27	Cameronian	p	1892	May 3	June 7	June 26	10½	13½			6	6	½
28	Chairs	p	1893	May 2	June 7	June 26	31½	15½	23½	20½	5	5	½
29	Charlie	p	1894	May 4	June 6	June 26	45½	30			1	1	½
30	Cheyenne	p	1894	May 8	June 7	June 30	22	15			4	4	1
31	Clark	b	1892	May 2	June 1	June 26	6½	16½			6	6	½
32	Cleveland	p	1888	May 2	June 3	June 19	11	8½	36½	25½	4	4	½
33	Columbia	b	1894	May 2	June 5	June 26	8	17			4	4	½
34	Consensus	p	1893	May 8	June 10	June 26	12½	11			5	5	½
35	Copernicus	p	1893	May 3	June 10	June 26	11	16	21	40	5	5	½
36	Crescent	p	1888	May 3	June 1	June 21	13½	18½	72½	56½	7	7	½
37	Cruse	b	1894	May 4	June 7	June 24	12½	22½			3	3	½
38	Curtis 15	b	1892	May 2	June 1	June 16	24½	15	27½	51	8	8	½
39	Curtis 159	p	1892	May 2	June 1	June 26	37	24½	39½	63	9	9	1
40	Cyclone	b	1894	April 29	June 1	June 24	20	15			6	6	1-6
41	Daisy	p	1890	April 29	June 1	June 17	8½	25	55½	79	6	6	½
42	Dan Bisel	b	1894	May 4	June 3	June 29	42	28½			2	2	1.5
43	Dayton	b	1892	May 2	June 1	June 21	18	16	41½	43½	5	5	½
44	Early Jack	b	1894	May 1	June 1	June 19	48½	74			1	1	1
45	Edgar	p	1890	May 4	June 10	June 17	2½	3½	32	56	1	1	½
46	Edward (Fav.)	b	1894	May 8	June 12	June 29	6½	17½					½
47	Edith	p	1894	May 9	June 17	June 26	5	15			5	5	½
48	Edwards	b	1894	May 7	June 12	June 29	6½	17½	27½	46½	4	4	½
49	Enhance	b	1890	May 2	June 10	June 29	23	20	21	53½	4	4	½
50	Epping	p	1894	May 4	June 7	June 26	22½	14½			4	4	½
51	Equinox	b	1894	May 2	June 17	June 27	3½	11½					½
52	Estelle	b	1891	May 6	June 14	June 26	5½	3½	24½	14			½
53	Eureka	p	1888	May 6	June 10	June 24	15	16½	17½	29½			½
54	Fairmount	b	1891	May 1	June 2	June 26	22	36½	52½	60½	5	5	½
55	Feicht 2	b	1894	May 4	June 3	June 21	12½	16½			4	4	½

STRAWBERRIES.—CONTINUED.

Number.	Names.	Sex.	b—bisexual, n—nearly, p—pistillate.	When received.	Earliest bloom.	First picking.	Last picking.	Ounces.				Vigor of plant, 1-10.	Weight of berry in ounces.
								1st year.		2d year.			
								Hills.	Matted row.	Hills.	Matted row.		
56	Faicht 3	p		1894	May 4	June 5	June 29	19½	22			5	½
57	Fir	b		1894	May 2	June 3	June 24	15½	7			6	¼
58	Florence	b		1888	May 2	June 1	June 26	17	21	44½	75	2	¾
59	Gipsy	p		1894	May 2	June 3	June 21	35½	40			2	¾
60	Glenfield	b		1894	May 2	June 3	June 24	17	11½			2	¾
61	Greenville	p		1891	May 4	June 3	June 26	43	50½	66	61	1	¾
62	Harmon	b		1894	April 29	June 1	June 19	14½	11			2	¾
63	Hattie	p		1892	May 4	June 5	June 26	50½	36	72	67	4	¾
64	Haverland	p		1887	April 29	June 1	June 26	44½	31½	40	42	4	¾
65	Hermit	b		1892	April 29	June 3	June 24	10½	19½	45	90	6	1-5
66	Hinman	b		1890	May 3	June 7	June 24	21½	14½	36	61½	4	¾
67	Hoard	b		1888	May 2	June 5	June 21	14	16	21	21½	2	¾
68	Holyoke	b		1891	May 2	June 7	June 26	24	38½	38½	60	2	¾
69	Hugo	b		1891	May 2	June 5	June 29	8	15			6	¾
70	Huntsman	b		1892	May 2	June 5	June 24	18	21½	9	29	1	¾
71	Hyslop	b		1892	April 29	June 5	June 19	12	18	12½	88½	2	¾
72	Iowa	b		1892	April 29	June 7	June 17	4½	4½			2	¾
73	J. S. 4	p		1894	May 2	June 5	June 26	31½	37½			2	¾
74	J. S. 6	p		1894	May 3	June 5	June 26	25	11			1	¾
75	Kansas	b		1894	May 2	June 3	June 24	36	50			1	¾
76	Katie	b		1892	May 2	June 3	June 21	11½	11	27	38	3	1
77	Klickita	p		1894	May 4	June 12	June 24	8½	7			1	1-6
78	Kosuth	b		1894	April 30	June 1	June 24	18	15			3	¾
79	Lacrosse	n p		1893	May 6	June 10	June 26	3	10	19	45	1	¾
80	Leader	b		1892	April 29	June 1	June 21	28	35			3	1
81	Lehig	p		1891	April 29	June 1	June 19	37½	9½	64½	114½	2	1-5
82	Leroy	p		1892	April 29	June 1	June 26	13	11½	22	22½	2	½
83	Leviathan	b		1892	May 6	June 1	June 26	24½	23½	15	21	2	¾
84	Lincoln	p		1892	April 29	June 3	June 29	86	42½	82	126½	1	¾
85	Little 26	b		1894	May 4	June 12	June 24	9½	5			1	¾
86	Little 42	n p		1894	May 3	June 5	June 24	21	11			1	¾
87	Longfield	p		1894	May 2	June 1	June 24	37	17½			2	¾
88	Lovett	b		1891	April 30	June 1	June 24	42	19	39½	41½	1	¾
89	Lower	b		1894	May 3	June 12	June 19	3½	3			9	1-5
90	Magnate	p		1894	May 1	June 1	June 19	14½	14½			2	½
91	Marshall	b		1894	May 6	June 11	June 19	2	2			1	¾
92	Mary	p		1894	May 6	June 11	June 24	14½	5			1	¾
93	Maxwell	b		1894	April 30	June 1	June 21	20½	15			1	1
94	Meeks	b		1894	May 1	June 3	June 21	3½	12			1	¾
95	Miami	p		1889	May 4	June 5	June 21	11	19½	35	66	3	¾
96	Miller	b		1890	May 8	June 12	June 24	14½	8			1	1-6
97	Monroe	b		1891	May 2	June 7	June 24	15½	17½			5	½
98	Muskingum	b		1892	May 6	June 12	June 29	59½	26	31½	75½	2	½
99	Mystic	b		1892	May 6	June 14	June 29	6	12½	15½	10½	5	½
100	Neptune	p		1890	May 6	June 12	June 26	5	8½	31½	46½	5	½
101	No Name	n p		1894	May 7	June 3	June 26	26	22½			4	½
102	No. 31	b		1893	May 8	June 12	June 26	5½	3	30½	44	1	¾
103	Odessa	p		1894	May 4	June 10	June 26	6½	9			1	1-5
104	Ohio Centennial	b		1893	May 6	June 10	June 29	8½	24	37½	42	5	½
105	Ona	p		1894	May 2	June 3	June 24	17	11			4	¾
106	Oregon	p		1891	May 1	June 5	June 26	9½	10			5	½
107	Oregon 278	b		1894	May 4	June 7	June 24	8	6½			3	¾
108	Oscar	b		1894	May 6	June 10	June 21	4	2½			7	1-5
109	Ostego	p		1894	May 4	June 5	June 26	28½	31			2	¾
110	Pacific	p		1890	May 1	June 5	June 26	47	22	36	81	1	¾

STRAWBERRIES.—CONTINUED.

Number.	Names.	Sex.	When received.	Earliest bloom.	First picking.	Last picking.	Ounces.				Vigor of plant, 1-10.	Weight of berry in ounces.
							1st year.		2d year.			
							Hills.	Matted row.	Hills.	Matted row.		
111	Parker Earle	b	1889	May 2..	June 5.	June 24.	22½	18½	31½	81½	2	½
112	Pawnee	p	1894	May 8..	June 7.	June 29.	32	29½	—	—	2	½
113	Phillip	b	1894	May 4..	June 8.	June 26.	12½	3	—	—	1	½
114	Price	b	1892	May 1..	June 1.	June 29.	21	20½	29½	36	1	½
115	Primate	b	1894	May 7..	June 12.	June 24.	22	13	—	—	2	½
116	Princess	p	1892	May 3..	June 8.	June 29.	27½	22	60	79½	2	½
117	Princeton	b	1894	April 30.	June 7.	June 26.	31½	17½	—	—	2	½
118	Puritan	n p	1887	April 29.	June 1.	June 14.	18½	27½	22½	57½	5	½
119	Putnam	p	1890	May 7..	June 12.	June 29.	10	4½	43	57½	1	½
120	Regina	p	1890	May 4..	June 14.	June 29.	12½	15	—	—	2	1-5
121	Richmond	b	1894	May 6..	June 5.	June 26.	33	27½	—	—	1	½
122	Riehl 6	b	1893	May 6..	June 5.	June 26.	24	13½	20½	25½	3	½
123	Rio	b	1890	May 1..	June 8.	June 17.	14½	24½	—	—	3	½
124	Robinson	b	1894	May 1..	June 7.	June 24.	17½	11	—	—	1	½
125	Sadie	p	1890	April 30.	June 1.	June 24.	35	50½	47½	103½	3	½
126	Sandoval	b	1890	May 2..	June 5.	June 24.	15½	15½	24½	42	4	½
127	Saunders	b	1889	May 8..	June 5.	June 26.	23	33½	115½	126	3	½
128	Scarlet Ball	p	1892	May 6..	June 14.	June 24.	14	6½	59	59½	1	½
129	Shawnee	n p	1894	April 29.	June 1.	June 26.	29½	18½	—	—	2	½
180	Shuckless	b	1894	May 6..	June 12.	June 29.	8	10	—	—	1	½
131	Smalley	p	1894	April 30.	June 5.	June 29.	17½	14½	—	—	6	½
132	Smeltzer	b	1894	May 2..	June 5.	June 17.	14½	17	—	—	8	½
133	Smith	b	1894	April 30.	June 1.	June 19.	26½	31	—	—	1	½
134	Stahelin	p	1894	May 2..	June 1.	June 29.	31½	27½	—	—	1	½
185	Southard	b	1892	April 29.	June 1.	June 24.	24	18½	42½	53½	5	½
136	Speece	p	1890	May 2..	June 3.	June 29.	33½	25½	54	70½	1	½
137	Splendid	b	1893	May 1..	June 1.	June 24.	30	45	16½	52	1	1
138	Springdale	b	1894	May 3..	June 5.	June 26.	9½	8	—	—	6	½
139	Standard	b	1892	May 1..	June 1.	June 21.	8½	8½	—	—	2	1-5
140	Surprise	b	1892	May 1..	June 1.	June 24.	14½	10	16	32	4	1-5
141	Swindle	p	1892	May 1..	June 1.	June 24.	32	44	14½	81½	4	½
142	Tennessee	b	1894	May 3..	June 3.	June 26.	29	43	—	—	2	½
143	Thompson 40	p	1894	May 3..	June 3.	June 19.	42	19½	—	—	1	½
144	Thompson 66	p	1894	May 1..	June 12.	June 26.	23	25½	—	—	1	1-5
145	Timbrell	p	1893	May 6..	June 12.	June 29.	29	43	16	28½	2	1
146	Tom Walker	p	1894	May 7..	June 5.	June 24.	5½	2½	—	—	3	½
147	Tooga	p	1894	May 2..	June 5.	June 24.	28	33	—	—	1	½
148	Topeka	b	1894	May 3..	June 11.	June 21.	10½	19½	—	—	1	½
149	Van Deman	b	1894	April 30.	June 3.	June 26.	19½	33½	—	—	2	½
150	Vick	b	1878	May 4..	June 8.	June 26.	19½	29	—	—	3	1
151	Warfield	p	1890	May 2..	June 3.	June 26.	23½	19½	47½	56	1	½
152	Weston	p	1892	May 8..	June 10.	June 26.	30½	26	17½	54	2	½
153	Williams	b	1892	May 8..	June 7.	June 29.	26½	21½	40½	77	2	½
154	Wilson	b	1876	April 29.	June 1.	June 24.	16	13	22	57	3	½
155	Wood (Beder)	b	1890	April 29.	June 1.	June 21.	27½	34½	42	97	2	½
156	Woolverton	b	1891	May 9..	June 5.	June 29.	18	47½	49½	109½	1	½

Notices are appended of a few varieties which have shown the highest productiveness during the past unusually unfavorable season; although it may reasonably be inferred that, owing to such exceptional conditions, and possibly also to peculiarities of soil or environment, such results may not properly express the real relative values of the varieties noticed, and their ultimate status as compared with many others under trial along with them.

The varieties are noticed in the order of their productiveness during the past season, and the weights of single berries are those of such crop, which doubtless may be assumed to be rather below than above the average of ordinary seasons.

Early Jack, bisexual, was received from Kansas and planted in the spring of 1894. So far the plant manifests great vigor and hardiness; in weight of berry it ranks very high, many specimens weighing an ounce each; firmness about six, upon the scale running from one downward to ten; quality, four; total product from the twenty plants, 112 ounces.

Lincoln, pistillate, was received from Delaware and planted in 1892. In vigor and hardiness it ranks one; firmness and quality, each five; weight of berry, half an ounce; total yield, 108 ounces. This is apparently distinct from the Lincoln (a very early berry) of some fifteen to twenty years ago.

Greenville, pistillate, was received from Ohio in 1891. It possesses superior vigor and hardiness; firmness, two; quality, five; weight of berry, half an ounce; total product, 93 ounces. It is worthy of extensive trial as a market berry.

Kansas, bisexual, was received from the state of that name and planted in 1894. So far it ranks one in vigor and hardiness; in firmness, five; in quality, as high as three; weight of berry, half an ounce; total product, 86 ounces.

Hattie, pistillate, was received from J. H. Haynes, Delphi, Ind., in 1892. In vigor and hardiness it ranks two; firmness, four; quality, five; weight of a single berry, one third of an ounce; total product, 86 ounces. Relatively it has proved more productive this season than usual.

Sadie, pistillate, was received from Ohio in 1890. In vigor it ranks three; in hardiness, two; firmness, four; quality, six; weight of berry, one third of an ounce; total product, 85 ounces. During this season of excessive drouth this variety appears to have proved relatively more successful than in more favorable seasons.

Haverland, pistillate, was received from New Jersey as early as 1887. It has slowly but steadily won its way to a somewhat prominent position as a market variety, and at the same time as an excellent variety for the home plantation. In vigor it ranks as low as four; hardiness, two; firmness, three; quality, two; weight of berry, half an ounce; total product, 76 ounces.

Beauty, bisexual, received in 1892, from Michigan Agricultural College. Vigor, three; hardiness, one; firmness five; quality, three; weight of berry, half an ounce; total product, 76 ounces.

Swindle, pistillate, was received from G. H. & J. H. Hale, South Glastonbury, Conn., in 1892. Vigor, four; hardiness, one; firmness, three; quality, six; weight of berry, one third of an ounce; total product, 76 ounces. This forbidding name was apparently bestowed with the hope that the variety might be kicked into notoriety as a consequence.

Charlie, pistillate, was received from Virginia in 1894. Vigor and hardiness rank, one; firmness, three; quality, four; weight of berry, one third of an ounce; total product, 75 ounces.

Gipsy, pistillate, was received from Michigan Agricultural College in 1894. Vigor and hardiness each three; firmness, four; quality, five; weight of berry, half an ounce; total product, 75 ounces. A variety under this name was tested here many years since. The present one is apparently distinct—the plant being more vigorous.

Splendid, bisexual, was received from Illinois in 1893. Vigor and hardiness each one; firmness, three; quality, one; weight of berry, one ounce; total product, 75 ounces.

Mary Marshall, and several others were planted either in late spring or in summer, for which reason the tabulation does not in such cases properly express their relative character so far as productiveness is concerned.

RASPBERRIES (*Rubus*).

For several years past, the plat of raspberries (including blackberries, which alternate with them), has been in an unsatisfactory condition, such as could only be effectually remedied by replanting in other ground. This was accordingly done

last spring, so far as plants were available for the purpose. The remaining vacancies will, in most cases, be filled during the present autumn or next spring, with plants propagated for the purpose upon the premises, except in the case of varieties too rare or recent for the purpose. Of small fruits, ten plants constitute a set.

The foliage of many varieties of raspberry, especially those of *Idæus* and *strigosus* parentage, is frequently attacked by a fungus and which is confined to the lower surface of the leaf, seriously affecting the size and quality of the fruit and capacity to aid the growth of the plant. This season has not proved an exception, though the attack may have been slightly less severe than usual. A few varieties of *strigosus* parentage, such as Cuthbert, Golden Queen, and perhaps a few others, appear to be in a measure exempt from this malady, as is the case with the varieties of *occidentalis*. The spray of copper sulphate, so generally effective against fungi, appears to be ineffective in this case, possibly for the reason that, as usually applied, it rarely reaches the under surface of the foliage, where only this parasite occurs. Another season's experiments are needful to solve this doubt.

Anthraxnose continues to manifest itself mainly upon the blackcaps, although, with the free use of the spray of copper sulphate, its depredations have not proved very serious. Most of the suckering varieties have, thus far, escaped the malady in whole or in part.

The only insects which have been at all troublesome this season are the leaf-miners, which, apparently, are merely estrays from the adjacent blackberries.

The general spraying given raspberries, in common with the entire plantation, in March, was repeated upon raspberries April 27, with one pound of copper sulphate dissolved in 250 gallons of water.

May 3, raspberries were sprayed for anthracnose, using Bordeaux mixture of the usual strength.

June 21, repeated the spray for anthracnose, with a solution of one and a half ounces of copper sulphate in fifty gallons of water.

Special notices are appended of a few comparatively recent varieties, as well as of several older ones; some of them as worthy of increased attention by planters, while others are apparently unworthy.

American Everbearing, blackcap, has been on trial here, two years only. Thus far it has shown no everbearing tendency, nor does it otherwise give promise of valuable qualities.

Cardinal was received from Kansas, and has been noticed in previous reports as Greisa (the name of the introducer). It is intermediate, possibly a hybrid, between *strigosus* and *occidentalis*. It roots somewhat reluctantly, from both suckers and tips. It is hardy and fairly productive of more than medium-size fruit, though scarcely prolific enough to prove satisfactory as a market variety.

Champlain was only planted last spring and has barely shown a few imperfect specimens, from the appearance of which, as well as from the habit of the plant, it is apparently identical with a variety grown here several years ago and condemned as unworthy.

Church (Royal), a native of Ohio, was received in 1892. Although put forth with a "flourish of trumpets," it has not developed qualities such as would warrant a recommendation for extensive planting.

In the following tables the weight of a specimen in ounces or fractions of an ounce is given, instead of size, as a more accurate indication of the relative value; while their productiveness is estimated upon the scale running from 1 to 10, 1 representing the highest degree of productiveness.

RASPBERRIES (*Rubus*).

Number.	Name.	Species.	Received.	Bloomed.	First picking.	Last picking.	Weight of berry in ounces.	Productiveness, scale 1 to 10.
1	American Everbearing	Occidentalis	1893	May 28.	June 29.	July 29.	1.25	2
2	Brandywine	Strigosus	1888	May 31.	July 5.	Aug. 14.	1.16	4
3	Cardinal	Neglectus	1890	May 29.	June 26.	Aug. 5.	1.7	1
4	Carman	Occidentalis	1890	May 24.	June 24.	July 19.	1.17	1
5	Caroline	Neglectus	1888	May 30.	June 28.	July 10.	1.10	1
6	Centennial	Occidentalis	1888	May 23.	June 25.	July 10.	1.13	1
7	Champlain	Strigosus	1895					
8	Church	Strigosus	1894	May 31.	June 28.	July 10.	1.14	2
9	Conrath	Occidentalis	1893	May 30.	June 28.	July 10.	1.9	2
10	Cromwell	Occidentalis	1889	May 28.	June 25.	Aug. 7.	1.15	1
11	Cuthbert	Strigosus	1888	May 31.	July 5.	Aug. 7.	1.10	1
12	Doollittle	Occidentalis	1888	May 24.	June 26.	Aug. 7.	1.17	1
13	Early King	Occidentalis	1888	May 29.	June 24.	Aug. 5.	1.22	1
14	Early King	Strigosus	1894	May 31.	June 28.	Aug. 7.	1.8	2
15	Emmett	Strigosus	1895					
16	Enreka	Occidentalis	1895					
17	Farnsworth	Occidentalis	1891	May 30.	June 26.	Aug. 2.	1.20	1
18	Gladstone	Strigosus	1893	May 30.	June 26.	Aug. 2.	1.16	2
19	Golden Queen	Strigosus	1888	May 31.	June 29.	Aug. 10.	1.12	2
20	Green (New)	Occidentalis	1895					
21	Gregg	Occidentalis	1888	May 31.	July 3.	Aug. 7.	1.13	4
22	Hansell	Strigosus	1888	May 30.	June 20.	Aug. 10.	1.12	2
23	Herstine	Idæus	1888	May 31.	June 25.	Aug. 5.	1.10	3
24	Hilborn	Occidentalis	1888	May 30.	July 6.	Aug. 5.	1.27	3
25	Idaho	Occidentalis	1890	May 29.	July 1.	Aug. 19.	1.16	4
26	Indiana	Occidentalis	1888	May 30.	June 26.	Aug. 7.	1.12	2
27	Johnston	Occidentalis	1888	May 30.	June 29.	Aug. 7.	1.24	1
28	Kansas	Occidentalis	1892	May 30.	June 28.	Aug. 7.	1.12	1
29	Kenyon	Strigosus	1895					
30	London	Strigosus	1895					
31	Lovett	Occidentalis	1891	May 29.	July 1.	July 29.	1.14	1
32	Marlboro	Strigosus	1888	May 30.	June 26.	Aug. 7.	1.8	1
33	Miller	Strigosus	1895					
34	Mills 15	Occidentalis	1895					
35	Muskingum	Strigosus	1893	June 3.	June 28.	Aug. 5.	1.15	1
36	Nemaha	Occidentalis	1888	May 30.				
37	Ohio	Occidentalis	1888	May 29.	June 26.	July 29.	1.15	1
38	Older	Occidentalis	1893	May 28.	June 8.	July 25.	1.10	1
39	Palmer	Occidentalis	1890	May 24.	June 26.	July 31.	1.14	1
40	Progress	Occidentalis	1890	May 29.	June 28.	July 22.	1.13	5
41	Reeder	Strigosus	1888	May 31.	June 25.	Aug. 5.	1.9	1
42	Reliance	Strigosus	1888	May 31.	June 26.	Aug. 10.	1.10	3
43	Shaffer	Neglectus	1888	May 31.	June 23.	Aug. 5.	1.10	1
44	Smith Giant	Occidentalis	1892	May 29.	June 19.	Aug. 7.	1.12	4
45	Smith Prolific	Occidentalis	1893	May 30.	June 29.	July 17.	1.12	1
46	Sonhegan	Occidentalis	1888	May 28.	June 25.	July 29.	1.14	2
47	Superlative	Strigosus	1895					
48	Thompson	Strigosus	1890	May 30.	June 24.	Aug. 5.	1.12	2
49	Thwack	Strigosus	1895	May 31.	June 28.	Aug. 5.	1.18	4
50	Turner	Strigosus	1888	June 3.	July 1.	Aug. 10.	1.21	4
51	Tyler	Occidentalis	1888	May 25.	June 25.	July 19.	1.16	
52	Winona	Occidentalis	1895	May 29.	June 26.	July 31.	1.16	1
53	Wragg	Occidentalis	1895					

Conrath, a Michigan *occidentalis* seedling, has already won more or less reputation as a profitable early market variety, comparing very favorably with others of its season, both as respects plant and fruit.

Cromwell, a Connecticut seedling, is much like the preceding in season, as well as in general character, though scarcely its equal in size of fruit.

Early King is apparently a variety of *strigosus*, possessing the vigor and hardness of that species. So far it is productive of fruit of fine size and good quality.

Farnsworth was received from Ohio in 1891. It possesses valuable characteristics as a market blackcap, and is well worthy of trial for that purpose.

Gladstone, though bearing an honored name, has proved to be a disappointment. The fruit is far from attractive in either appearance or quality. The young canes produce an autumn crop of fruit, a large proportion of which, however, in this climate, is usually ruined by frost before maturity.

Palmer is vigorous and productive. In weight of berry it is fully medium, while its bright color and good flavor render it very desirable for either family or market. It is early, though not the earliest.

Reeder (formerly *Reder*, by an error of the introducer), is still one of the most excellent red raspberries, so far as weight of berry, bright color, and fine flavor are concerned, only needing greater vigor and productiveness to adapt it to commercial purposes.

Thwack was received last spring. It is an old variety, which was tested here ten or twelve years ago, and although large, hardy, vigorous, productive, and a good handler, it proved so utterly deficient in quality that it was dropped. It is yet occasionally planted for market.

BLACKBERRIES (*Rubus villosus*).

The stand of blackberries having been for several years in a very unsatisfactory condition, a new plat was planted last spring, which when well grown is intended to supersede the former one.

Blackberries having been sprayed April 1, together with the entire plantation, were again treated, April 27, with a weaker solution, consisting of one pound of copper sulphate in 250 gallons of water, to prevent anthracnose.

May 23, anthracnose beginning to appear upon the young canes, the plat was treated with a spray of Bordeaux mixture, consisting of four pounds of copper sulphate and nine pounds of stone lime (that quantity proving necessary under the prussiate of potash test) in forty gallons of water.

June 21, repeated the spray for anthracnose, using one and one half ounces of copper sulphate dissolved in fifty gallons of water.

The only notable insect which has depredated upon the blackberry during the season is the leaf-miner, *Tischeria malifoliella* Clemens, which has proven increasingly troublesome for several years, and has this season become so numerous as to nearly or quite ruin a very large percentage of the foliage. So serious has the injury become that some means of preventing or exterminating it seemed indispensable.

Saunders, in "Insects Injurious to Fruits," pages 114 and 115, notices the apple leaf-miner as also attacking the foliage of the blackberry, this being assumed to be the insect in question, although this may be doubted since he does not accurately describe its habits as observed here, adding, moreover, "It has never been known to do any material injury."

Finding it indispensable that a remedy be applied, and observing that the larvæ were protected by the upper and lower tissues of the leaf, between which they operate, it was obvious that no poisonous spray, whether caustic or otherwise, could effectually reach them. As a dernier resort, in view of this dilemma, the infested leaves were removed and burned, while the larvæ were yet at their work. Later a few leaves were again attacked. These were treated in the same manner.

The result of such treatment can only become manifest when it can be observed through its influence upon the growth of the coming year. Quite possibly a better knowledge of the life habits of the insect in its transformations might point to a more effective or economical method of attacking it.

BLACKBERRIES (*Rubus villosus*).

Number.	Name.	Planted.	First bloom.	First picking.	Last picking.	Weight of berry in ounces.	Quality—scale 1 to 10.	Productiveness—scale 1 to 10.
1	Agawam	1888	May 25.	July 12.	Aug. 1.	1.5	2	4
2	Ancient Briton	1888	May 28.	July 13.	Sept. 10.	1.3	7	2
3	Bonanza	1888	May 31.	July 13.	Sept. 14.	1.6	4	1
4	Childs	1892						
5	Early Cluster	1888	June 1.	July 12.	Aug. 16.	1.8	3	1
6	Early Harvest	1888	June 1.	July 8.	Aug. 26.	1.9	2	6
7	Early King	1890	June 1.	July 8.	Aug. 5.	1.7	2	4
8	Early Mammoth	1891	June 1.	July 13.	Aug. 31.	1.5	4	1
9	Eldorado	1892	May 30.	July 13.	Aug. 14.	1.7	4	1
10	Erie	1888	June 6.	July 20.	Aug. 1.	1.5	5	9
11	Fruitland	1892	June 6.	July 31.	Aug. 14.	1.3	5	6
12	Kittatinny	1888	June 1.	July 19.	Sept. 14.	1.6	3	5
13	Knox	1888	May 31.	July 13.	Sept. 16.	1.6	3	6
14	Lawton	1888	June 1.	July 16.	Sept. 14.	1.6	3	6
15	Lincoln	1891	May 30.	July 16.	Aug. 24.	1.9	5	3
16	Maxwell	1894						
17	Minnewaska	1888	June 1.	July 13.	Aug. 31.	1.5	5	5
18	Nevada	1888	May 31.	July 15.	Sept. 12.	1.5	4	1
19	Ohmer	1892	June 6.	July 17.	Aug. 31.	1.6	3	5
20	Oregon (Everbearing)	1892	May 31.	July 25.	Sept. 14.			
21	Sanford	1894						
22	Snyder	1888	May 28.	July 13.	Sept. 7.	1.10	1	1
23	Stone	1890	May 30.	July 19.	Aug. 16.	1.10	5	4
24	Taylor	1888	May 31.	July 17.	Sept. 15.	1.11	1	4
25	Thompson	1890	May 31.	July 13.	Aug. 24.	1.5	5	4
26	Wachusett	1890	May 29.	July 13.	Aug. 7.	1.16	3	1
27	Wallace	1888	May 29.	July 16.	Sept. 12.	1.8	3	3
28	Western Triumph	1888	May 31.	July 15.	Aug. 14.	1.8	4	1
29	Wilson	1888	May 30.	July 13.	Aug. 26.	1.4	5	4
30	Wilson Jr.	1888	May 31.	July 13.	Aug. 26.	1.5	5	4

Ancient Briton and Western Triumph are both vigorous and hardy, though small and inclined to overbear. The former is popular at the west as a market variety. Both require superior cultivation and close pruning to maintain an acceptable size for market.

Bonanza, Early Cluster, and Nevada have given better results this year than usual. Childs, thus far, has given little indication of value. Having been transplanted last spring, it has not yet shown fruit.

Early harvest was badly injured by cold last winter. It must have winter protection to succeed even in our lake shore climate.

Early King and Early Mammoth are comparatively recent varieties, usually quite productive of fine-size fruit. They are apparently well worthy of trial for market, though they may perhaps prove deficient in hardness.

Eldorado, Lincoln, and Ohmer have been too recently planted here to warrant a conclusion, as to their measure of success, although they are well spoken of in certain other localities.

Maxwell, Piasa, and Sanford were first planted here last spring, and must therefore have further opportunity to develop their characteristics.

Oregon (Everbearing) is a curiosity, with cut-leaved foliage, a vigorous, semi-trailing habit of growth, blooming and fruiting in succession.

Stone (Hardy) is a vigorous, spreading grower, said to be unusually hardy. As generally grown its fruit is quite too small for either home use or market.

Wachusett (and Hoosic also) is chiefly notable for the absence of spines, although Wachusett is of fine flavor. Both are quite too small. So far, no spineless variety of practical value has been introduced to the public.

SERVICE BERRY (*Amelanchier*).

Only three varieties of this species, all of them of dwarf habit, have so far been planted here. These are, an unnamed variety, designated in our lists as common; one known as Success, and one received from Indiana as Mammoth.

So far as either plants or fruit are concerned, the difference between these alleged varieties, as grown here, is very slight, if even perceptible.

The fruit is so specially attractive to birds that the entire crop is invariably appropriated by them, even before fully ripe, unless protected by netting or otherwise. Indeed, so decided is such preference, that this fruit might perhaps be profitably planted as the means of diverting the attention of the birds from other fruits of similar season.

In quality, this fruit is by no means equal to the huckleberry, which it closely resembles.

CURRANTS (*Ribes*).

A new plantation of currants was made last spring, so far as plants were available for the purpose, and at the same time the plants in the old plat were earthed up to insure the rooting of sufficient additional plants for the filling of the new plat next spring.

March 18, while yet dormant, currants (in common with the entire plantation) were sprayed with a solution of two pounds of copper sulphate in 50 gallons of water.

April 27, being then in foliage, they were again sprayed with a solution of one pound of copper sulphate in 250 gallons of water.

May 8, the currant worm (*Nematus ventricosus*) having attacked the foliage, the infected plants were treated with a spray consisting of one pound of Paris green in 250 gallons of water.

May 27.—Previous season's trials having shown that liver of sulphur (potassium sulphide), the antidote for gooseberry mildew, is also a preventative of premature loss of currant foliage, the spray of this preparation was also applied to the currant, and this was repeated June 4, June 19, and July 5.

Later a spray of buhach in water was applied to subdue the second brood of currant worms, which appeared just as the fruit was ripening.

Aside from the currant worm already referred to, the twig borer (*Aegeria tipuliformis*) has been the only troublesome insect this year. A careful search for this insect will scarcely be made prior to the pruning, next spring, though the indications are that (owing doubtless to persistent efforts for its destruction during the past two or three years) its numbers may prove to have considerably diminished.

In the following table, in the column of weights of single berries, expressed in fractions of an ounce, it will be seen that in all cases the denominator of the fraction gives the number of berries in an ounce. The extreme drouth of the season doubtless considerably diminished the weights as recorded. The quality and productiveness given are *relative*, being arrived at by comparing each with others of the same species.

CURRANTS (*Ribes*).

Number.	Name.	Species.	Planted.	Bloomed.	Ripened.	Weight of berry in ounces.	Quality—scale 1 to 10.	Productiveness—scale 1 to 10.
1	Champion (Black)	Nigrum	1889	May 2..	June 27.	1-17	1	4
2	Cherry	Rubrum	1888	May 1..	June 21.	1-28	3	3
3	Crandall	Aureum	1889	May 1..	July 2.	1-20	10	2
4	English (Black)	Nigrum	1892	May 3..	June 29.	1-18	5	4
5	Fay	Rubrum	1888	May 1..	June 21.	1-27	3	2
6	Holland (Long Bunched)	Rubrum	1889	May 2..	June 24.	1-44	5	2
7	Knights (Improved) .....	.....	1895	.....	.....	.....	.....	.....
8	Lakewood	Rubrum	1890	May 1..	June 21.	1-25	3	6
9	Lee	Nigrum	1888	May 3..	June 29.	1-21	7	2
10	London (Red)	Rubrum	1890	May 2..	June 22.	1-37	6	2
11	Moore Ruby	Rubrum	1890	May 1..	June 21.	1-32	2	2
12	Moore Select	Rubrum	1890	May 2..	June 21.	1-35	5	2
13	Naples (Black)	Nigrum	1888	May 3..	June 29.	1-37	5	5
14	North Star	Rubrum	1890	May 1..	June 21.	1-45	3	1
15	Red Dutch	Rubrum	1888	May 1..	June 22.	1-43	2	2
16	Ruby Castle	Rubrum	1892	May 1..	June 21.	1-45	4	1
17	Saunders	Nigrum	1890	May 4..	June 29.	1-28	7	4
18	Versaillese	Rubrum	1888	May 1..	June 21.	1-39	3	3
19	Victoria	Rubrum	1888	May 1..	June 21.	1-41	5	2
20	Wales (Prince of)	Nigrum	1890	May 4..	June 29.	1-15	7	4
21	White Dutch	Rubrum	1888	May 1..	June 21.	1-44	1	2
22	White Gondoin	Rubrum	1890	May 2..	June 15.	1-30	1	1
23	White Grape	Rubrum	1888	May 2..	June 21.	1-33	2	1
24	Wilder	Rubrum	1890	May 1..	June 29.	1-20	3	3

Cherry is large but with short clusters, quite acid, but popular on account of its large size. An indifferent grower.

Crandall, a variety of the old yellow-flowering currant, though large is of no practical value. It has been omitted in our recent planting.

Fay is much like Cherry in both plant and fruit. It apparently requires superior culture to fully develop its best characteristics.

Holland (Long Bunched) is the most vigorous variety in our collection. It holds its foliage more persistently than any other variety, if we except Victoria. It is late in ripening, with long bunches but small berries. Productive.

Lakewood is a recent Ohio variety which, so far, has shown few valuable qualities.

London (Red) is supposed to be identical with London Market; it is vigorous and very productive, and, though neither large nor of high quality, is a profitable market variety.

Naples (Black) is very vigorous and productive. It has long been considered the leading market variety of its species.

North Star, a recent Minnesota variety, is exceedingly vigorous and said to be productive, a characteristic not yet determined so far as this locality is concerned. The clusters are long, but, so far, the berries are not large.

Red Dutch, so far, everything considered, has no superior among red varieties.

Victoria, on account of its partial exemption from attacks of the twig borer (*Aegeria tipuliformis*) is the leading commercial variety in localities in which that insect is troublesome. It is slightly later in ripening and retains its foliage longer than most varieties.

Wales (Prince of), a comparatively recent variety of *nigrum*, although less productive has this year produced larger specimens than any other of its species.

White Dutch and White Gondoin are very similar. In mild, rich flavor they have so far no superior.

Wilder has been grown here several years without developing specially valuable qualities, although in a few other localities it has recently been highly commended.

GOOSEBERRIES (*Ribes*).

Gooseberry and currant rows being adjacent have received the same treatment, so far as spraying is concerned, and since both are alike subject to the attacks of the currant worm (*Nematus ventricosus*), their treatment for this malady was also the same, excepting only the Industry gooseberry, which, June 21, was treated with a spray of zenoleum (a preparation manufactured by a Detroit firm and represented as a non-poisonous insecticide, fungicide, and disinfectant). The application was effective against mildew, for which purpose it was applied.

Liver of sulphur, applied as stated under the head of currants, has apparently proved to be a specific in both cases, except that in the case of a plant or two of Triumph gooseberry, under the shelter of some evergreens, spoken of in last year's report, which, perchance lacking free exposure, should for this reason have received unusually thorough treatment.

The crumpling of the terminal leaves, mostly of such varieties as Houghton and Pale Red, has again appeared this year. It is supposed to be the work of a minute aphid, which attacks the under side of the leaves and which, in consequence, are drawn so compactly together that a spray can scarcely be made to penetrate the mass effectively. The remedy resorted to has been to cut away and burn affected tips. The attack this year has apparently been less severe than heretofore.

Except as noted, the gooseberry has been exempt during the season from serious attacks of either insects or fungi.

As in the case of currants, the plants were "earthed up" last spring for the purpose of securing rooted plants to be used next spring in completing a new plantation of this fruit, with a more even stand of plants, for this reason better adapted to Station purposes.

GOOSEBERRIES (*Ribes*).

Number.	Name.	Species.	Planted.	Bloomed.	Ripened.	Weight of berry in ounces.	Quality—scale 1 to 10.	Productiveness —scale 1 to 10.
1	Apex.....	Cynosbati	1893	May 2..	Aug.	1-6	2	
2	Auburn.....	Grossularia	1890	May 3..	July 2..	1-2?	1	7
3	Bendelon.....	Grossularia	1894			1-7		
4	Champion.....	Grossularia	1891	May 2..	July 2..	1-6	2	2
5	Chautauqua.....	Cynosbati	1892	May 2..	July 2..	1-4	2	
6	Columbus.....		1895					
7	Downing.....	Cynosbati	1888	May 2..	July 8..	1-8	4	1
8	Golden (Prolific).....	Grossularia	1891	May 2..				
9	Houghton.....	Hirtellum	1888	May 2..	July 2..	1-13	1	1
10	Industry.....	Grossularia	1889	May 2..	July 1..	1-2	3	1
11	Keepsake.....	Grossularia	1894	May 2..				
12	Lancashire (Lad).....	Grossularia	1894	May 2..				
13	Orange (Early).....	Grossularia	1890	May 2..	June 24..	1-5	2	4
14	Pale Red.....	Hirtellum	1890	May 2..	July 1..	1-13	1	1
15	Pearl.....	Grossularia	1890	May 3..	July 2..	1-7	1	1
16	Red Jacket.....	Grossularia	1890	May 2..	June 8..	1-4	2	4
17	Smith.....	Cynosbati	1888	May 2..	June 28..		1	5
18	Strubler.....	Cynosbati	1892	May 2..				
19	Tree.....	Cynosbati	1892	May 2..	July 16..	1-14	3	5
20	Triumph.....	Grossularia	1890	May 2..	July 16..	1-3	3	3

Apex, a native of Oregon, has the habit and foliage of the Europeans, though apparently distinct in fruit. It is yet too soon for it to have properly manifested its peculiarities.

Auburn is a name temporarily applied to an unknown foreign variety of excellent quality, early, and of large size.

Pendelon (the name of the person from whom the variety was received), is an untested seedling of foreign parentage, originated at Detroit, Michigan.

Champion, Industry, Pearl, and Triumph are all of European extraction and have been sufficiently tested here to justify their commendation for extended trial, but only with persistent spraying to ward off the attacks of mildew.

Chautauqua, though highly spoken of elsewhere, requires further trial here.

Columbus, Golden (Prolific), Keepsake, Lancashire (Lad), and Orange (early), are all understood to be of foreign parentage. With persistent spraying they have so far escaped mildew, but further trial is needful to determine their value here.

Downing is beyond doubt the most popular of our alleged native varieties, for commercial planting, though not of superior flavor. Smith is even larger and of superior quality, but the plant lacks vigor and productiveness.

Houghton and Pale Red are much alike, so far as both plant and fruit are concerned. They are healthy and vigorous, though of slender habit, but the fruit, though abundant and of good quality, is quite too small to suit the popular taste.

Red Jacket, judging from the habit of the plant and the size and general appearance of the fruit, though an American seedling, is probably of foreign parentage. With persistent spraying it is healthy and vigorous and the fruit of fine size. Further trial is needful.

Strubler, from Illinois, and Tree, from Ohio, are unmistakable natives, healthy and vigorous, but have yet to develop their full qualities here.

CHERRIES (*Prunus*).

Notwithstanding the renewal, and even increased intensity, of the drouth of the past season, as compared with that of 1894, frequent and thoroughly clean cultivation has sufficed, in the case of the cherry, as also with the other tree fruits, to secure a very satisfactory growth of wood, as well as a fair development of fruit upon such trees as were in bearing. Even the few trees which, up to last year, had failed to repair the injury due to the excessively wet spring of 1893, have now so far improved as to afford the promise of permanent recovery.

After the spray applied to cherries in common with other fruits in March last, further treatment was not found needful till June 24, when cherries (and pears also) were given a spray of strong tobacco water, as a remedy for the slug (*Eriocampa cerasi*), which made its first appearance at that time. A very few appeared subsequently, but yielded readily to a repetition of the same treatment. Except as already described, neither insects nor fungi have been observed to attack the cherry, either tree or fruit, the curculio apparently having confined his attention to early peaches and plums.

In the following table the quality of the fruit is arrived at by comparing each variety with others of its species, as Duke varieties with Dukes, Morellos with Morellos, etc.

Under the head of weight, as in the case of small fruits, it will be observed that the denominator of the fraction gives the number of fruits in an ounce.

The degree of productiveness as given under that head, has reference to the product of the year 1895 only.

CHERRIES (*Prunus*).

Number.	Name.	Species.	Planted.	Bloomed.	Ripened.	Weight of fruit in ounces.	Quality—scale 1 to 10.	Productiveness—scale 1 to 10.
1	Abbesse	Morello	1888	May 2	July 3	1.8	2	8
2	Angonleme	Morello	1888	May 2	July 8	1.5	2	5
3	Badacconyi	Avium	1894	May 4				
4	Baender	Morello	1892	May 3				
5	Bessarabian	Morello	1888	May 2	June 26	1.7	2	2
6	Brusseler Braune	Morello	1888	May 3	June 26	1.7	1	8
7	Carnation	Duke	1891	May 3	June 24	1.4		
8	Centennial	Avium	1893	May 4				
9	Choisy	Duke	1888	May 2	June 20	1.5		6
10	Cleveland	Avium	1891	May 2	June 19	1.4		
11	Coe (Transparent)	Avium	1888	May 2	June 20	1.4		7
12	Downer	Avium	1888	May 2	July 1	1.5		7
13	Dyehouse	Morello	1891	May 3	June 12	1.9		3
14	Eagle (Black)	Avium	1888	May 1	June 28	1.5	2	5
15	Early Purple	Avium	1892					
16	Elton	Avium	1892	May 2	June 18	1.4		
17	Eeperen	Morello	1892	May 3				
18	Eugenie	Duke	1888	May 2	June 18	1.5		6
19	Everbearing	Morello	1892	May 3				
20	Florence	Avium	1892	May 3				
21	Fraendorfer Weichsel	Morello	1888	May 2	July 3	1	1	2
22	Galopin	Morello	1891	May 3				
23	Geo. Glass	Morello	1888	May 3	July 3	1.8	5	5
24	Griotte du Nord	Morello	1888	May 3	July 18	1.7	4	5
25	Hortense	Duke	1888	May 2		1.5	3	8
26	Ida	Avium	1893	May 4				
27	King Amarelle	Morello	1891	May 3	June 18			
28	Knight Early	Avium	1891	May 3				
29	Late Duke	Duke	1890	May 3				
30	Lithaner Weichsel	Morello	1892	May 3	July 10	1.8	3	1
31	Lutovka	Morello	1888	May 3	July 8	1.4	2	4
32	Magnifique	Duke	1888	May 4	July 13	1.5	3	9
33	Mahaleb	Mahaleb	1893	May 4				
34	Mary (Kirtland)	Avium	1891	May 2	June 13	1.4		
35	Mastodon (Black)	Avium	1893	May 4				
36	May Duke	Duke	1888	May 2	June 18	1.5	2	7
37	Mezel	Avium	1891	May 2	June 18			
38	Minnesota (Ostheim)	Morello	1892	May 3	June 29	1.6	5	4
39	Montmorency	Morello	1888	May 3	June 17	1.7		2
40	Montmorency, Ordinaire	Morello	1891	May 3	June 25	1.6		
41	Montrenil	Duke	1890	May 3	June 26	1.5	5	2
42	Napoleon	Avium	1892	May 2	June 24	1.4		
43	Northwest	Morello	1893	May 4	July 8	1.12	4	1
44	Ohio (Beauty)	Avium	1891	May 3				
45	Olivet	Duke	1890	May 2	June 24	1.4		6
46	Orel 25	Morello	1893	May 4				
47	Orel 27	Morello	1893	May 4				
48	Ostheim	Morello	1891	May 2	July 1	1.11	5	2
49	Ostheimer	Morello	1893	May 4	July 12	1.8	6	6
50	Phillippe (Louis)	Morello	1888	May 2	June 24	1.4	4	3
51	Richmond	Morello	1892	May 2	June 20	1.7	3	1
52	Rockport	Avium	1891	May 2	June 14	1.4		
53	Royal Duke	Duke	1891	May 3				
54	Sklanka	Morello	1888	May 2	June 17	1.6		3
55	Spate Amarelle	Morello	1888	May 3	July 3	1.7	5	6
56	Strans Weichsel	Morello	1888	May 2	June 27	1.5	3	4
57	Suda	Morello	1893	May 4	July 15	1.5	3	1
58	Tartarian (Black)	Avium	1888	May 2	June 21	1.3	3	6
59	Wier	Morello	1893	May 4	June 22	1.7		
60	Windsor	Avium	1891	May 2	June 22	1.4		
61	Wood (Gov.)	Avium	1891	May 2	June 18	1.5		
62	Wragg	Morello	1892	May 4	July 1	1.6	6	3
63	Spanish (Yellow)	Avium	1891	May 2		1.4	1	6

Abbesse, Angouleme, Bessarabian, Brusseler Braune, Frauendorfer Weichsel, George Glass, Griotte du Nord, Lithauer Weichsel, Lutovka, Sklanka, Spate Amar-elle, and Strauss Weichsel were all received from Prof. Budd of Iowa Agricultural College, and are understood to be among those imported by him from eastern Europe.

Of the above Abbesse is, so far here, a slow, weak grower and a moderate bearer of rather small, acid fruit.

Sklanka, another of these, is a moderately vigorous grower, in habit of growth and productiveness, as well as in quality of fruit, much like Montmorency.

The remaining ones are vigorous growers, generally rather upright for Morellos, ripening from late to very late; the fruit of good size, dark color, and acid. So far they have improved from year to year in productiveness and size of fruit. They are apparently slow in developing their characteristics in these respects.

Badaconyi, Baltavari, and Moduyansky, apparently of the sweet or *avium* class, received through the Department of Agriculture from southeastern Europe, may be expected to fruit here next season.

Baender, Everbearing, Galopin, King Amarelle, Minnesota (Ostheim), Northwest, Orel 25, Orel 27, Ostheim, Ostheimer, Suda, and Wier 2, have been received at sundry times from various sources. All are Morellos and several are known, while others are believed, to be of western origin. Nearly all have now fruited here, but many of them so lightly that special notices and descriptions are deferred till they shall have more fully developed their respective qualities.

Carnation has so far proved a shy bearer, though a vigorous grower.

Centennial and Mastodon (Black) are understood to be California seedlings, of the *avium* class. They have not yet shown fruit here.

Choisy, a Duke, though but a moderate bearer, is one of the most beautiful and excellent of cherries. Where the Dukes succeed, no farmer's or amateur's garden should be without a tree or two of this variety.

Cleveland, Downer, Napoleon, Rockport, Tartarian (Black), and Wood (Gov.), are all valued as market varieties, where the sweet cherries are employed for this purpose.

Coe (transparent), very beautiful and excellent, also Eagle (Black), Early Purple, are of the earliest, with Elton, Florence, Ida, Knight Early, Mary (Kirtland), and Mezel are all more or less popular amateur sweet varieties. They require further trial here prior to comparative characterization.

Dyehouse is an early and productive Morello, with a very slender, drooping habit. Neither tree nor fruit has much, aside from earliness and productiveness, to recommend it.

Esperen, though it bloomed last spring, has not yet fruited here. It has the habit of growth of the Morellos.

Eugenie is a fine duke variety, which apparently deserves more attention than it has yet received. The fruit is excellent, though its productiveness here can not yet be vouched for.

Hortense is vigorous and productive, and the fruit large and excellent. In season it is about medium.

Late Duke is an old variety, which has not so far been largely planted. Apparently it lacks productiveness.

Magnifique is desirable on account of its extreme lateness as well as its fair size and quality. Its reputation for productiveness here is yet to be established.

Mahaleb is the stock, largely used by nurserymen, on which to work cherries. Its fruit is of little account. The dwarfing influence of this, when employed as a stock, appears to be more a myth than a reality.

May Duke is the type of its class. It is too well known and valued to need either description or characterization.

Montmorency, Montmorency Large, and Montmorency Ordinaire seem to need investigation. Whether they are really three varieties, as would appear from current nursery catalogues, or two only, or in fact but one, seems uncertain. Montmorency Large, received here from a prominent eastern establishment, proves to be Dyehouse.

Montreuil is an early and prolific bearer of good quality, apparently only second to May Duke.

Olivet promises well but requires further trial here.

Phillippe (Louis), is every way highly satisfactory, save that it sadly lacks the essential quality of productiveness.

Richmond (the Kentish of Downing) is universally known as a leading market, culinary cherry, although Montmorency is to some extent superseding it.

Rocky Mountain (Dwarf) has recently been widely and apparently extravagantly lauded. Those tested here are very dwarf and have borne while very young, but the fruit is utterly worthless.

Royal Duke is an old variety, which seems never to have attracted much attention. Experience here so far would seem to justify this.

Windsor, a recent, late, sweet cherry, originating near Windsor, opposite Detroit, has fruited here twice, though but lightly. It promises well as a hardy variety.

Wood (Governor) is valued as a market sweet cherry for localities adapted to this species.

Wragg, originated in Iowa, is popular as an acid cherry, where superior hardiness is requisite. Here it proves to be a slow grower and quite late, though an early and productive variety.

Spanish (Yellow) (Bigarreau of Downing) is a type of the class of firm-fleshed, sweet cherries. It is not even yet excelled in high quality. But for its unfortunate tendency to crack and decay in case of warm, moist weather during the ripening season, it would doubtless even yet hold a leading position in its class.

MULBERRIES (*Morus*).

The varieties of mulberry which ripen their fruits in succession, during several weeks, and hence are said to be everbearing, are the only ones grown here for trial. Of these Downing is very vigorous, though scarcely hardy, even at the lake shore. New American is hardy, vigorous, and productive.

Hicks is a southern variety, evidently out of its proper latitude here.

Russian is a spreading, drooping variety, valuable, if at all, on account of its hardiness, for screens or windbreaks. Its fruit, though abundant, is of no value.

Teas Weeping, when grafted upon upright stocks of suitable height, makes one of the finest of weeping trees.

PEACHES (*Prunus Persica*, *Amygdalus Persica* or *Persica vulgaris*, of various botanists).

A large number of varieties of peach have fruited here this season, many of them for the first time. Of these an unexpectedly large number have proved spurious, indicating an inexcusable amount of error, carelessness, or worse. So far the proportion of error proves to be far greater among peaches than with other classes of fruits. This is stated the more confidently with the hope to induce increased carefulness. The practice here is to keep an accurate record of the source from which each tree is received. A careful description is also made of both fruit and tree of each variety when at maturity.

April 1 to 6, peaches in common with all other tree fruits were sprayed with a solution of two pounds of copper sulphate in fifty gallons of water.

May 15, peaches were sprayed to prevent leaf-curl, using a solution of one pound of copper sulphate in 500 gallons of water.

Early in May the peach trees were "wormed" to eradicate the larvæ of the borer, which had escaped the scrutiny of the previous autumn, and the process was repeated in the following September to dispose of the current season's colony.

May 29, commenced jarring trees for curculio, but so far as peaches were concerned it was mainly confined to the early, smooth-skinned varieties. Even this was soon found to be unnecessary, the attacks of the insect being mainly confined to the adjacent plums.

A few rose chafers were also caught upon peaches, when jarring for curculios, though their depredations were mainly confined to the plum.

The spray to prevent curl-leaf was apparently unnecessary, since the disease, so prevalent in other years, has this season been conspicuously absent, even in unsprayed orchards.

As has been stated in previous reports, the fungus usually so injurious to the young wood and foliage of serrate peaches, has been found to be amenable to a spray of Bordeaux mixture. This fungus also has been entirely absent during this year.

Except as already noted, neither fungi nor insects have been observed attacking the peach during the season.

As a remedy for the unprecedented drouth, the soil has been kept mellow by the persistent use of the cultivator, with the effect that the trees have been maintained in vigorous growth and their fruit developed more perfectly than had been anticipated.

The productiveness as given in the following table is that of the current season. It is given without regard to the size, age, or condition of the trees.

Many of the varieties on trial and noted in the following tables were received without history or description, and hence with no possible means of determining their identity. In a few cases their identity or incorrectness has incidentally betrayed itself. Quite possibly, however, other cases of spuriousness yet remain undetected.

PEACHES.

Number.	Name.	Planted.	Bloomed.	Flowers—l, large; m, medium; s, small.	Glands—g, globose; r, reniform; s, serrate.	Ripened.	Adhesion—c, cling; f, free; s, semi cling.	Weight of fruit in ounces.	Productiveness—scale 1 to 10.
1	Adrian	1892	May 3	l	r				
2	Alberge	1893	May 4	s	r	Aug. 28	f	4	6
3	Albright	1890	May 3	s	r	Sept. 24	f	5	8
4	Alexander	1892	May 3	l	r	July 27	s	3½	10
5	Allen (Stark)	1890	May 3	s	r	b. m. Oct	f	5	3
6	Allen (Taft)	1890	May 3	s	r	Sept. 7	f	4	6
7	Allen (Cleffey), See 39	1890	May 3	s	r	Sept. 7	f	4½	6
8	Alpha	1890	May 3	s	r	Sept. 2	c	5	10
9	Amelia (Carolina)	1890	May 3	s	r	Aug. 24	f	4	9
10	Amsden	1890	May 3	l	g	July 22	s	4	3
11	Andrews	1890	May 3	l	r				
12	Arctic	1894	May 2	l	r				
13	Barber	1893	May 3	l	r	m. e. Sept	f	5	2
14	Beers Smock	1890	May 3	s	r	b. m. Oct	f	5½	5
15	Bell (Fav.)	1890	May 3	s	r	Sept. 19	f	5	10
16	Bequette (Free)	1890	May 3	s	r	Sept. 12	f	5½	
17	Berenice	1894	May 3	s	r				
18	Bickell	1890	May 3	s	r	m. Oct.	f	3	1
19	Bishop	1890	May 3	s	g	Aug. 14	f	4	1
20	Blood Leaf	1890	May 2	l	r	b. Oct.	c	2¼	4
21	Bonanza	1890	May 3	s	r	m. e. Oct	f	3	3
22	Boyle	1890	May 3	s	g	Sept. 3	f	3	1
23	Brandywine	1890	May 3	s	g	Sept. 25	f	5	7
24	Brett	1890	May 4	s	r	e. Oct.	c	3½	4
25	Brigdon (Garfield)	1890	May 3	s	g	Sept. 3	f	3½	6
26	Briggs	1890	May 3	s	r	Sept. 3	f	4	6
27	Brunson	1894	May 2	s	r	Sept. 12	f	2½	1
28	Brown	1894	May 2	l	r	Aug. 19	f	3	1
29	Burke	1892	May 3	l	r	Sept. 13	s	5	7
30	California	1895	May		r				
31	Canada	1892	May 2	l	g	July 25	s	4	1
32	Chair	1890	May 3	s	r	Sept. 27	f	4½	4
33	Champion (Ill.)	1892	May 2	s	r	Aug. 27	f	5	10
34	Champion (Michigan)	1890	May 3	l	s	July 27	s	4	5
35	Chili (Hill)	1888	May 3	l	r	Sept. 10	f	3	1
36	Chili 2 (Engle)	1888	May 2	s	r	Sept. 14	f	5	1
37	Chili 3 (Engle)	1888	May 2	s	r	Sept. 14	f	4	1
38	Chinese Cling	1890	May 3	l	r	b. m. Sept	c	5½	3
39	Cleffey (Allen)	1892	May 3	s	r	Sept. 7	f	4½	6
40	Columbia	1890	May 3	l	r	Sept. 26	f	4	3
41	Conkling	1890	May 3	s	r	Sept. 17	f	4	4
42	Cornett	1894	May 2	l	r				
43	Coolidge (Mammoth)	1892	May 3	s	r	Sept. 19	f	6	6
44	Corner	1890	May 3	s	g	Sept. 11	f	4	2
45	Crosby	1892	May 3	s	r	Sept. 24	f	4	5
46	Caruthers	1890	May 3	s	g	Sept. 17	f	4	1
47	Dennis	1890	May 2	l	g	Sept. 4	f	2½	1
48	Diamond	1892	May 4	s	g				
49	Druid Hill	1890	May 3	s	g	Sept. 23	f	5	10
50	Dumont	1894	May 6	s	r				
51	Dunlap	1892	May 3	s	r	Sept. 1	f	5½	2
52	Dwarf Cuba	1892	May 4	s	r				
53	Early Barnard	1888	May 2	s	r	Aug. 29	f	4	1
54	Early Crawford	1888	May 2	s	g	Aug. 28	f	6	4
55	Early Crawford 1	1888	May 2	s	g	Aug. 29	f	4	8

PEACHES.—CONTINUED.

Number.	Name.	Planted.	Bloomed.	Flowers—l, large; m, medium; s, small.	Glands—g, globose; r, reniform; s, serrate.	Ripened.	Adhesion—c, cling; f, free; s, semi cling.	Weight of fruit in ounces.	Productiveness—scale 1 to 10.
56	Early Crawford 3	1888	May 2	s	g	Sept. 6	f	4½	3
57	Early Michigan 15	1894	May 2	l	g	Aug. 27	f		
58	Early Michigan 16	1894	May 2	l	r	Aug. 27	f	4	1
59	Early Silver	1888	May 2	l	r	Sept. 3	f	3	1
60	Ede	1890	May 2	s	r	Sept. 12	f	6	3
61	Elberta	1890	May 3	s	r	Sept. 11	f	6	3
62	Ellison	1889	May 3	s	r	Sept. 24	f	3	2
63	Engle (Mammoth)	1892	May 3	s	g	Sept. 3	f	4	3
64	Ford New	1894	May 3	s	g				
65	Ford Red	1894	May 2	s	g				
66	Ford 1	1894			r	Aug. 14	s	3½	
67	Ford 2	1894	May 3	s	g				
68	Ford 3	1894	May 4	s	r				
69	Ford 7	1894	May 2	l	r				
70	Foster	1888	May 2	s	g	Aug. 24	f	4	4
71	Fox	1890	May 3	s	g	Sept. 24	f	5	3
72	Garfield (See Brigdon)	1892	May 3	s	g	Sept. 5	f	4	10
73	Geary (Hold On)	1890	May 3	s	r	b.m. Oct.	f	5	4
74	Gem Cling (No. 5)	1890	May 3	s	r	Sept. 20	c	7	1
75	Globe	1888	May 3	s	g	Sept. 12	f	7	8
76	Gold Drop	1890	May 3	l	r	Sept. 18	f	4	1
77	Grant (General)	1890	May 3	s	r	Sept. 27	c	4½	8
78	Great Western	1892	May 2	s	r	m.e. Oct.	c	4	10
79	Gudgeon	1890	May 3	s	r	b.m. Oct.	f	4	4
80	Haas	1890	May 3	l	r	Aug. 12	f	3	2
81	Hale	1888	May 2	l	g	Aug. 10	s	2½	1
82	Hale Cross 1	1888	May 3	l	g	Aug. 8	s	2	1
83	Hance Golden	1890	May 3	s	g	Sept. 7	f	4	6
84	Hance Smock	1890	May 3	s	r	b.m. Oct.	f	4½	3
85	Heath Cling	1890	May 3	s	r	m.e. Oct.	c	6	10
86	Hughes IXL	1892	May 3	l	r				10
87	Hyatt	1888	May 2	l	g	Aug. 10	f	2½	1
88	Hynes (Surprise)	1890	May 3	s	g	Aug. 10	f	2½	5
89	Hyslop	1892	May 2	s	r	Sept. 24	c	5	
90	Ice Mountain	1894	May 3	l	r				
91	Infant Wonder	1892	May 2	s	g	Sept. 3	f	4	1
92	Iron Mountain	1894	May 3	s	r				5
93	Jacques Late	1890	May 3	s	g				
94	Japan Dwarf	1894	May 1	l	r				
95	Jersey Yellow	1895	May 3		r				
96	Jones	1892	May 3	s	g	Sept. 17	f	6	10
97	June Rose	1894	May 2	l	g	Aug. 28	f	4	1
98	June	1894			r				
99	Kalamazoo	1890	May 3	s	r	Sept. 12	f	4	1
100	Kallola	1892	May 2	l	r	Sept. 17	f	5	4
101	La Fleur	1894	May 2	l	r				
102	Late Barnard	1894	May 2	l	r	Sept. 12	f	4	2
103	Late White	1889	May 2	s	r	Sept. 24	f	4	1
104	Lemon Cling	1888	May 4	s	g	Sept. 10	c	4	2
105	Lemon Free	1894	May 2	l	r				
106	Lewis	1890	May 3	l	r	Aug. 14	f	3	1
107	Lock Cling	1892	May 3	s	r	Oct. 22	c	4	3
108	Longhurst	1894	May 2	l	r				
109	Lovell	1894	May 2	s	g	Sept. 19	f	4	1
110	Lovett (White)	1890	May 3	s	r	Sept. 24	f	5	5

PEACHES.—CONTINUED.

Number.	Name.	Planted.	Bloomed.	Flowers—l, large; m, medium; s, small.	Glands—g, globose; r, reniform; s, serrate.	Ripened.	Adhesion—c, cling; f, free; s, semicling.	Weight of fruit in ounces.	Productiveness—scale 1 to 10.
111	Magdala	1890	May 3	s	r	Aug. 28	f	2¾	2
112	Marshall	1890	May 3	s	r	b.m.Oct.	f	4½	3
113	McCollister	1892	May 2	s	r	Sept. 24	f	6	3
114	McKevitt (Cling)	1892	May 3	s	g	b.m.Oct.	c	4	
115	Milhizer	1892	May 2	s	g				
116	Minnie	1892	May 4	s	r	Aug. 28	f	4¾	9
117	Moore	1890	May 4	s	g	Sept. 10	f	4	4
118	Morris Co.	1890	May 4	s	r	b.m.Oct.	f	4	1
119	Morris White	1888	May 2	s	r	Sept. 10	f	3	1
120	Mountain Rose	1888	May 2	s	g	Aug. 17	f	4	1
121	Muir	1890	May 4	l	r	Sept. 12	f	7½	1
122	Murat	1889	May 2	s	r	Sept. 24	f	4	1
123	Mystery	1888	May 2	s	r	Aug. 19	f	5	6
124	N. Am. Apt.	1892	May 3	l	r	Sept. 17	f	5	9
125	Nectarine	1889	May 2	l	r	Sept. 10	f	3	2
126	Need (Barnard)	1890	May 3	s	r	Aug. 31	f	3½	2
127	Neil (Marshall)	1892	May 2	l	r	Oct. 2	f	4¾	6
128	Newington free	1893	May 3	s	r				
129	New Prolific	1894	May 2	s	g				
130	Normand	1892	May 4	s	r	m.e.Oct.	c	4½	10
131	Oldmixon cling	1888	May 2	s	g	Sept. 7	c	3	1
132	Oldmixon free	1893	May 2	s	g	Sept. 12	f	7	
133	Oriole	1894	May 2	l	r				
134	Oscar	1894				b.m.Sep.			
135	Ostrander	1892	May 3	s	g	Aug. 20	f	3½	5
136	Pallas	1894	May 3	l	g				
137	Palmerston	1890	May 3	l	g	Sept. 23	f	8	4
138	Pansy	1890	May 4	s	r	Aug. 15	f	4	10
139	Pearl	1889	May 2	s	g	Sept. 10	f	3½	2
140	Peninsular (Yellow)	1894	May 3	s	g				
141	Pickett	1890	May 3	l	r	b.m.Oct.	c	4½	8
142	Pratt	1890	May 3	s	r	Sept. 3	f	3	4
143	Prince (R. E.)	1890	May 3	s	g	Sept. 6	f	4½	5
144	Princess	1894	May 3	l	g				
145	Princess (of Wales)	1889	May 2	l	g	m.e.Sep.	f	7	1
146	Prize	1892	May 2	s	g	Sept. 24	f	5	9
147	Prize 1	1890	May 4	s	r	Sept. 18	f	4	1
148	Red Cheek (Mel.)	1893	May 3	s	g	Sept. 16	f	4	5
149	Red Seedling	1893	May 3	l	g	Aug. 30	f	2	2
150	Reid	1890	May 3	s	g	Aug. 27	f	6	8
151	Reeves (Fav.)	1890	May 4	s	g	Sept. 7	f	5¾	6
152	Ringold	1890	May 4	s	r	b.m.Oct.	c	6	9
153	River Bank	1892	May 2	l	g	July 24	s	3	2
154	Rivers	1888	May 2	l	r	Aug. 5	s	4	1
155	Roser	1892	May 2	l	r	m.e.Oct.	f	4	7
156	Roseville	1892	May 3	l	r	Sept. 20	c	4	10
157	R. S. Stevens	1891	May 3	s	r	Sept. 9	f	3	10
158	Salway	1890	May 3	s	r	Oct. 15	f	5	1
159	Scott	1890	May 3	s	r	Sept. 17	f	3½	1
160	Sener	1888	May 2	s	r	Sept. 14	f	6	10
161	Shipley	1890	May 2	s	g	Sept. 17	f	6	10
162	Smock free	1888	May 3	s	r	b.m.Oct.	f	5½	1
163	Smock X	1892	May 3	s	r	m.e.Oct.	f	4	6
164	Snow Late	1890	May 3	s	r	Sept. 3	f	3½	2
165	Southern Early	1890	May 3	s	r	Aug. 28	f	4	2

PEACHES.—CONCLUDED.

Number.	Name.	Planted.	Bloomed.	Flowers—l, large; m, medium; s, small.	Glands—g, globose; r, reniform; s, serrate.	Ripened.	Adhesion—c, cling; f, free; s, semicling.	Weight of fruit in ounces.	Productiveness—scale 1 to 10.
186	Spottswood	1892	May 4	l	r				
187	Stark Heath	1892	May 2	s	r	m.e.Oct.	c	6	6
188	Steady	1888	May 2	s	r	b.m.Oct.	f	4½	2
189	Stevens Late	1890	May 3	s	r	b.m.Oct.	f	4	1
170	Stevens Rareripe	1890	May 2	s	r	Sept. 19.	f	4½	2
171	St. John	1890	May 3	s	g	Aug. 19.	f	3	1
172	Strong (Mammoth)	1892	May 2	s	g	Sept. 9.	f	5	2
173	Stump (the World)	1892	May 2	s	g	Aug. 14.	f	3	1
174	Summer Snow	1894			r	Aug. 28.			
175	Surpasse (Melocoton)	1890	May 3	s	r	Aug. 28.	f	4½	10
176	Switzerland	1890	May 3	s	g	Sept. 16.	f	4	4
177	Toledo	1894	May 2	l	r	Aug. 12.	f	2	
178	Toquin	1892	May 3	l	r	Sept. 9.	f	3	10
179	Townsend	1892	May 3	s	g	Sept. 24.	f	6	
180	Troth	1890	May 3	s	g	Aug. 26.	f	3½	3
181	Tnskona	1892	May 6		g				
182	Wager (Spurious)	1892	May 2	s	r	Sept. 27.	f	3	10
183	Walker	1892	May 2	s	g				
184	Walker var.	1893	May 3	s	g	Sept. 24.	f	5½	5
185	Washington	1890	May 3		g	Sept. 12.	f	3¾	5
186	Waterloo	1888	May 3	l	r	July 20.	s	3	1
187	Willet	1894	May 2	l	r				
188	Williamson	1892	May 2	s	g	Sept. 29.	f	4	
189	Wonderful	1890	May 3	s	r	b.m.Oct.	f	4½	2
190	Northern	1892	May 2	s	r	Aug. 30.	f	3	6
191	Yellow Rareripe	1888	May 2	s	g	Aug. 24.	f	2	1

The following notes are intended mainly to invite attention to new and promising varieties, to such older ones as appear to deserve increased attention, and to give such further particulars as are supposed to be of more or less general interest.

Two varieties of peach have been received and planted here as Allen, also a third as Clefey Allen, which appears in our lists as Clefey (Allen), with the anticipation that the portion in brackets may be ultimately suppressed. Upon further trial one of the former may prove to be identical with the last.

Alexander, Amsden, Canada, River Bank, and Waterloo are all semiclings, and for practical purposes may be treated as identical, though the last named is probably the best of the lot. A variety coming from Texas, erroneously as Lady Ingold (which should be yellow), is also of this class.

Barber, a variety understood to have originated in Allegan county, Michigan, is also known as Hinman.

Bequette free and Bequette cling, as received from Texas, both prove to be free and identical.

Bickell, received from Delaware, ripens here in late October, quite too late for this latitude.

Bonanza may perhaps justify so pretentious a name in a more southern latitude. Here it is so late as to be worthless.

Brett is also too late, poor, and small to be of any value here.

Brigdon is a fine yellow peach of good quality, a popular market variety in central New York. Garfield is probably identical with this.

Brunson, although coming to us from Delaware, is understood to be the variety of this name originated at Benton Harbor, Michigan.

Brown (Brown's Early) originated with the late W. A. Brown of Berrien county, Michigan. It is an early, pale-fleshed variety, an early bearer, and productive. Ripe in August, but less desirable than several others of its class and season.

Champion, originating in Illinois, but disseminated by an Ohio establishment, is a beautiful and excellent pale-fleshed variety, an amateur peach, rather delicate

for the rough handling of the markets. It ripens here the last of August. A serrate-leaved Champion, originated in Allegan county, Michigan, is so liable to mildew of the young wood and foliage during summer, as to be of little value. This, however, may be prevented by persistent spraying with a solution of copper sulphate.

Chili 2 and Chili 3 are seedlings by C. Engle of Paw Paw, Michigan, from the well known (Hill's) Chili. The two are much alike, ripening a little later than the parent, of slightly larger size and superior quality.

Crosby ripened a few specimens, late in September. It manifests good market qualities, but is apparently a somewhat tardy bearer.

Dunlap is a rather large, yellow peach of good quality, productive, ripening about Sept. 1. It promises to be a superior market variety.

Early Crawford seedlings, 1 and 3, seedlings of C. Engle, are results of his quest for a variety similar to the original Early Crawford, but with hardier fruit buds. Experience with these so far indicates a possible improvement in this respect.

Early Michigan originated several years ago near Lowell, Michigan, with J. D. Husted, then of that place, now of Georgia. His numbers 15, globose, and 16, reniform, are very much alike in fruit, so much so that they are grown and sold indiscriminately, by many nurserymen. Grown here separately, there are so far a few days' difference in their time of ripening. Both are valuable.

Lewis, which is understood to have originated some time ago, in Allegan county, Michigan, closely resembles the foregoing, and by some persons the two are assumed to be identical. The fruits are scarcely distinguishable, although Early Michigan appears to be slightly superior in quality.

Elberta, though originating at the south, is attracting much attention at the north. It has now fruited here two seasons, the fruit proving to be large and fine. Its productiveness here is yet to be determined.

Egle (Mam.), another seedling by C. Engle, has been disseminated to some extent as a promising market variety, ripening early in September.

Fox is a rather large and fine pale-fleshed peach, of good quality, which is apparently worthy of a trial, to at least a limited extent.

Globe is large, beautiful, and good, but so far unproductive. Ripe this season m. September.

Gold Drop (possibly an old variety renamed), ripe this season m. e. September; also Kalamazoo, ripe Sept. 12, are both too well and generally known as popular market varieties to require description.

Haas (John), and Hynes (Surprise) are a few days later than the semiclings heretofore mentioned. They are freestones and for this reason desirable as early varieties for the home plantation.

Hale, Hale X No. 1 (a seedling by C. Engle), and Hyatt also, are all nearly alike in season and general character. All are semi-clings.

Hance Smock, in season and general qualities, is quite similar to the old Smock free, slightly larger, though scarcely its equal in flavor.

Late Barnard is quite similar to Early Barnard in general qualities, but ripens two weeks later.

Late White (one of C. Engle's seedlings), although of only medium quality, is so far very productive, and for this reason may prove valuable as a late market peach.

Magdala, Nectarine, and Wales (Princess of), are fine amateur varieties of English origin. They are mainly desirable as fine-flavored varieties for the home plantation.

McCollister, ripe Sept. 24, is a large, attractive-looking, late, yellow peach of good quality. It promises to be a regular and profuse bearer, worthy of extensive trial.

Moore (Fav.) is a pale-fleshed peach of more than medium size, and of fine flavor. It is popular at the east.

Morris White has long been valued for the home plantation as a superior variety for canning.

Muir, in season m. September, is a fine yellow peach, of above medium size, of good flavor, and productive. Promising for market.

Murat, a seedling by C. Engle, is a yellow peach of more than medium size, ripe e. September; and Pearl, another from the same, with pale flesh of superior flavor, is ripe Sept. 10. Both are worthy of trial.

Mystery (Yellow) is a very beautiful and excellent variety, ripe Sept. 24. So far it is comparatively unproductive.

Rivers (Early), ripe August 5, has scarcely an equal as an early peach for both dessert and market. It is of English origin.

R. S. Stevens is the name under which trees of a yellow variety were received from a western New York nurseryman for trial. They have now fruited two years but very sparingly. Not promising.

Salway is an excellent variety when well ripened, but it is too late to be reliable in this climate.

Steadily, ripe here b. m. October, is apparently a tardy bearer and rather late for this latitude.

Stevens Rareripe proves so far to be a heavy bearer of fruit of medium weight and size and good quality. It promises to be profitable. Season, m. e. September.

St. John is somewhat popular as an early yellow variety; ripe here August 19. Crane's Early is alleged to be a synonym, but trees received under this latter name from Allegan county, Michigan, ripened fully three weeks later and are obviously distinct.

Wonderful, of New Jersey, is quite too late to be useful or valuable here. Its season in this locality is b. m. October.

Yellow Rareripe is an old variety and there appear to be a number of varieties doing duty under this name. A variety under this name some fifty years ago was of fine size and high quality, while the one grown here is of small size and low quality.

APRICOTS (*Armeniaca vulgaris*).

A few of the so-called Russian apricots were planted here in 1888 and still others in 1890. Several of these have shown bloom from time to time, but have invariably failed to set and mature fruit. The trees also have most of them died from some not very obvious cause till only a few remain.

Two years ago, trees of the new Harris apricot (a recent New York seedling) were planted. These have grown finely and remain in apparently perfect health. Bloom may be expected upon them next season.

Some fifty years ago the writer worked the Breda, and also the Black, apricot upon plum stocks. These were planted and trained against the south side of a building, in which situation they bloomed and fruited freely for a series of years, until their removal became necessary to accommodate building improvements. Such experience seems to indicate that the failure of this fruit in this climate may be due to either innate lack of hardiness, or to its habit of very early blooming, one or both, and point to the need of a sheltered location.

Under the circumstances, the Harris plants will be carefully watched with the hope that, as a genuine American seedling, it may prove the forerunner of a new and hardier strain.

They have been treated for insects and fungi in connection with peaches and plums, to which reference is therefore made.

NECTARINES (*Persica vulgaris*).

The nectarine, being closely affiliated with the peach, has been given a place in the peach plantation and subjected to the same general treatment, although, owing to its special liability to the attacks of curculio, only a single variety has thus far been planted.

For treatment, as against insects and fungi, reference is made to the section on peaches.

Pitmaston Orange is the only named variety thus far planted. This is reputed to be a vigorous grower, but the plants which were received in 1892 prove to be persistently feeble, and so far have not even shown bloom, a condition probably due either to disease or to the unfriendly influence of the stock upon which it was worked.

GRAPES (*Vitis*).

The number of varieties of grape now growing upon the Station premises is one hundred and sixty-seven.

Last spring proved unfortunate for the grape. The earlier part of May was rather mild, though with occasional paroxysms of cold, dangerously near the freezing point. Yet the young grape wood had made satisfactory growth, and in most cases the incipient clusters were already formed when, after several threatenings, a severe frost occurred during the night of May 21 and 22, killing nearly the entire new foliage and wood, and thus ruining the prospect of a season's crop of fruit.

The warm weather which followed, however, soon forced new growth from dormant buds, while more or less of the older buds upon the new canes proved to be so far uninjured that they finally burst into growth. It soon became obvious that so many young canes were being started that at least very many were likely to be too weak to become satisfactory fruiting canes for next season.

To at least partially escape this danger, a large portion of the weaker canes was pruned away, the result being the increased growth of those remaining. Still, it seems possible, if not even probable, that a still better result might have been secured by at once removing all the frosted young wood.

While this subsequent growth has produced a small crop of secondary clusters, which a very favorable summer and autumn has ripened fairly well, its amount will scarcely be claimed to have exceeded one tenth, perchance not above one twentieth, of a full crop.

Aside from this, the relative dates of ripening, as well as the comparative productiveness, are, as an unavoidable result, so seriously disarranged that any attempt to tabulate them seems likely to prove rather misleading than beneficial. This, therefore, is omitted for the present season.

PLUMS (*Prunus*).

The plums upon the station grounds, both trees and fruit, have been notably exempt from attacks of fungi during the year.

Among insects, the curculio has been present as usual, also the rose chafer, the latter perhaps in somewhat reduced numbers. The cherry slug, though attacking the cherry, pear, and quince, has not been observed upon the plum this season.

The spray of copper sulphate applied while growth was yet dormant, included the plums. No subsequent applications were found to be needful.

May 29, the crescent mark of the curculio beginning to appear upon the young fruits, jarring was commenced, and was continued daily with only occasional intermissions until June 29, when the insects had become so rare that it seemed no longer needful.

The same process was adopted against the rose chafer, its season being mainly coincident with that of the curculio, although more or less hand-picking was found to be necessary in the case of the chafer.

Plums bloomed from the 1st to the 6th of May, and the young fruits were therefore yet enclosed in the remains of the calyx during the frost of the 21st and 22d, which was probably the reason why they escaped the calamity which befell the grapes on that occasion.

The bloom of many varieties was very profuse, notably that of most of the Japanese varieties, some of which, although hand-thinned while yet small, were still so borne down by the weight of the fruit when fully grown, that more or less of them were broken, although carefully supported.

Several of the more heavily laden trees were given a thorough drenching with water to enable them to carry through and properly mature their heavy burdens of fruit during the heat and unprecedented drouth then occurring. This was done by forming a trench about the tree, filling it with water, and replacing the earth after the water had been absorbed. This process was repeated once or twice per week while the necessity continued.

PLUMS.

Number.	Name.	Species.	Planted.	Bloomed.	Ripened.	Weight of fruit in ounces.	Productiveness — scale 1 to 10.
1	Abundance	Hattan	1890	May 1	Aug. 9	1	
2	Agen Prune	Domestica	1890	May 4			
3	Archduke	Domestica	1893	May 3			
4	Arctic	Domestica	1891	May 3	Aug. 14	$\frac{5}{8}$	7
5	Bailey (S. S.)	Domestica	1890	May 2	Aug. 12	3	6
6	Baker prune	Domestica	1893	May 3			
7	Bavay	Domestica	1892	May 1	b. Oct.	1½	6
8	Black Diamond	Domestica	1892	May 1	Sept. 1	1¼	4
9	Black prune?	Domestica	1888	May 3			
10	Burbank	Hattan	1893	May 2	Aug. 26	2	10
11	Burbank 2	Hattan	1890	May 1	Aug. 9	1	1
12	Burbank 7	Mume?	1890	May 2	Aug. 22	1¾	8
13	Burbank 11	Hattan	1890	May 1			10
14	Chabot	Hattan	1893	May 3			
15	Cheney	Americana	1888	May 3	Aug. 15	1	5
16	Cook	Hortulana?	1890	May 4	Aug. 20	1	5
17	Czar	Domestica	1892	May 3	July 23	1	10
18	De Soto	Americana	1888	May 4	Aug. 25	1	10
19	Engle	Domestica	1890	May 2	Aug. 6	1	7
20	Englebert	Domestica	1890	May 3	Aug. 24	$\frac{3}{4}$	9
21	Field	Domestica	1892	May 3	Aug. 16	1	10
22	Forest Garden	Americana	1889	May 4	Aug. 22	1	7
23	Forest Rose	Hortulana var. Mineri.	1890	May 4	m. e. Sept.	1	10
24	Garfield	Hortulana	1889	May 6	m. e. Oct.	$\frac{3}{4}$	10
25	Glass	Domestica	1890	May 3			
26	G. No. 4	Domestica	1890	May 3			
27	Golden Beauty	Hortulana	1890	May 6	e. Oct.	$\frac{3}{4}$	1
28	Grand Duke	Domestica	1890	May 2	Sept. 18	2	1
29	Gueii	Domestica	1890	May 3	Aug. 25	1	1
30	Hawkeye	Americana	1888	May 4	b. m. Sept.	1	9
31	Hungarian (Iowa)	Domestica	1888	May 3	Aug. 20	1	7
32	Jewell	Americana?	1890	May 4	Aug. 26	$\frac{3}{4}$	6
33	Kelsey	Hattan	1890	May 2			
34	Kingston	Domestica	1890	May 2	Sept. 18	2	3
35	Lombard	Domestica	1890	May 2	Aug. 22	1	1
36	Long Fruit	Hattan	1890	May 2	July 18	$\frac{1}{4}$	8
37	Maquoketa	Americana	1888	May 5	Sept. 16	1	9
38	Mariana	Cerasifera Hyb.?	1890	May 3	Aug. 10	1	6
39	Maru	Hattan	1890	May 1	Aug. 6	1	1
40	Merunka	Domestica	1888	May 3	July 31	1¼	7
41	Middleburg	Domestica	1890	May 3			
42	Miner	Hortulana var. Mineri.	1890	May 4	Sept. 19	1	9
43	Moldavka	Domestica	1888	May 2	Aug. 14		8
44	Moreman	Hortulana	1890	May 6	July 26	$\frac{3}{4}$	8
45	Naples (Beauty of)	Domestica	1889	May 3	Aug. 25	$\frac{3}{4}$	1
46	Newman	Angustifolia	1890	May 6			
47	Nagara	Domestica	1890	May 3	Aug. 25	$\frac{3}{4}$	1
48	Nicholas (White)	Domestica	1890	May 3			
49	Ogon	Hattan	1890	May 2	July 24	$\frac{3}{4}$	1
50	Orel 20	Domestica	1888	May 4	Aug. 27		9
51	Pissard	Myrobalan?	1889	May 2			
52	Prairie (Flower)	Hortulana var. Mineri.	1890	May 3	Oct. 1	1	9
53	Red Nagate	Hattan	1890	May 3	Aug. 9	1½	1
54	Robinson	Angustifolia	1890	May 6	Aug. 17	$\frac{3}{4}$	1
55	Rollingstone	Americana	1888	May 4	Sept. 1	1½	8

PLUMS.—CONCLUDED.

Number.	Name.	Species.	Planted.	Bloomed.	Ripened.	Weight of fruit in ounces.	Productiveness —scale 1 to 10.
56	Saratoga	Domestica	1890	May 3..	Aug. 24..	1½	1
57	Satsuma	Hattan	1890	May 3..	Aug. 28..	2	1
58	Shipper (Pride)	Domestica	1890	May 3..	Aug. 19..	2	10
59	Shiro Smomo	Hattan	1890	May 3..	July 23..	¾	1
60	Shropshire	Domestica	1890	May 4..	Sept. 9..	½	10
61	Simon	Simoni	1888	May 1..	Aug. 25..	2	1
62	Spanish (King)	Domestica	1890	May 3..	Aug. 29..	1	6
63	Van Buren	Americana var. Mollis.	1890	May 4..	.....	.....	7
64	Victoria	Domestica	1890	May 3..	Aug. 15..	1½	6
65	Wangenheim	Domestica	1890	May 4..	.....	.....	8
66	Weaver	Americana var. Mollis.	1890	May 4..	Sept. 25..	1	4
67	Wolf	Americana var.	1888	May 4..	Aug. 22..	¾	10
68	Wyant	Americana	1890	May 4..	Sept. 18..	1	5
69	Yellow Aubert	Domestica	1888	May 3..	Aug. 27..	2¼	2
70	Yosebe	Hattan	1890	May 1..	July 13..	¾	9
71	Yosemite Purple	Americana	1892	May 4..	Sept. 6..	3-5	9
72	Yosemite Yellow	Americana	1892	May 4..	Sept. 7..	¾	9

NOTES RESPECTING SOME OF THE PLUMS FRUITED DURING THE PAST SEASON.

European or domestica varieties.

Bailey is a variety received in scion from S. S. Bailey of Kent county, Michigan, without name, and is temporarily designated as above. The fruit is large, yellow, nearly free, and of excellent quality. The tree is vigorous, of upright habit. Productiveness yet undetermined.

Bavay was originally introduced from Belgium as Reine Claude de Bavay. But that type of high quality among plums, the true Green Gage or Reine Claude, having long since preempted both these names, their application to this is sure to occasion confusion. For this reason, and in the interest of brevity, the word Bavay (the originator's name) only is used to designate this variety.

Black Diamond, round; Grand Duke, long oval, and Kingston, of similar form, are each very large, with dense blue bloom and very showy. The trees are vigorous and productive.

Black prune (probably incorrect), Hungarian (?), Merunka, Moldavka, Orel 20, and Yellow Aubert (received as Dame Albert), are all from Prof. Budd's Russian importations. Yellow Aubert promises to be the most valuable of these. So far nearly all are but moderately productive.

Czar has only fruited this year upon small trees. The fruit is large and attractive.

Engle, received without name, from C. Engle of Paw Paw, Michigan, is a rather small yellow plum of good quality. It is understood to be the originator's purpose to withhold it on account of its deficient size.

Gueii, Lombard, Naples, and Niagara (as received here), are all very similar so far as their fruits are concerned, although the trees differ more or less in habit of growth.

Saratoga is promising as a market plum. Color purplish red, a rare color among the domestics. Tree vigorous and productive.

Victoria fruited here for the first time this season. Weight of a specimen, one and a half ounces; color, red, with yellowish-gray dots; flesh firm, moderately juicy, nearly sweet, freestone. A market variety.

Native plums.

Few if any of these are desirable in Michigan, except, possibly, in localities in which unusual hardiness is requisite.

Cheney, De Soto, Hawkeye, Moreman, Robinson, and Rollingsstone are among the most desirable of these so far as quality and reasonable productiveness are concerned.

Cook (Fav.), Forest Garden, Forest Rose, Nicholas (white), and Prairie Flower have so far proved only moderately productive.

Garfield is very vigorous, very late, and exceedingly unproductive. It is valueless here.

Golden Beauty is exceedingly vigorous and enormously productive. The clusters of fruit are very beautiful, but too late to acquire even tolerable flavor within our season.

Jewell, Makquoketa, Van Buren, Weaver, Wolf, Wyant, Yosemite Purple, and Yosemite Yellow, so far are neither sufficiently productive nor otherwise desirable for this region, so far as tested here.

Oriental or Japanese plums.

Abundance is an objectionable name apparently chosen for purposes of trade. Its adoption can only be justified by the fact that it applies to one of the two varieties originally introduced to our country as Botan. In common with several other Oriental varieties, although of only medium size and quality, it is so enormously productive that, unless severely thinned, the tree will surely ruin itself by overbearing. Ripe b. August, and continues a long time.

Burbank is similar to the foregoing in habit of growth, though more spreading, the fruit larger and of better quality, and ripening later. It promises to be productive.

Burbank 2 is much like Abundance, equally productive, and ripens about the same time.

Burbank 11 is of finer flavor, larger size, and ripens later, but is less productive. In both tree and fruit it gives indications of a possible admixture of domestica blood.

Long-Fruited.—Trees received under this name are so far comparatively unproductive, the fruit small and round, ripening July 15. It is perhaps spurious.

Maru and Shiro Smomo are quite similar in most respects, though the latter differs in flavor and ripens a few days later. Both are enormously productive. Their fruit is similar to Abundance in general appearance.

Ogon has pale yellow fruit, slightly larger than the foregoing, but lower in quality. It is similarly productive and ripens about the same time.

Red Nagate is abundantly productive, and the fruit larger and of higher quality than is the case with most others of its class tested here. It ripens the last of August.

Satsuma is an oddity among plums. When fully ripe, both skin and pulp are very dark purple. Weight of fruits, two ounces. This, as well as most others of this class, keep unusually well after ripening.

Yosebe is the earliest plum with which we are acquainted, ripening here this season July 13. Its size is rather small, and quality only passable. So far it is a thin bearer.

Simon (quoted in catalogues as *Prunus Simoni*) is not recognized as belonging to either of the foregoing classes. The tree is a fine grower and very productive, and the fruit large and beautiful, but nearly or quite worthless, so far as quality is concerned.

Pissard (*Prunus Pissardi*) is only desirable as a novelty on account of the dark purple color of its foliage.

PEARS (*Pyrus communis*).

This second year of excessive drouth has proved even more severe than the preceding one, while even during the intervening dormant period the supply of moisture was by no means adequate. This deficiency must be supposed, at least to some extent, to have affected both wood and fruit growth. Quite possibly, during both seasons, it partially prevented the development of fruit buds and thus partially or wholly delayed the fruiting of some varieties. Be this as it may, the trees have continued in a healthy and vigorous condition, and a considerable number of varieties have matured more or less fruit.

There have been no fungous attacks upon pear trees except in the case of two trees of Vicar, in which the blight of last year compelled their entire removal last spring, together with one or two adjacent trees, the disease in which was not discovered until the planting season last spring.

The larvæ of the codlin moth were so effectually subdued by the sprays applied to the first brood that a treatment for a second brood was deemed unnecessary; but, too late, it became obvious that either the remaining progeny of the first brood or an immigration from outside had sufficed to largely colonize the scattered product of the newly fruiting trees.

The slug (*Eriocampa cerasi*) appeared upon the pear at the usual season, but yielded readily to the usual spray of tobacco decoction.

The three or four trees which were supposed to have been overlooked in the preliminary spray of the spring of 1894, and which apparently for that reason were afflicted last season with scab (*Fusicladium dendriticum*) were, together with the entire plantation, thoroughly treated, April 1 to 6, with the strong copper sulphate solution, with very satisfactory results.

May 3 and 4, a second treatment was applied, using a solution of one pound of copper sulphate in 250 gallons of water.

May 20, a spray was applied, consisting of four pounds of copper sulphate, nine pounds of lime, and two and one half ounces of Paris green in forty gallons of water.

June 1, the above was repeated as a remedy for the codlin moth.

June 24, the slug having appeared, they were treated with a strong dose of tobacco water, which was thoroughly effective.

The following table includes such varieties of pear as have shown bloom and fruit, one or both, during the current year.

PEARS (*Pyrus communis*).

Number.	Name.	Planted.	Bloomed.	Ripened.	Weight of fruit in ounces.	Quality—scale 1 to 10.	Productiveness—scale 1 to 10.
1	Angouleme	1891	May 3.	Oct.-Nov.	12	5	10
2	Anjou	1888	May 4.	Oct.-Nov.	5	4	9
3	Ansault	1889	May 4.	b. m. Sept.	6	3	3
4	Barry	1892	May 5.				
5	Bartlett	1891	May 5.	b. m. Sept.	6½	5	9
6	Bessemanka (508)	1888	May 4.				
7	Bloodgood	1888	May 3.	Aug. 3.	3½	3	6
8	Clairgeau	1891	May 4.				
9	Clapp (Fav.)	1888	May 4.	e Aug-b Sept	7	4	8
10	Comice (Doyenne du)	1891	May 4.	Oct.-Nov.	4	2	8
11	Congres (Souv.)	1890	May 5.				
12	Dana Hovey	1888	May 4.	Nov.	4	1	7
13	Dubamel	1891	May 4.	b. Sept.	7	2.3	
14	Early Duchesse	1892	May 5.				
15	Fitzwater	1891	May 5.				
16	Gakovsk (347)	1888	May 4.	b. Aug.	8	7	10
17	Giffard	1888	May 4.	b. Aug.	4	2	7
18	Gray Doyenne	1888	May 4.	m. Nov.	4	4	4
19	Howell	1888	May 4.	m. e. Sept.	7	3.4	4
20	Jones	1889	May 4.	e. Oct.	4	2.3	9
21	Kurskaya (392)	1888	May 3.	m. e. Sept.	4	7.8	8
22	Lawrence	1888	May 3.	Nov.-Dec.	5	2.3	7
23	Louise (Jersey)	1891	May 4.				
24	Lucrative	1888	May 4.	b. m. Sept.	5½	2	1
25	Margaret	1889	May 4.	July 25	2	4	4
26	Millett	1891	May 5.				
27	Mount Vernon	1891	May 4.		8		
28	Ogereaun	1891	May 4.	Oct.-Dec.	11	4.5	
29	Pitmaston	1891	May 5.				
30	Pound	1889	May 4.	Winter	12	10	10
31	Reeder	1891	May 4.	m. Oct.	7	2.3	1
32	Rostiezer	1888	May 4.	Aug. 13	3	1	6
33	Rutter	1892	May 4.				
34	Seckel	1888	May 4.				8
35	Summer Doyenne	1888	May 4.	July 18	1	5	8
36	Victorina	1888	May 3.	Aug. 12	4½	8.9	7
37	Winter Nellis	1888	May 5.	Oct.-Dec.	7½	1	4

Angouleme (usually known as Duchess) is reputed to be only desirable as a dwarf, for which purpose it is doubtless one of the best. It may, however, be doubtful whether this assumption is not due quite as much to the preference of nurserymen for this method of propagation as to any actual advantage of dwarfs over trees grown upon free stocks. The experience of the writer, both at this station and elsewhere, is quite in favor of the latter.

Anjou, though reputed to be a tardy bearer, has this year produced a few good specimens upon trees planted as yearlings in 1888, branched low and managed as dwarf standards.

Ansault (Bonne de Puits Ansault) is an early-bearing, very prolific variety, and the fruit of fine size, though of only moderate quality.

Bloodgood, an old variety, is an early and profuse bearer, fruit of good size and finely flavored, ripening early in August.

Clapp (Favorite) ripened in advance of Bartlett. It is large, beautiful, and good, but must be picked early to prevent rotting at the core.

Dana Hovey is small but excellent, and the tree very satisfactory. It is one of the very finest early winter pears for the home plantation.

Comice (Doyenne du Comice) is a large and excellent pear, which was received and planted in 1891, as Howell, to which it is far superior in both size and quality.

Gakovsk, Kurskaya, Bessemianka, and Victorina are from Prof. Budd's importations from eastern Europe. None of them compare favorably with our well-known varieties of similar season.

Giffard, an early August pear of high quality, is admirably adapted to use in the plantations of critical lovers of this fruit.

Gray Doyenne is an old and excellent amateur pear, ripening in October and November. It is now rarely planted.

Howell is well known as a desirable market pear for late September.

Jones is a scarcely medium-size pear, of very good quality, ripening in October and November.

Lawrence has many desirable qualities of both tree and fruit, which render it desirable as an early winter market variety.

Lucrative is an old and excellent pear which every lover of this fruit should plant for home use. With better color it would doubtless be valued as a market fruit also.

Margaret.—Several varieties have been received and fruited under this name. Further trial is needful to determine the identity of each. A small, very early one is of fair quality and very productive.

Mount Vernon.—Two varieties have been received and fruited under this name, and further trial is needful to properly determine their identity.

Ogreau, a large pear, season November and December, is a vigorous grower and an early bearer. Worthy of trial for market.

Pound is a very old variety, very large, but only valuable for show and for the kitchen.

Reeder (Dr. Reeder) is a fruit weighing seven ounces, of high quality, keeping through November. The tree is thrifty and so far an early and abundant bearer.

Rostiezer is an old European variety, weighing only three ounces, not attractive appearance, but of exquisite flavor. Season, August. Tree, vigorous, very spreading, requires severe cutting back to produce a satisfactory head.

Seckel is well known for its exquisite flavor. Its diminutive size is its chief drawback, which, however, is compensated by its productiveness. The tree is healthy and remarkably free from blight.

Summer Doyenne (Doyenne d'Ete) is the earliest reasonably good pear. Although of diminutive size, this is compensated by its productiveness. The tree is vigorous and healthy.

Winter Nelis ranks among winter pears as does Seckel among the summer and autumn varieties, as the type of high quality. The tree is of a straggling, irregular habit, and doubtless for that reason is not popular with nurserymen, who usually double-work it.

APPLES (*Pyrus malus*).

Apples, in common with other fruit trees, have made satisfactory growths, notwithstanding the prevailing drouth, and a very considerable number of varieties have shown more or less fruit.

Whether due to the spray applied April 1 to 6, or otherwise, no fungi have been discovered attacking either trees or fruit during the season, and the only insect noted was the second brood of codlin moth larvæ, the appearance of which had not been anticipated, as the first brood had been conspicuous by their absence.

Following the general spray of April 1 to 6: May 3 to 4, apples were sprayed to prevent scab, with a solution of one pound of copper sulphate in 250 gallons of water; May 20 they were again sprayed, this time with Bordeaux mixture consisting of four pounds of copper sulphate, nine pounds of stone lime, and two and one fourth ounces of Paris green in forty gallons of water; June 1, the spray was repeated, using the same mixture.

Further treatment should doubtless have been applied to destroy the second brood of codlin moth larvæ, but the apparently thorough destruction of the early brood had left the conviction that no second brood need be expected, and this error was not discovered till too late for remedy.

The following table includes the varieties which have bloomed and fruited, one or both, during the current season.

Under the head of productiveness the results of the current year only are given. The word crab attached to a name is not to be understood as any part of such name.

In grading as to quality, crabs are compared with crabs only.

APPLES (*Pyrus malus*).

Number.	Name.	Planted.	Bloomed.	Ripened.	Weight of fruit in ounces.	Quality—scale 1 to 10.	Productiveness— scale 1 to 10.
1	August (crab).....	1890	May 5				
2	Babbitt.....	1890	May 5		6	5.6	7
3	Barty.....	1888	May 9		8½	3.4	9
4	Batullen.....	1888	May 6				
5	Blue Anis.....	1890	May 6	Sept. 15	5½	4.5	10
6	Borovinka.....	1888	May 4	Aug. 7	8	5	3
7	Bough.....	1888	May 6	Aug. 12	6½	3.4	8
8	Bradford.....	1890	May 6				
9	Carlough.....	1889	May 8				
10	Chenango.....	1888	May 7	Aug. 13	6	3	10
11	Cogswell.....	1888	May 6				
12	Colton.....	1888	May 4	July 22	6	4	7
13	Cornell.....	1890	May 5	b. Sept.	6	3.4	2
14	Craine.....	1888	May 7				
15	Cullin.....	1890	May 6				
16	Dartmouth (crab).....	1890	May 5	Sept. 1	2	1	2
17	Dickinson.....	1889	May 7				
18	Dyer.....	1888	May 6				
19	Early Strawberry.....	1888	May 7				
20	Egyptian.....	1888	May 8				
21	Excelsior (crab).....	1890	May 5	Aug. 24	6	4	7
22	Fall Pippin.....	1888	May 7				
23	Fink.....	1892	May 7				
24	Florence (crab).....	1890	May 4	Aug. 10	1½	5.6	1
25	Flushing.....	1888	May 8				
26	Gano.....	1890	May 6	Sept. 16	10½	5	7
27	Garden Royal.....	1888	May 8				
28	Gibb (crab).....	1892	May 4	Aug. 15	2½	2	5
29	Gideon.....	1890	May 5	Sept. 1	8½	5	7
30	Gloege.....	1888	May 6				
31	Golden Reinette.....	1888	May 5				
32	Golden Russet (N. Y.).....	1888	May 5	Dec.-Mar.	5½	3	7
33	Grimes Russet.....	1890	May 5	Dec.-Mar.	6	2.3	7
34	Grosh.....	1890	May 6				
35	Hagenkopt.....	1888	May 7				
36	Hargrove.....	1892	May 6				
37	Hawley.....	1888	May 6				
38	Hubbardston.....	1888	May 7				
39	Indian.....	1892	May 10				
40	Iowa Keeper.....	1891	May 6				
41	Jefferis.....	1888	May 5	b. Sept.	7½	2	6
42	Jelly (crab).....	1890	May 5	b. m. Sept.	2	5	5
43	Jersey Sweet.....	1888	May 5	b. Sept.	6	2	4
44	Jonathan.....	1888	May 6	Nov.-Mar.	5	2	6
45	Keswick.....	1888	May 5	Aug.-Sept.	6	6	1
46	Lawver.....	1890	May 7	Jan.-May	7	6.7	6
47	Longfield.....	1892	May 5	Sept. 14	7	5	8
48	Lou (crab).....	1890	May 5	Aug. 6	6½	5	9
49	Lowell.....	1888	May 6	Aug. 19	10	3.4	2
50	Magog.....	1890	May 7		6		
51	Maiden Blush.....	1888	May 5				
52	Marmalade.....	1888	May 8				
53	Martha (crab).....	1890	May 6	b. Sept.	2½	1.2	3
54	Mason Orange.....	1890	May 9	Nov.	8	5.6	10
55	Minkler.....	1892	May 5	Jan.-Mar.	9	6.8	10

APPLES.—CONCLUDED.

Number.	Name.	Planted.	Bloomed.	Ripened.	Weight of fruit in ounces.	Quality—scale 1 to 10.	Productiveness— scale 1 to 10.
56	Nero	1890	May 5				
57	Northfield	1890	May 5				
58	No. 2 New	1890	May 7	Aug. 31	8	4	8
59	Oakland	1888	May 5	Nov.-Mar.	5½	4	10
60	October	1890	May 5	Sept.-Oct.	5	3.5	5
61	Ontario	1890	May 6	Jan.-April	9	3.5	7
62	Peck (Pleasant)	1888	May 8				
63	Peter	1890	May 5	b. Sept.	10	3.4	3
64	Pickett	1888	May 8				
65	Pine Stump	1892	May 6				
66	Primate	1888	May 5	July 20	8	2	3
67	Pryor Red Seedling	1888	May 8				
68	Pyrus malus, rosea plena	1892	May 8				
69	Quaker	1891	May 6				
70	Rambo	1888	May 9				
71	Red Apont	1888	May 7	b. m. Sept.	11½	5	7
72	Red Astrachan	1888	May 5	Aug. 1	6½	4.6	5
73	Red Canada	1888	May 6	Jan.-May	6	2.3	8
74	Red Dettmer	1888	May 5	b. Sept.	7½	5	7
75	Red Russet	1890	May 10				
76	Reid Golden	1890	May 6	Aug. 9	5	5	7
77	Rhode Island	1888	May 6	Nov.-Feb.	10½	2.3	10
78	Rosenhager	1888	May 8	m. e. Sept.	12	4.5	10
79	Roxbury	1888	May 6	Jan.-June	6	3.4	8
80	Salome	1888	May 9				
81	Scarlet Cranberry	1891	May 6				
82	Shackleford	1893	May 9				
83	Sheriff	1891	May 7				
84	Smokehouse	1893	May 7				
85	Somerset (N. Y.)	1893	May 7	Aug. 19	3½	2	10
86	Stark	1888	May 6	Jan.-May	8	7.8	2
87	Stuart	1890	May 7				
88	Stump (N. Y.)	1889	May 7				
89	Summer Pearmain	1888	May 5	b. Sept.	5½	1	8
90	Summer Rose	1892	May 5	Aug. 12	4	2	10
91	Thornton	1892	May 6				
92	Titovka	1888	May 5	Aug. 5	9	4.6	4
93	Tolman	1888	May 7	Nov.-April	6	3.4	9
94	Townsend	1890	May 7				
95	Transcendent (Crab)	1893	May 6	Aug. 21	2	5	7
96	Washington (Strawberry)	1890	May 5	Sept.-Oct.	9½		10
97	Water	1890	May 6	Oct.-Nov.	6	5	9
98	Wealthy	1890	May 6	Sept.			5
99	Winter Streiffing	1888	May 5	Aug. 20	5	5	3
100	Yellow Transparent	1888	May 6	July 22	5	7	5
101	Zolotoreff	1890	May 5				

It should be understood that the fruit trees at this Station are yet young, many of the apple trees bearing their first crop of fruit this year, and that for this reason the results noted may be modified as they come more fully into bearing.

Babbitt comes to us from Missouri. Little can yet be said respecting it from actual experience here. If valuable here it will probably be on account of color or productiveness rather than for superior quality.

Barty is a sweet apple whose first specimens here weigh eight and one half ounces. In quality it grades 3 to 4, one being the highest. Should it prove productive it may rank as a desirable market variety.

Blue Anis, Longfield, Red Dettmer, Rosenhager, Titovka, and Winter Streiffing are all of reputed Russian origin. Nearly all are of the J. L. Budd importation, very subject to blight in the northwest, and most of them ripening in winter only at the extreme north. So far they have been free from blight here, but nearly all ripen in August and early September.

Borovinka is also one of the Budd importations. If not identical with Oldenburg it so closely resembles it both in tree and fruit that it is difficult to distinguish the one from the other.

Bough, generally known as Sweet Bough, is our earliest good sweet apple. Its chief fault is that it is a thin bearer.

Chenango is well and favorably known as one of the numerous group of "strawberry" apples. When well grown it has few superiors as a dessert or family apple. It is also esteemed for a near market.

Colton is a comparatively new variety. Here, so far, it proves to be an early and prolific bearer, specimens weighing six ounces and ripening the latter half of July; quality 4, of the scale 1 to 10. Desirable for both home use and market.

Cornell originated in Pennsylvania, and is successful in Michigan. Its most serious fault is ripening in early September, when even the best apples are at a discount, as compared with the more delicate peach and plum.

Dartmouth, Excelsior, Florence, Gibb, Jelly, Lou, Martha, No. 2 New, and Transcendent are all crabs of the *Pyrus baccata* type, ripening in August and early September, varying more or less in quality, but all possessing the distinctive flavor of the species.

Gano has ripened its first crop of fruit here this season. The specimens are beautifully colored, weighing ten and one half ounces, and ripening September 16. It will rank as a market fruit if sufficiently productive.

Gideon, October, and Peter are all seedlings by Peter M. Gideon of Minnesota, as is also Wealthy. All are very hardy and adapted to the extreme northern climate. They are claimed to be partially or wholly of crab parentage.

Golden Russett (N. Y.) is too well known to require either description or characterization. It lacks size, unless with good and rich cultivation, and must be kept in tight packages to prevent shriveling.

Grimes (Golden) is reputed to have originated in Virginia. It is one of the very few varieties which maintain their quality when grown at the north.

Jeffers is a native of Pennsylvania. It has few if any superiors as a beautiful and excellent dessert fruit, for late August and early September. Specimens grown here this year weighed seven and one half ounces.

Jersey Sweet is perhaps the very best sweet dessert and baking apple for early September.

Jonathan is generally popular as a beautiful and excellent mid-winter apple, for either dessert or market. Its chief defect for the market is lack of size, well-grown specimens weighing scarcely more than five ounces.

Keswick (Codlin) is one of the very best and most productive culinary apples. Too acid for other uses, it cooks well even when half grown.

Lawyer is a long keeper, of supposed western origin, of mild subacid flavor, ranking as low as 6 or 7 in the scale of 1 to 10. Tree vigorous and hardy.

Lowell is an old variety, ripe in early September. It is of fine appearance and very productive. Weight, ten ounces. It is doubtless less popular on account of the wealth of the more delicate fruits contemporaneous with it.

Magog (Red Streak) is a western variety valued especially for its hardiness. It is not yet sufficiently tested here.

Mason Orange, received from Kansas, ripe here November to probably January or February, weight eight ounces, is a roundish or slightly oblate, irregular fruit, yellow, with a faint brownish blush; flavor, mild subacid; tree vigorous, spreading, needs further trial here.

Minckler is an old variety, grown mostly at the west, season January to March, weight nine ounces, quality low, 6 to 8, tree vigorous, spreading.

Oakland is known in some localities as Oakland Co. Seeknofurther. It ripens here in September but is said to be a winter keeper. Weight five and one half ounces; color, yellow, blushed and striped with two shades of red; flavor, mild subacid; quality 3 to 4; growth of tree slender, spreading.

Ontario, originated by the late Charles Arnold of Paris, Ontario, is a cross between Northern Spy and Wagener. The fruit is in season from January to April. Weight, nine ounces; color, pale yellow, with a bright red cheek; flesh, tender, juicy, sub-acid; quality, 3 to 5; tree vigorous, upright, spreading, an early bearer.

Primate is well and favorably known as one of the very best summer dessert apples, ripening in succession through a considerable period. The fruits when large are sometimes water-cored.

Red Aport is one of Prof. Budd's Russian importations. Its weight is eleven and one half ounces, season b. m. September. In form, color, and quality it is much like the well known Alexander.

Red Astrachan is too well known as a leading summer market and culinary apple to require description. It ripened here this season August 1; weight, six and one half ounces.

Red Canada is the apple so long and favorably known in the markets of Detroit and Chicago as Steele's Red. In some soils and localities it is inclined to scab and crack. It is a slender grower and should always be top grafted on vigorous stocks. Season, January to May; weight, six ounces.

Reid Golden comes to us from New Jersey without a history. It ripens here August 9; weight, five ounces; form, oblate; color, dark, rich red on a yellow ground; flesh, white with red stains next the skin; quality, 5. A culinary fruit.

Rhode Island Greening is universally prized at the north and east as a leading winter apple; in season here from November to February or March; weight, ten and one half ounces. Further south it becomes an autumn fruit.

Roxbury Russett, long known and prized as a superior, long-keeping, culinary market apple; in season from January to June; weight, six ounces. It is open to the objection that the tree lacks hardiness at the west.

Somersset (N. Y.) ripened August 19, weighing three and one half ounces. The fruit is conical and not attractive in appearance but sprightly, high-flavored, and rich; quality, 2; tree an upright grower and an early bearer.

Stark hails from Ohio. It is a long-keeping, winter apple. Weight, eight ounces; quality as low as 7 or 8; tree very vigorous, hardy, and productive. A market apple.

Summer Pearmain is a beautiful and excellent fruit for the home plantation, ripe early in September; weight, five ounces. Unfortunately the fruit is liable to scab and crack. The tree is hardy, but of scarcely medium vigor. It requires good, rich culture.

Summer Rose is a beautiful and excellent little fruit for the home garden; ripe early in August; weight, four ounces; quality, 2. The tree is moderately vigorous and very productive.

Tolman is a long-keeping, winter, sweet apple; weight, four ounces; tree, very hardy; generally popular.

Washington (Strawberry), ripe in September and October. Weight, nine and one half ounces. Is a roundish oblate, yellow apple, splashed and mottled with rich red; flesh a little coarse; tender, juicy, brisk, sub-acid. Culinary, market.

Water, ripe October and November; weight, six ounces; quality, 5; is a culinary variety; so far only moderately productive.

Yellow Transparent is reported to be of Russian origin; ripe July 22, weight, five ounces. The fruits are usually free from imperfection and of even size; color, pale yellow; flesh, a little coarse, white, tender, juicy, acid; culinary. Tree vigorous, upright, very productive.

QUINCES (*Cydonia*).

No indications of fungi have been observed during the past season.

The only insect attacks demanding attention have been those of the slug (*Eriocampa cerasi*) to subdue which a single spray of strong tobacco water proved sufficient.

Quinces have fruited much less freely than usual the past season, due apparently to the frost of the morning of May 21, at which time the plants were in bloom.

Quality being a somewhat variable characteristic, dependent upon peculiarity of the season, and the more or less perfect development of the fruit, the grading given in the following table will be liable to modification in other and more favorable seasons.

QUINCES (*Cydonia*).

Number.	Name.	Planted.	Bloomed.	Ripened.	Weight of fruit in ounces.	Quality, scale 1 to 10.	Productiveness, scale 1 to 10.
1	Alaska	1891	May 11	b. m. Oct...	5½	1	8
2	Champion	1888	May 16	m. e. Oct...	9	1	2
3	Fuller	1891	May 18				
4	Meech	1883	May 15	b. m. Oct...	7½	1	6
5	Missouri (Mam.)	1890	May 10	b. m. Oct...	9	1	7
6	Orange	1883	May 10	e. Sept.	12½	1	4
7	Rea	1883	May 10	e. Sep., b. Oct	9½	1	7
8	Van Deman	1895	May 18				

Alaska, as the name may be supposed to indicate, is alleged to be especially hardy. As yet it is but imperfectly tested here.

Champion is an early and prolific bearer, but ripens rather late for this latitude, especially in unfavorable seasons.

Meech so far has in no sense shown itself superior to older, well-known varieties.

Missouri (Mam.), as tested here, differs but slightly, if at all, from the old well-known Orange quince, which still is without an equal, everything considered.

NUTS.

Almonds (*Amygdalus communis*) are represented here by Luelling, a hard-shell variety, and also by one received as Soft-shell, neither of which has yet shown fruit.

Chestnuts (*Castanea*). Hathaway bloomed July 12, and Ridgley and Numbo each produced catkins but neither of them produced fruit.

Paragon has produced a heavy crop of nuts, which were smaller than usual, probably by reason of the severe drouth. It bloomed July 1 and ripened in advance of frost.

Spanish chestnut also bloomed and ripened at the above dates.

Kentish Cob Filbert has produced catkins the past two years, but has not yet shown fruit.

Japan Walnut (*Juglans Seiboldii*), bloomed July 11, but the young germs were badly injured by frost so that only a very few survived, which matured and dropped with the first killing frost.

ASPARAGUS (*Asparagus officinalis*).

Three varieties of asparagus, Barr, Conover, and Palmetto, have been on trial since 1890, of which Palmetto has been found the most desirable. A more recent variety, the Columbian Mammoth White, of which seed was planted in 1894, is promising, but requires another year or two for a complete test.

RHUBARB (*Rheum raponticum*).

In out-of-door culture, none of the so-called early varieties tested here have proved perceptibly earlier than Linnæus, which still maintains a leading position.

A new variety received two years ago from S. S. Bailey of Kent county, is of large size and excellent quality, with distinct dark-green foliage. It is worthy of extensive trial.

EXPERIMENTS WITH FERTILIZERS.

Quantities of several commercial fertilizers having been supplied, the five rows of grapes in the northeast block, planted in 1888, and trained upon a four-wire, horizontal trellis, fifty plants in each row, were divided into sections, each extending across the entire five rows, and applications of fertilizers made as follows: The growth of plants in the sections not fertilized is assumed to be medium, or 5, in the scale 1 to 10, 1 being the maximum. The crop of fruit being exceedingly light, owing to a killing frost in May last, is not taken into the account.

Section.	No. of plants.	Fertilizers applied.	Rate of growth.
1	10	None.....	5
2	20	Ground bone, 15 lbs.; muriate of potash, 7 lbs.....	4
3	20	None.....	5
4	20	Michigan Carbon Works fruit grower, 25 lbs.....	3
5	10	None.....	5
6	20	Ground bone, 15 lbs.; muriate of potash, 7 lbs.; nitrate of soda, 3 lbs.....	3
7	10	None.....	5
8	20	Two one-horse loads stable manure.....	3
9	10	None.....	5
10	20	Ground bone, 15 lbs.; muriate of potash, 7 lbs.....	2
11	10	None.....	5
12	20	Michigan Carbon Works fruit grower, 25 lbs.....	2
13	20	None.....	5
14	20	Ground bone, 15 lbs; muriate of potash, 7 lbs.; nitrate of soda, 3 lbs.....	3
15	10	None.....	5
16	10	Mich. Carbon Works fruit grower, 9½ lbs.; ground bone, 5 lbs.; muriate of potash, 5 lbs.	2

SOUTH HAVEN, MICH., }
 January 1, 1896. }

T. T. LYON.

FRUITS AT THE AGRICULTURAL COLLEGE.

Bulletin No. 130, February, 1896.

L. R. TAFT AND H. P. GLADDEN.

STRAWBERRIES.

The soil upon which the strawberries were grown is a sandy loam in which is considerable clay. Some portions have much more clay than other parts of the field. Under much the larger portion, at a depth of from one and a half to two feet, is a heavy clay subsoil. Some parts of the field rest upon quicksand which often comes within a few feet of the surface. A good application of stable manure was given and the land plowed the fall before the plants were set. The summer of 1894 was unfavorable for the plants to make a good growth for the fruiting season of 1895. The frequent rains occurring in the early part of year gave the plants a good start, but the protracted drouth of summer and fall prevented the formation of runners and in many cases killed the plants first set. The field was cultivated frequently during the season and was free from weeds. After freezing weather came on the plants were quite heavily mulched with marsh hay. In the spring this was removed from above the plants and placed between the rows. This mulch was utilized to cover the plants when frost was expected. For several days, after the blossoms had appeared, the plants were covered with the mulch and protected from frosts. This was removed when danger was thought to be passed. An unexpected freezing came when many sorts were in full bloom, and the blossoms of many varieties were almost entirely killed. A system of pipes for irrigating purposes was put in last spring, but was not in shape for the water until June 10. This prevented an early application which would have greatly benefited the spring-set plants; however, we have a fair stand of most varieties for the season of 1896. One watering was given the field when the berries were well formed, and another when they were just ripening. This enabled those varieties which had made a fair stand of plants, and whose blossoms escaped frost, to mature a good crop of fruit.

In the following table, many varieties which have in other seasons proved valuable are omitted because of the effects of the drouth of the previous year and of the frosts of 1895.

STRAWBERRIES.

ABBREVIATIONS.

Form.

b, broad. l, long.
c, conical. o, oval.
d, depressed. r, round.
i, irregular.

Size.

s, small.
m, medium.
l, large.

Color.

b, bright. l, light.
c, crimson. r, red.
d, dark. s, scarlet.

Variety.	Sex.	Vigor (1-10).	Date of bloom.	First ripe fruits.	Last fruits.	Productiveness (1-10).	Size.	Form.	Color.	Quality.	Firmness.
Afton	p	2.5	May 14	June 12	July 3	9	m to l	lc	dc	9	8.8
Allen No. 1	p	9.5	May 14	June 13	June 27	5	m	rc	bc	9	8.5
Allen No. 3	b	8	May 16	June 17	July 3	7	l	rc	bc	9	8.5
Allen No. 13	p	8	May 14	June 12	June 28	7	m to l	rdc	vd c	9	9
Allen No. 14	p	7	May 16	June 13	June 28	5	m	lc	ls	9	7.5
America	b	8.5	May 14	June 17	July 3	8	m	rc	b ds	9.5	9
Aroma	b	8	May 18	June 13	July 4	8	l	lc	ls	8	9.5
Beauty	b	8	May 16	June 6	June 29	8	l	r bc	b ds	8.5	8
Belle	b	8	May 16	June 16	July 5	9	m to l	lc	bs	8	9
Belle of Lacrosse	p	8.8	May 14	June 13	July 2	9	l	r bc	b ds	8	8
Bickle	p	8	May 18	June 16	July 6	7	m	rc	ls	7	7
Bird	p	8.5	May 16	June 16	July 2	9.2	m	lc	b ds	9	9.2
Bixler Seedling	b	9.5	May 14	June 17	July 3	5	s to m	r dc	ls	9.5	8.5
Bomba	b	7.5	May 14	June 14	July 1	9	m	c	dc	9	8.5
Brandywine	b	8	May 12	June 17	July 3	7	l	rc	b dc	9.5	8.5
Bubach	p	8	May 14	June 17	July 2	8	l	dc	lc	9	8
Cameronian	b	9	May 14	June 13	July 3	7	m	rc	ls	7	7
Cameron No. 2	b	8.5	May 16	June 13	July 3	7	l	lc	bc	9	9
Charlie	p	8	May 18	June 12	June 28	6	m	lc	b ds	9	8.8
Childs	b	7.5	May 16	June 13	July 7	7	l	dc	bc	9.5	9
Cyclone	b	9.3	May 10	June 14	July 4	9	m	lc	dc	9	9
Dan Bisel	b	7.5	May 14	June 18	June 28	8	m	l bc	bc	9	9
Early Jack	b	8	May 10	June 7	July 4	5	m	rc	ls	6	6
Edith	p	6	May 18	June 17	July 5	8	m	rc	r dc	9.5	9
Edwards Favorite	b	7	May 16	June 13	July 8	8	l	rc	b dc	9.4	9
Epping	p	9	May 14	June 13	July 2	8	l	r dc	ls	8	9
Feicht No. 3	p	8	May 10	June 7	July 2	7	l	ic	lc	8.8	8
Fred Stahelin	p	8.5	May 14	June 8	June 27	8.5	l	ic	vd c	9.5	8
Greenville	p	8	May 16	June 13	July 3	6	l	r dc	bc	8	7
Haverland	p	8.5	May 10	June 8	June 28	8	m	lc	s	8	8
Jay Gould	p	9	May 16	June 13	July 4	8.5	m	rc	bc	9.2	9
Jones Seedling	b	8	May 10	June 6	July 3	7	l	dc	dc	9	8.5
Judsonia	b	9.5	May 10	June 13	July 1	8	l	r bc	lc	7.5	7
Klickita	p	9.5	May 14	June 15	July 3	8.5	l	r dc	ds	9	7.5
Kyle No. 1	b	9	May 18	June 17	July 2	8	m	rc	ls	6	6
Leroy	p	9.5	May 10	June 13	June 28	8.5	l	dc	dc	9	9
Longfield	p	8	May 10	June 13	July 3	8.5	l	rc	dc	9.2	9.4
Long John	b	8.5	May 18	June 7	July 3	9.8	m to l	vl c	bc	9	8.5
Magnate	p	8.5	May 10	June 13	July 3	8	m to l	lc	bs	9	9
Marshall	b	8.5	May 10	June 17	July 5	8	l	rc	bc	8.5	9
Maxwell	p	9	May 10	June 14	June 28	8.8	m	rc	dc	9.8	8.5
Miner	b	8.5	May 10	June 14	July 2	7.5	l	c	ds	8	7
Mrs. Cleveland	p	9	May 12	June 18	July 3	8	m	r bc	bs	8	8
Neptune	p	8.5	May 18	June 16	July 2	8.5	m to l	rc	dc	7	7
Nims' Seedling	p	9	May 16	June 17	July 6	8.8	l	rc	bs	9.2	7.5
No. 16 (Stayman & Black)	b	8.5	May 14	June 14	July 2	8	l	rc	ds	8	8.5
No. 6 (J. S.)	p	8.5	May 14	June 13	July 5	8	l	rc	dc	9.8	9
No Name	b	9.5	May 10	June 17	July 3	9	l	bc	dc	9	9
Parker Earle	b	9	May 20	June 19	July 6	9.5	m	lc	ds	8	9
Phillip Seedling	b	8.5	May 10	June 14	July 3	8	l	rc	dc	7	7

STRAWBERRIES.—CONCLUDED.

Variety.	Sex.	Vigor (1-10).	Date of bloom.	First ripe fruits.	Last fruits.	Productiveness (1-10).	Size.	Form.	Color.	Quality.	Firmness.
Princeton Chief	p	9	May 10.	June 13.	June 28.	8	l	lc	dc	8.5	8.5
Princess	pp	8.5	May 18.	June 13.	July 2.	8	m	r	sa	9	8.5
Rio	b	8.5	May 10.	June 14.	July 3.	---	m	lc	bs	9	7.5
Robinson	b	9	May 16.	June 17.	July 5.	---	m	rc	bca	6	6
Sadie	p	9	May 12.	June 7.	June 28.	9	m	rc	dc	9	8
Shawnee	p	7	May 18.	June 17.	July 3.	---	m	lc	dc	8.5	8
Shuckless	b	8.5	May 14.	June 14.	June 23.	---	l	rc	dc	7	7
Smith Seedling	b	8	May 12.	June 1.	June 20.	---	s	rc	bs	8	8
Snowball	p	9.5	May 18.	June 14.	June 6.	---	m to l	lc	bs	8	8
Springdale	p	9	May 16.	June 16.	July 10.	9.5	l	rc or lc	bs	8	9
Stimmel No. 20	p	9	May 12.	June 14.	July 3.	7	s to m	lc	dc	9	8
Shuckless	b	9.2	May 10.	June 14.	July 2.	7	l	lc	bs	8	8.5
Swindle	p	9.4	May 16.	June 14.	July 5.	8	m to l	rc	c	7	8
Tennessee Prolific	b	6	May 16.	June 19.	July 6.	---	l	rc	bdc	8	8.5
Timbrell	p	8	May 18.	June 17.	July 6.	---	l	vc	vdc	8.5	8
Thompson No. 34	p	---	May 18.	June 14.	July 3.	8.5	m	rc	bc	8	8
Thompson No. 40	p	9	May 10.	June 14.	July 6.	9.5	m	rc	bc	8.5	8
Thompson No. 64	b	8.5	May 16.	June 14.	July 5.	8	m to l	irc	bds	8.5	8
Thompson No. 66	p	8.8	May 14.	June 14.	July 2.	9	l	lc	bdc	8	8
Tonga	p	8.5	May 14.	June 14.	July 6.	---	m	irc	s	8	9
Townsend No. 19	p	8.5	May 16.	June 8.	June 27.	8.8	m to l	rc	s	8.5	8.5
Warfield	p	9	May 10.	June 7.	July 2.	9	m	lc	dc	8.5	8.5
Weston	p	9	May 16.	June 17.	July 5.	8.5	l	bc	bc	8	8.5
Williams	b	8.5	May 14.	June 14.	July 5.	8	m to l	rc	dc	8.5	9.8
Woolverton	b	8.5	May 14.	June 14.	July 3.	8	m	lc	dc	8	9

NOTES ON VARIETIES.

The following varieties fruited for the first time the past season:

Aroma.—Plants from Thompson's Sons, Rio Vista, Va.: The plants are of strong and vigorous growth and make runners well. The roots are large, go down deep, and have numerous fibers at lower end. Berry large in size, long-conical form; color, light scarlet; seeds prominent, flesh light, of good quality, and very firm. Valuable for strength and vigor of plant growth, ability to resist drouth, and for the firmness of the fruit. The frost injured the blossoms so badly that a fair estimate of productiveness could not be made.

Bixler's Seedling.—Plants from C. G. Bixler, Three Rivers, Mich.: The plants are of strongest growth. A good plant-producer, and a deep rooter. Berry of medium size, round, depressed-conical in form, and of light scarlet color. Quality is of the best, and the fruit is moderately firm. Frost injured blossoms badly. Valuable for vigorous plant growth and high quality of fruit.

Cyclone.—Plants from Thompson's Sons: The plants are of very strong growth; fruit stalks long, reclining, blossoms turned down, making it a good frost-resisting sort. The roots go down deep, strongly aiding the plants to make growth in dry seasons. Berry of medium size, long-conical; dark-crimson color; flesh, dark; quality, excellent, and the fruit firm. Valuable for strong growth of plant, high quality, and firmness of fruit, and its ability to withstand drouth and frost.

Early Jack.—Plants from Stayman & Black, Leavenworth, Kan.: The plants are of good growth and are strong, deep rooters; row well filled out; berry of medium size, round conical form, very light scarlet color, and flesh light. The quality is not good and the fruit lacks firmness. An early ripening sort. Requires further trial.

Edith P.—Plants from Thompson's Sons: The plants are of rather weak growth, did not start well. The plants set in the spring of 1895 are doing well, and seem to have strong roots. The plants are of low growth, hug the ground. Berry of medium size, round-conical form; color, very dark crimson; of high quality and quite firm. A further trial is necessary to properly judge of merits.

Fred Stahelin.—Plants from F. C. Stahelin, Bridgman, Mich.: Plants quite strong-growing. Blossoms considerably injured by frost, but recovering well. Berry large, short-round-conical in form; color, very dark crimson; seeds, yellow, slightly prominent; flesh, very dark red and of best quality, though lacking in firmness. The variety resisted frost well, and the attractive appearance and high quality of the fruit gives promise of a valuable sort for home use or near market.

Kyle No. 1.—Plants from Wm. C. Babcock, Bridgman, Mich.: The plants are of strong growth. Blossoms badly frosted and few left to set fruit. Berry of medium size, round-conical form; color, light scarlet; seeds prominent, flesh light in color, of poor quality, and soft. Calyx parts very easily. Must try again in a more favorable season.

Longfield.—Plants from Stayman & Black: The plants are not of strong growth, quite scattering, and made but few runners. Plants and blossoms but little injured by frost, fruit-stalk short and close-branching, blossoms turned down. Berry large, round, or broad-conical; dark crimson color; flesh medium dark, good quality, and firm. A very promising market sort; will stand shipment well and is attractive in appearance.

Marshall.—Plants from Prof. S. T. Maynard, Amherst, Mass.: The individual plants are quite strong but did not make many runners. The plants set in the spring of 1895 have made a well-filled row and seem to be strong, deep rooters. Blossoms badly frosted. Berry large, round-depressed-conical, largest in center; color, a bright crimson; seeds, prominent; flesh, rather light in color, but of excellent quality and quite firm. A variety of much promise. Quite liable to rust.

Maxwell.—Plants from Thompson's Sons: The plants are of quite strong growth. The roots do not go deep, but have numerous fibers at lower end. Blossoms stood frost well, turned downward. Berry rather small in size; form, round-conical; dark crimson color; seeds, prominent; flesh, quite dark, of high quality, and moderately firm. A promising sort.

No. 16.—Plants from Stayman & Black: The plants are of fairly strong growth. Blossoms frosted badly and but little fruit borne. Berry large, round-conical in form, dark scarlet color, seeds even, of fair quality, and moderately firm. Requires further trial.

No Name.—Plants from Thompson's Sons: The plants are of very strong, vigorous growth, and are deep, strong rooters. Most of the early blossoms were killed by frost, but the plants recovered and sent out more. Berry large, broad-conical, somewhat irregular in form, dark crimson color; does not ripen well at tip, seeds yellow, prominent, flesh dark, of excellent quality and firm. Very handsome in appearance, an excellent shipper, of good quality, and stands frost well.

Phillip Seedling.—Plants from Slaymaker & Son, Dover, Del.: The plants are of good, vigorous growth, and are strong, deep rooters. But few blossoms appeared and little fruit was borne. Berry large in size, form round-conical, dark crimson color, seeds yellow, prominent; flesh dark, not of high quality, and rather soft. The fruit is attractive in appearance, but so little was borne that a fair estimate of value can not be made.

Rio.—Plants from Thompson's Sons: Some of the plants are of strong and vigorous growth, but the row is somewhat scattering. The roots are numerous and fibrous but do not go deep. Blossoms quite badly frosted. Berry of medium size, round or long-conical in shape, bright scarlet color, and seeds prominent; flesh rather light, of excellent quality, but somewhat lacking in firmness. Can not judge properly of merits, but the variety is certainly one well worthy of further trial.

Robinson.—Plants from Edw. W. Cone, Menominee, Wis.: The plants are of good growth, roots are not numerous, but go down deep. Blossoms badly frosted, but plants sent out more and bore a fair crop of fruit. Berry of medium size, round or broad-conical, bright crimson color; flesh, light, poor in quality, and very soft. Further trial necessary.

Shawnee.—Plants from Stayman & Black: A few plants are of strong growth. The others did not get a good start. Blossoms badly frosted, but plants recovered fairly well. Berry of medium size; form, long-conical, usually with neck; color, dark crimson when fully ripe; quality good, moderately firm. Does not ripen evenly. A variety of much promise.

Shuckless.—Plants from Slaymaker & Son: The plants are of fairly vigorous growth. Blossoms but little injured by frost. Berry of good size, round-conical in form, dull crimson color, seeds prominent, flesh light, lacking in quality and

firmness. The berry parts easily, leaving the calyx on the stem. The variety does not seem to have much of promise in it.

Smith Seedling.—Plants from Slaymaker & Son: The plants are not of very strong growth. Blossoms quite badly frosted. Berry rather small in size, round-conical, bright scarlet color, flesh light, of fair quality, and moderately firm. A few berries were ripe June 1. It was the earliest variety to ripen fruits of any grown this year. Not sufficiently tested.

Snowball.—Plants from Edw. W. Cone: The plants are very strong-growing and healthy. Blossoms quite badly injured by frost, but the plants recovered well. Berry medium to large in size, long-conical, with neck; bright scarlet color, seeds dark, not prominent; flesh light, quite acid in flavor, firm. The plants are healthy and of good growth. The fruit is handsome in appearance and a good shipper. Regard it as a very promising variety.

Springdale.—Plants from Stayman & Black: Of fairly strong and vigorous growth. A good rooter. Blossoms somewhat injured by frost, but others came on and the plants bore a large crop of fruit. Berry large in size; form round or long-conical; color, bright scarlet, of medium quality but firm. The plants are of excellent growth and very productive. The fruit is of regular form, handsome in appearance, and a good shipper. A variety of much promise.

Tennessee Prolific.—Plants from Slaymaker & Son: The plants set in 1894 are of weak and scattering growth, those set in the spring of 1895 are among the strongest in the patch and are deep and strong rooters. But little fruit was borne. Berry large in size, shape round-conical; bright, dark-crimson color; flesh, dark, of good quality, and moderately firm. Handsome in appearance, but not enough fruit borne to judge fairly of value. Appears promising.

Timbrell.—Plants from Slaymaker & Son: The individual plants are of good growth, but made few runners; roots are numerous, fibrous, and go down deep. Few blossoms appeared, but they were little injured by frost. Berry large, round-conical, very dark crimson, almost black when fully ripe; flesh, rather light in color, of good quality, but not firm. Does not ripen evenly, appears spotted until fully ripe; likely to be picked before it is ripe. Requires further trial.

Thompson No. 40.—Plants from Thompson's Sons: The plants are of excellent growth and the row well filled out, the roots are numerous and go down deep. Blossomed early, but resisted frost well and bore a large crop of fruit. Berry of medium size, round-conical, bright crimson color, seeds prominent, flesh dark and of very good quality, moderately firm. Fruit handsome in appearance. Plants of vigorous growth and productive. Very promising.

Thompson No. 64.—Plants from Thompson's Sons: Some of the plants are of good growth; few roots, but they go down deep. Most blossoms came out late and were little frosted. Berry of medium size, long-conical form, dull crimson color, of good quality, and firm. Did not bear much fruit, but the variety has much promise in it.

Tonga.—Plants from Stayman & Black: The plants are of vigorous growth and are good rooters. But few blossoms appeared, and these were considerably frosted, so little fruit ripened. Berry medium in size, round-conical, quite irregular in form, dull scarlet color, seeds prominent; of fair quality and firm. Requires further trial.

The following new sorts did not make sufficient plant growth, or were so badly injured by frost that little could be said of them, and description will be postponed until another season's trial shall give more data upon which to form an opinion:

Australian, Annie Laurie, Columbus, Equinox, Jarbola, Kossuth, Ona, Oscar, Ostego, Richmond, Smalley, Yahoo.

NEW VARIETIES OF 1894.

The behavior of varieties during so unfavorable a season as that of 1895 should give valuable data toward determining their place in comparison with the older and standard sorts.

Bird, Charlie, Jay Gould, and Princeton Chief were of vigorous plant growth and had deep, strong roots. They withstood frost well and bore, for the season, a large crop of fruit. Bird and Jay Gould are specially valuable as market sorts on account of the handsome appearance, good quality, and firmness of their fruit. Charlie and Princeton Chief are somewhat lacking in firmness of berry; they will doubtless find a place in the home garden or for near market use.

Long John.—If this variety were a good plant-producer it would be a most valuable sort. More berries were borne on these plants than on those of any other sort in the field. It blooms late and the blossoms are protected from frost by the leaves of the plant. The fruit is moderately firm, of fine appearance, and good quality. As a variety for culture in hills, it is excelled by few sorts.

Allen No. 13 has again shown its superiority over the several other numbers received here for trial. There is much of promise in the variety. Fruit of good size, fine appearance, regular form, good quality, and firm.

Brandywine in plant growth was not so vigorous as last year and the blossoms were badly affected by frost. Still promising for home use or near market.

Childs, Judsonia, and Seedling B are varieties having considerable merit but are unlikely to ever reach great prominence.

Bowman, Chairs, Dan Bisel, Luther, and Sandovel did very poorly the past season. They will be given further trial under more favorable conditions.

Of the somewhat newer sorts, but including those that have been tried for three or more seasons, Greenville, Leroy, and Weston still hold high place. The plants are of strong growth and productive. The berries are of good form and color and sufficiently firm to stand shipment well.

Clyde did not hold out in promise. Others report it as not of much value.

Feicht No. 2, Huntsman, and Topeka were wanting in vigor of plant growth. When the season is a favorable one, they are valuable as home market sorts.

Epping was vigorous in plant growth and bore a good crop. The light color of the fruit is against it as a market berry.

Allen No. 1 was so badly frosted as to greatly lessen the otherwise excellent prospects of the variety.

Iowa Beauty, on account of the high quality and handsome appearance of the fruit, should find a place in every home garden.

Brunette, which has previously ranked above Iowa Beauty as a home variety, did not do well the past season. The plants seem to lack ability to form good, strong roots, and it was injured by drouth.

Cameron No. 2 and No. 4 J. S. were far above the average in plant growth and productiveness.

Leader and Williams are likely to occupy a prominent place as market sorts. Reports from localities where they have been on trial have been very favorable. Swindle is quite likely to rust badly, otherwise a valuable sort.

Nims' Seedling is excellent in plant growth, and productive of good-size berries. It has a long season and holds out well to the end. The color of the fruit is light, but the variety is likely to find a place for home or near-market use.

Afton.—This variety is very similar if not identical to Warfield in plant growth, productiveness, and in form, color, and firmness of berry.

Mrs. Cleveland and Sadie are well worthy of notice as home or near-market sorts. The plants are of excellent growth, productive, and the fruit handsome in appearance. These varieties have been tried here a number of years and with uniformly good results.

Klickita, Lovett Early, and Surprise bore large crops of good fruit during the past unfavorable season.

The following sorts have some good points, but they are deficient in others and there is little chance of their occupying a prominent place:

Alabama,	Henry Ward Beecher,	Pawnee,
Banquet,	Kansas,	Princess,
Bickle,	Lincoln,	Standard,
Cameronian,	Magnate,	Smeltzer's Early.
Gypsy,	Neptune,	

The varieties named below have few points of merit and most of them will be placed in the rejected list:

Accomac,	Feicht's No. 3,	Mystic,
Allen No. 3,	Glenfield,	Odessa,
Belt No. 3, (Wm. Belt)	Hattie Jones,	Primate,
Beverly,	Hermit,	Southard,
Cameron No.'s 6 and 13,	Katie,	Stevens,
Cheyenne,	Leviathan,	Westlawn,
Clark,	Little No.'s 18, 26 and 42,	Wyoming,
Fairmount.		

Belle and Parker Earle blossom late and thus escape early frosts. The plants are of good growth and have proved very productive for many seasons. They are excellent market berries.

Bubach, Crescent, Haverland, and Warfield are the leading pistillates planted by the general strawberry-grower. The inability of Warfield to withstand drouth proved a serious fault the past two seasons.

Beder Wood, and Woolverton, in addition to being most excellent pollenizers for the pistillate sorts, are also valuable market berries. Wilson is also used as a fertilizer, but its use is not so general as a few years ago.

The severe frosts occurring during the blossoming period gave an excellent opportunity to notice if any varieties were better able to resist frost than others. The two hundred varieties were carefully examined in sex and position of blossom; number and size of petals and sepals, length and position of fruit stalk, and habit of growth of plant.

The examination seemed to warrant the following conclusions:

1. The pistillate varieties were much less injured by frost than the staminate, other conditions being equal.

2. The perfect-flowering sorts that have large-size, irregular blossoms with numerous petals and sepals were most injured, unless the blossoms were protected by the plants or turned downward. Examples—Wm. Belt, Brandywine, and Lower.

3. Varieties having the blossoms erect, and thus exposed to the full effects of frost, were badly injured. Examples—Huntsman, Epping, and Lovett Early. Those sorts having blossoms turned downward, as Afton, Belle of Lacrosse, and Princeton Chief, were able to carry many blossoms through uninjured.

4. Varieties having short and reclining fruit stalks, or stalks protected by the foliage of the plant, as Mrs. Cleveland, Sadie, and Warfield, stood frost better than varieties like Mystic, Pawnee, and Richmond, having upright fruit stalks.

5. Varieties that blossom late, often escape a frost that severely injures those that blossom earlier. Among late-blooming sorts are Belle, Gandy, Neptune, and Parker Earle.

6. Some varieties seem to recover from frosts and send out new blossoms much better than others. Among those sorts that recovered well may be named Bubach, Haverland, Leroy, Judsonia, No Name, Princess, Shawnee, and Snowball.

RASPBERRIES.

The bushes were sprayed thoroughly with Bordeaux mixture just before growth started in the spring. The treatment was repeated when the new growth was about one foot high, special pains being taken to apply the spray to the new growth. While the old wood of many varieties was badly affected with anthracnose, the new canes are in good condition for next season's crop.

The raspberries suffered much from dry weather and extreme heat during the ripening season. The bearing period was so shortened by drouth that the dates of last ripening of fruits is omitted.

BLACK AND HYBRID RASPBERRIES.

ABBREVIATIONS.

Size.
s, small.
m, medium.
l, large.

Form.
r, round.
c, conical.
o, ovate.

Color.
b, black. g, glossy.
p, purple. l, light.
o, orange. pu. pubescent.

Variety.	Vigor (1-10).	Date bloom.	First ripe fruits.	Productiveness, (1-10).	Size.	Form.	Color.	Quality.
Ada.....	9.5	June 3	July 1	9.0	m	r	g b	8
Caroline.....	9.0	May 31	July 1	7.5	HL	r r	l o	8
Columbian.....	9.5	June 3	July 3	9.8	l	r o	p	8.5
Conrath.....	9.3	May 31	June 29	9.0	l	r r	b	8
Cromwell.....	7.5	May 31	June 25	7.0	m	r	b	8
Ebon Beauty.....	8.5	May 31	July 1	6.5	m	r c	b	7
Farnsworth.....	9.2	May 31	July 1	9.0	l	r r	b	8.5
Gregg.....	9.5	May 31	July 3	9.8	l	r r	b pu	7
Hopkins.....	8.5	May 31	June 29	6.0	m	r r	b	8.5
Jackson's May King.....	8.5	May 28	June 27	7.0	s	r c	b	7.5
Johnston Sweet.....	5.0	May 31	July 1	6.0	m	r	g b	8
Kansas.....	9.5	May 31	June 28	9.8	l	r r	g b	8.5
Lovett.....	9.0	May 31	June 29	7.5	m	r r	b	9
Nemaha.....	9.2	June 3	July 5	7.0	l	r	b pu	7
Norfolk.....	8.0	May 31	June 29	7.0	s	r	b	8.5
Older.....	9.5	May 31	July 1	9.0		r	b	9
Ohio.....	9.5	May 30	June 30	8.5		r r	b	6
Palmer.....	8.5	May 28	June 25	8.5	m	r r	b	8.5
Progress.....	9.0	May 31	June 27	7.5	m	r r	b	8.5
Shaffer.....	9.3	June 6	July 3	9.0	l	r o	p	8.5
Smith (Prolific).....	8.0	May 31	June 27	8.5	l	r	b	9
Surrey.....	8.5	May 31	July 2	8.5	l	r	b pu	8.5
Virginia.....	9.0	May 28	June 25	5.0	l	r c	b	8.5
Winona.....	8.7	May 31	June 25	8.0	m	r	b	8
Wonder.....	8.2	May 31	July 1	7.0	s	r	b	8

NOTES ON VARIETIES.

Ada.—The bush is quite vigorous, and withstood drouth and attacks of anthracnose as well as any of the blacks. Few blossoms were injured by frost, and a good crop of good-size fruit of fair quality was borne. An excellent sort.

Caroline.—If one desires a sort bearing yellow fruit, this is one of the best.

Columbian.—Growth of cane strong and vigorous, and but little injured by winter; blossoms not hurt by frost. This variety bore more fruit than any other in the plantation, and was taken as the standard of productiveness. Columbian differs from Shaffer in being of stronger and larger cane growth; the new canes lack the purple tinge of Shaffer, and the spines are fewer in number, but are considerably larger in size; the leaflets of Columbian are also larger than those of Shaffer. The berry closely resembles Shaffer but is drier, more seedy, and a little better in quality. Toward the close of the season the old canes were badly injured by anthracnose.

Conrath.—Canes slightly injured by winter; seven per cent. of blossoms killed by frost. The plant is fairly vigorous and is productive. The fruit is of large size, firm, and of fair quality. It is medium early and holds out well in season; considerable anthracnose toward close or season; growth of new canes excellent.

Cromwell.—Canes injured considerably by winter; 25 per cent. of blossoms killed by frost; canes badly affected by anthracnose and drouth. An early ripening sort but did not do well the past season.

Ebon Beauty.—Somewhat injured by winter, and considerable anthracnose on old canes; few blossoms killed by frost; fruit rather small in size, round-conical in form, deep black with considerable down; is quite soft, and rather poor in quality; of fair cane growth.

Farnsworth.—Stood winter well; quite free from anthracnose, and but few blossoms killed by frost. The plants are vigorous, healthy, and productive. The fruit is large, firm, and of good quality; an excellent variety for home use or market.

Gregg.—Canes quite badly killed back by winter. Ten per cent of blossoms frosted; old canes have considerable anthracnose; bore a good crop of large-size fruit. The best late market sort.

Hopkins.—Badly winter-killed; twenty-five per cent. of blossoms injured by frost; bush of weak growth; fruit small, of fair quality, but soft and a small quantity borne.

Jackson's May King.—Bush of fair growth and stood winter well; seven per cent. of blossoms killed by frost; fruit rather small in size, round-conical, jet-black, with considerable down between seeds; not of very good quality; did not bear much fruit, old canes dying with anthracnose and from drouth before crop matured.

Kansas.—But little injured by winter; some disease on old canes; new growth strong; five per cent. of blossoms frosted. This was the most productive blackcap grown this season. The fruit is large, jet-black, firm, and of fair quality. A most excellent medium-season sort.

Lovett.—Quite badly winter-killed; much anthracnose on old canes; ten per cent. of blossoms injured by frost; fruit small in size, and but a small crop borne. There are better sorts ripening at the same season.

Nemaha.—Quite badly injured by winter; bushes did not do well the past season, and but few berries borne. Usually a good late-ripening sort.

Norfolk.—Nothing special to recommend it. Others better.

Older.—But little injured by winter; much less disease than most other varieties; few blossoms frosted; bush of vigorous growth and productive. The fruit is of large size, rather soft, but of high quality. An excellent sort for home use or near market.

Ohio.—But little injured by winter; twenty per cent. of blossoms frosted; considerable anthracnose, but bushes bearing a good crop of fruit; one of the best medium-season market sorts. The leading variety for evaporating purposes.

Palmer.—Cane injured somewhat by winter, but not badly; ten per cent. of blossoms killed by frost. A good early-market variety.

Progress.—Very similar to Palmer, though scarcely so productive.

Shaffer.—For canning and home use this variety has no superior among the better known sorts. Quite badly injured by winter.

Smith (Prolific).—Canes were most injured of any variety by severe winter; badly affected with anthracnose; twenty per cent. of blossoms killed by frost. The bush is of strong growth and fairly productive. The fruit is large, jet-black, not very firm, but of good quality. A good variety.

Surrey.—Cane but little injured by winter; ten per cent. of blossoms injured by frost; bush vigorous and healthy; fruit closely resembles that of Gregg, but is not so late in ripening.

Virginia.—Cane winter-killed but little; thirty per cent. of blossoms injured by frost; bush not of vigorous growth this season, but little disease present; an early ripening sort. In past seasons this variety has done well.

Winona.—Canes were injured by winter, but not badly; few blossoms killed by frost; much disease on old canes; new growth excellent; fruit of medium size, round-conical, black, with considerable down; seeds rather large, lacking in quality and firmness. Not sufficiently tested.

Wonder.—Tips of canes winter-killed; new growth strong; considerable disease on old canes ten per cent. of blossoms injured by frost. Fruit large, jet-black, with down between seeds; good quality but not very firm. Requires further trial.

RED RASPBERRIES.

ABBREVIATIONS.

Size.	Form.	Color.
s, small.	r, round.	d, dark.
m, medium.	c, conical.	r, red.
l, large.	o, ovate.	p, purple.
		o, orange.
		b, bright.

Variety.	Vigor (1-10).	Date bloom.	First ripe fruit.	Productiveness (1-10).	Size.	Form.	Color.	Quality.
Arnold	9	June 3.	July 3.	6	v l	o	br	9
Brandywine	9.3	June 5.	July 8.	8.5	m	rc	dr	8
Cuthbert	9.5	June 5.	July 3.	9.5	l	rc	r	8
Gladstone	8	June 3.	July 2.	8	s	rc	dp	8
Golden Queen	9	June .	July 6.	8.5	l	rc	o	9.5
Hansell	9	June 3.	June 27.	8	m	r	dr	9
Lost Rubies	9	June 3.	June 27.	8.5	l	rc	bdr	9.5
Marlboro	8	June 3.	June 27.	9	m	r	r	8.5
Michigan Early	8.5	May 31.	June 25.	8.5	m	r	r	9
Philadelphia	8	June 3.	June 27.	7	l	rc	dr	9.5
Rancocas	8	May 31.	June 26.	8	m	r	r	8.5
Royal Church	8	June 3.	July 1.	8.5	l	rc	dc	8.5
Scarlet Gem	6.5	June 3.	June 26.	6	m	r	br	9
Thompson Prolific	8.5	June 3.	June 26.	7	m	r	dr	9
Turner	9.3	June 3.	June 27.	9	l	c	r	9

NOTES ON VARIETIES.

Brandywine.—Stood winter well; growth of cane vigorous and healthy; fruit of medium-size, bright red color, quite firm, and of fair quality. It is a late-ripening sort of some value.

Cuthbert.—But little injured by winter. The plant is vigorous and healthy. The variety has yet no superior for general planting.

Gladstone.—Canes hardy but quite badly affected with anthracnose. New growth good. The fruit when ripe is purplish, soft, and of fair quality. The variety, if valuable at all, is only so as a continuous bearer. The bushes bore a large crop of fruit in October.

Golden Queen.—The bush is hardy and of vigorous growth. The fruit is clear, bright yellow in color, and of high quality. It is a desirable variety for the home garden.

Hansell and Michigan Early are hardy in plant and fairly productive. As early-ripening sorts they may find a place to a limited extent.

Marlboro.—The bush is hardy, but not of very strong growth. It occupies a prominent place as an early-ripening market berry.

Royal Church.—The bush is hardy, of vigorous growth, and quite productive. The fruit is of dark, rich crimson color, and good quality, but crumbles easily.

Turner.—The bush is extremely hardy, of good growth, and productive. The fruit is of high quality but soft. Valuable for home use or for near market.

Arnold, Lost Rubies, Philadelphia, Rancocas, and Scarlet Gem are now but little grown, their place being taken by better varieties.

BLACKBERRIES.

The severe winter of 1894-5 gave a good opportunity to observe the hardiness of the several varieties grown here.

Early King.—Quite badly injured by winter, but some of canes left; canes of upright growth; leaves light green, rather small, and pointed; few blossoms left uninjured by frost; fruit very large; seeds large, round, loose; very sweet, and has a small core. More hardy than any other early sort grown here.

Eldorado.—Stood winter as well as Snyder; new growth good; most blossoms killed, and the fruit remaining is imperfect; closely resembles Snyder in cane and growth, though leaflets are a lighter green and the cane has more red, with larger and longer spines. A very promising, hardy sort.

Lincoln.—Stood winter almost as well as Snyder; new growth excellent; no fruit.

Minnewaski.—Stood winter fairly well; new growth very strong; no fruit.

Snyder.—Quite badly injured by winter; canes killed half of length; new growth strong; bore but little fruit.

Stone's Hardy.—Did not stand winter as well as Snyder, but some cane growth left; bore little fruit.

Taylor's Prolific.—Stood winter about the same as Stone's Hardy; some fruit, but small and imperfect.

Agawam, Jewett, and Kittatinny were killed nearly to ground; no fruit borne.

Childs Early Cluster, Erie, Ford's No. 1, Ohmer, Wilson Early, Wilson Jr., and White Blackberry were killed to ground and bore no fruit.

AGRICULTURAL COLLEGE, MICH., }
February 1, 1896. }

SOME INJURIOUS INSECTS.

Part of Bulletin No. 132.

BY G. C. DAVIS.

CLIMBING CUTWORMS.

Climbing cutworms have rarely been found injurious to orchards on clay or clay loam soil. For this reason a large proportion of Michigan orchards are not subject to attacks from this insidious pest. The writer has occasionally found their work on light clay soil, and in one such instance several cherry trees had quite a percentage of the buds eaten out, but such cases are exceptional. There are many sandy strips through the state, and particularly along the shore of lake Michigan, where we have our greatest fruitgrowing section. The lighter and more sandy the soil, the more likely it is to be infested with climbing cutworms. In such sections they are present in sufficient numbers to be destructive almost every season.

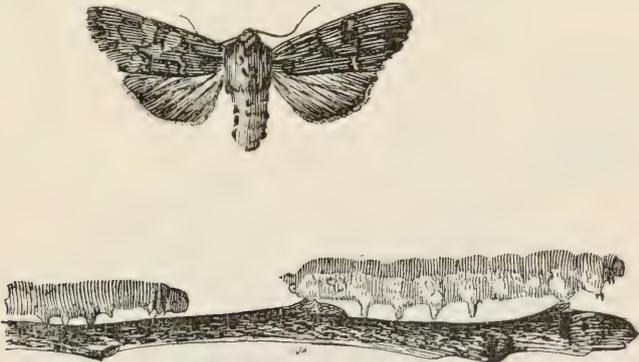


Fig. 1.—The speckled cutworm, *Mamistra subjuncta*: At the right is the full-grown cutworm and behind it a younger one; above is the moth, all natural size.

My own experiments and observations have been largely at Muskegon the past two seasons. In this work much credit is due Mr. H. C. Rood of that place, who kindly gave me access to his apple orchards of nearly 5,000 trees, and also gave me many valuable suggestions from his practical experience with the climbing cutworms. His first letter to us gives something of an idea of the conditions under which he was laboring at that time, and we can not do better than quote the first part of it, which reads as follows:

"I send you by mail a box of climbing cutworms that have been damaging my orchard. They are still at work, but the foliage is so large and tough now that they do but little damage. They like the tender buds and shoots, but will eat anything if they can not get the buds. They are also at work at my grape vines. We have killed as many as 1,500 on some trees, not all in one night, but I did kill on a tree the other night 412, and the next night 114, and the next night 141 on this same tree, at one time, where I had been hunting them for two weeks before. I did not have time to count them very often, as I have between four and five thousand trees. They have ruined a half or two thirds of my crop. They go straight to the top of a tree and leave the lower limbs. The tops of some of my trees look as though they were dead, while the bottom limbs are white and full of blossoms."

This statement is a very moderate one, for the next season Mr. Rood and myself found them equally abundant in a portion of his orchard. On trees in a neighboring apple orchard, where the climbing cutworms had not been killed the year previous, we repeatedly counted from 500 to 800 cutworms on the trunk of a single tree by ten o'clock at night. These trees were probably twelve years old and about eight or ten inches in diameter. They were in timothy sod. Mr. Rood's orchard had been in clover sod for two years preceding, and much of it had died out the fall before the cutworms were the worst.



Fig 2.—The white cutworm, *Carneades scandens*: a, moth natural size; b, moth twice natural size; c, cutworm, twice natural size *(after Slingerland).

Climbing cutworms make their appearance in the spring as soon as the soil is moderately warm. This is some time in April, and before the last of May the injury of the season by them is over. They are rarely abundant more than two or three weeks, and, by the time the apple trees are through blossoming, the cutworms are for the most part gone. They work exclusively at night, and the darker the night the more plentifully they appear. About eight o'clock in the evening they begin traveling, and by nine o'clock their movements remind one of the activities on a business street in a large city. By daylight they have again disappeared, and all is quiet. They have buried themselves in the soil for the day or hid under some loose rubbish that may afford them shelter from the hot sun.

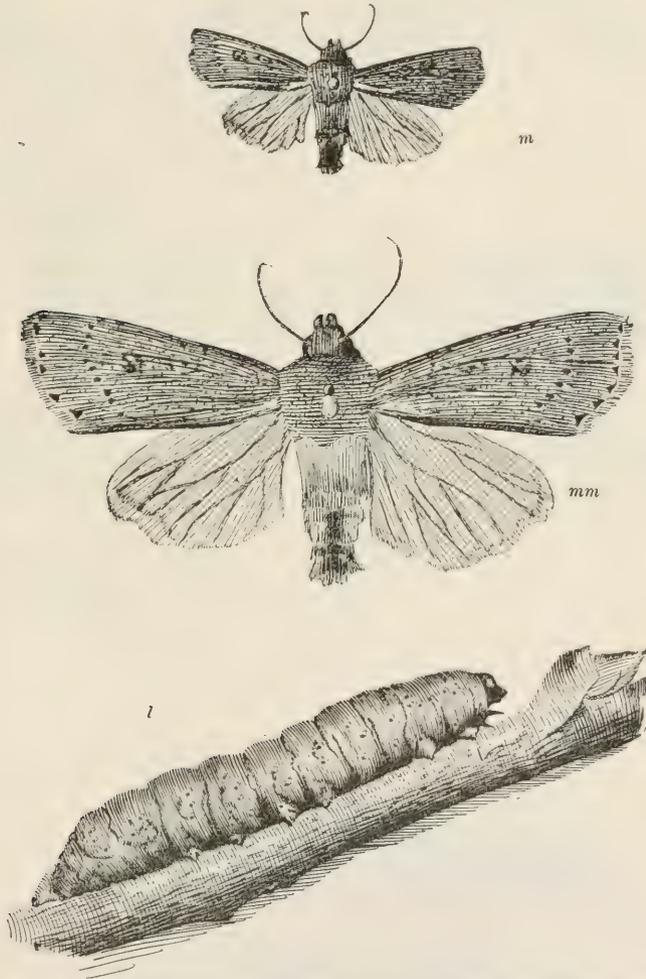


Fig. 8.—The spotted-legged cutworm, *Prosagrotis vetusta*: *m*, moth, natural size; *mm*, moth twice natural size; *l*, cutworm, twice natural size (after Slingerland).

If one watches them on their nocturnal raid, he will see most of them coming from the soil within a radius of five feet from the trunk of the trees, but others can be seen that start far beyond even where the branches of large trees reach. They usually take a direct course to the nearest tree, and in climbing it the tendency is to go into or near the top of the tree, and the terminal buds will generally show their work first. Often only the central portion or tenderest part of the bud is

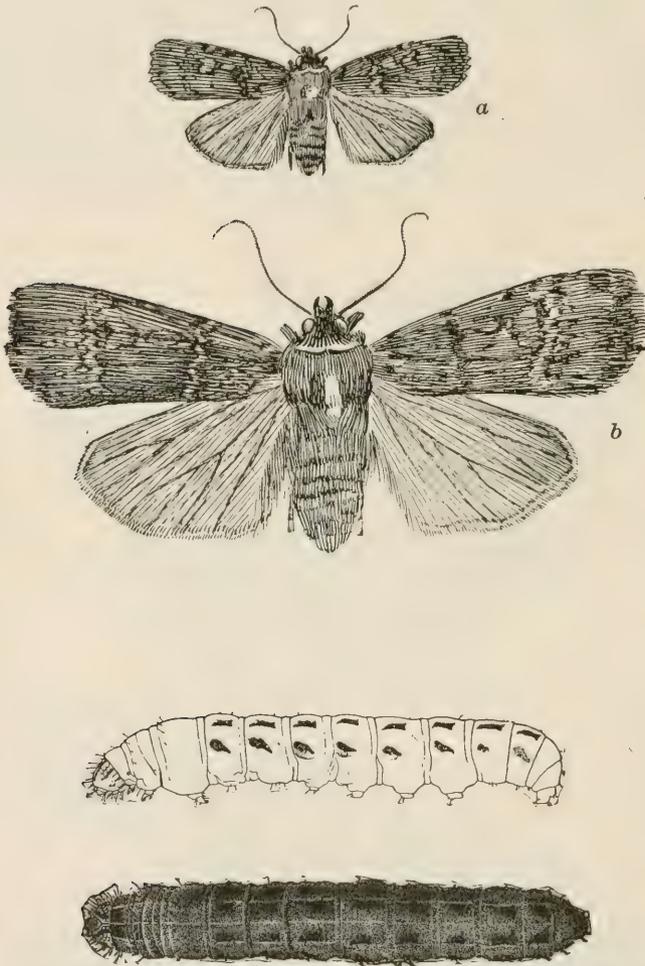


Fig. 4.—The well-marked cutworm, *Noctua clandestina*: Cutworm, beneath, side and back view, twice natural size (after Forbes). a, moth, natural size; b, moth, twice natural size (after Slingerland).

eaten into, but when the buds are not plentiful the whole is eaten, and sometimes the tip of the twig or the bark. When checked on the trunk by a band, the caterpillars often become so hungry that they will girdle a tree beneath the band by gnawing off a part or all of the bark. If one listens under a tree at night, he can plainly hear the rasping of their jaws as they are at work on the buds.

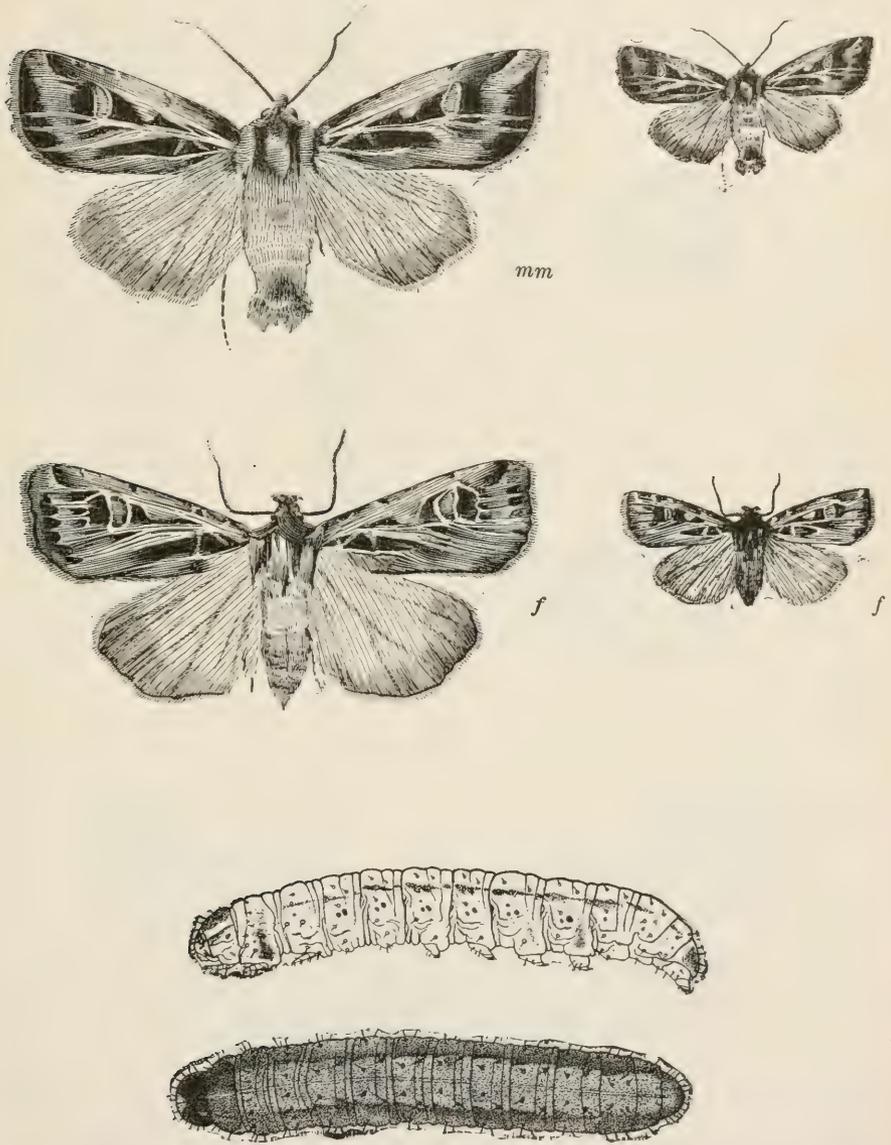


Fig. 5.—The dingy cutworm, *Feltia subgothica*: *m* and *f*, male and female moths, natural size; *mm* and *ff*, male and female moths twice natural size (after Slingerland). Beneath is side and back view of the cutworm, twice natural size (after Forbes).

Grape vines are particularly subject to attack from these cutworms, as they have such large, tender buds. Of the fruit trees, perhaps the peach is the most likely to be attacked, as it is usually grown on sandy soil, but the apple, plum and cherry suffer quite as much. The currant and berry bushes are also attacked, and in fact there are very few trees and bushes which are not known as food plants of the climbing cutworms.

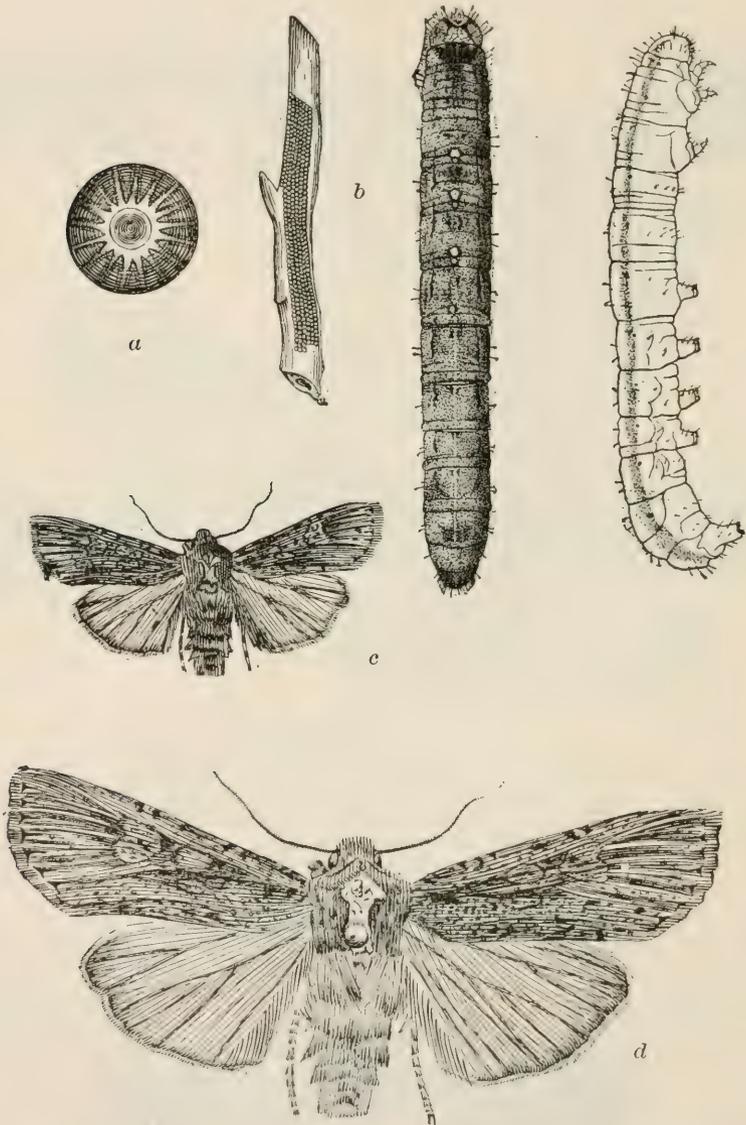


Fig. 6.—The variegated cutworm *Peridroma saucia*: a, an egg greatly enlarged; b, cluster of eggs, natural size; c, moth, natural size; d, moth, twice natural size (after Slingerland). Side and back views of the cutworm, twice natural size (after Forbes).

In a bulletin issued last November by the Cornell experiment station, on "Climbing Cutworms of Western New York," Mr. Slingerland has prepared a comprehensive table of the species known to be climbing cutworms, with date and references of first account of the climbing habit of each species, and its common and scientific name. The table, which I take the liberty to quote, is as follows:

1852. Harris, Injurious Insects, p. 349.
 The yellow-headed cutworm (*Xylophasia arctica* Bdv.).
 1866. Riley, Prairie Farmer, June 2.
 1869. Riley, First Missouri Report, p. 69-79.
 The variegated cutworm (*Peridroma saucia* Hbn.)
 The dark-sided cutworm (*Carneades messoria* Harr.).
 The white cutworm (*Carneades scandens* Riley).
 The well-marked cutworm (*Noctua clandestina* Harr.).
 1883. Cook, Report Mich. Bd. of Agr., p. 422.
 The black-lined cutworm (*Noctua fennica* Tausch.).
 1887. Murtfeldt, Bull. 13 U. S. Ent. Divc., p. 60.
 The mottled grey cutworm (*Rhynchagrotis alternata* Grt.)
 The white-spotted cutworm (*Homohadena badistriga* Grt.)
 1894. Davis, An. Rep't Michigan Expr. Station, p. 89.
 The speckled cutworm (*Mamestra subjuncta* Gr. & Rob.).
 1895. Davis, paper before Assoc. Ec. Ent., Aug. 28.
 The red cutworm (*Rhynchagrotis placida* Grt.).
 1895. Slingerland, Bull. 104, Cornell Expr. Sta., p. 570 & 574.
 The dingy cutworm (*Feltia subgothica* Haw.).
 The spotted-legged cutworm (*Porosagrotis vetusta* Walk.).

All or nearly all of these species are common over the eastern United States and Canada. The species found at Muskegon were the speckled, red, white, and dark-sided cutworms. Of these fully nine out of every ten were the speckled cutworm, *Mamestra subjuncta*. The red and white cutworms were usually present, but not abundant.

When the caterpillars become full grown, they are about an inch and a half long. They are now through feeding, and they bury themselves deeper in the soil than when they are hiding through the day. Here each one constructs an oblong cell in the earth, by the use of saliva and pressure of the body, and in this cell it transforms to what is known as the pupa or chrysalis. From the pupa stage they issue as moths between the last of June and early August. These moths are the parents for the next year's brood of cutworms. They lay their eggs, according to Dr. Riley, in the fall, in batches of from fifty to sixty, and generally in two layers. The eggs probably hatch in the fall, and the young cutworms partly mature on grass or some similar green food, before winter, as do many other species whose habits are better known. They never molest the fruit trees at this time of year. In this partly grown condition they remain until spring, when they awake from their long fast to feed on the early vegetation. Their growth is very rapid at this time, and in two or three weeks they are full-grown and ready to follow in the line of their ancestors.

This in general is also the life history of our other destructive species so far as we know it at present. Some species remain in the pupa stage a much shorter time, which is the case with the red cutworm that is later in reaching its growth but appeared in the breeding jar June 15, or in about two weeks after attaining its growth. Other species are slower in their transformation, and winter in the egg stage, and some are even known to hibernate in the pupa stage and appear as a moth the following spring. Undoubtedly these latter do no harm as climbing cutworms, as they would be too late to injure the buds or tender leaves.

Means of Control.—There perhaps is no one item more important for the orchardist to observe than this. All of my observations, and those of many others, give good evidence that the climbing cutworms do not breed to any extent in carefully tilled soil. In Mr. Rood's case the orchard had been in clover the past two years. Through the dry summer season, much of the clover was killed out, leaving enough still for the young cutworms to subsist on during the autumn. Mr. Rood felt very certain that the clover and its death had been the cause of the attack on his trees, and consequently, as soon as the attack in the spring was over, his orchards were plowed and, so far as could be, were kept under thorough cultivation the remainder of the

season, allowing no grass nor weeds to grow even close to the trunks of the trees. As a result these orchards were not molested last spring by climbing cutworms, and last fall he wrote me that he had never had a finer crop of apples nor a larger yield. There was one orchard which had grape vines between the rows of trees. This was plowed and cultivated, but could not easily be kept entirely clean, and it was here that the cutworms were almost as plentiful as the year before. In neighboring orchards similar conditions were noted. Those orchards that were in old sod or under partial cultivation suffered the most severe attack. This same relation between clean culture and freedom from cutworms has been reported to us from Benzie county, and Mr. Slingerland found the same to be true in western New York. Had Mr. Rood plowed his clover under at or before the time that it commenced to die, and kept the soil thoroughly cultivated from that time on, the climbing cutworms would probably not have been plentiful enough to cause any injury the following spring.

From what we know of the life history of these climbing cutworms, it seems safe to say that if the ground is kept free from grass and weeds from July to October of each year, there is little danger of injury from climbing cutworms, and probably if a crop of clover or grass is left over *one* year and plowed under in June of the next, the cutworms will not increase to any great extent in this short period. This would give an opportunity for using wheat, rye, or clover as a green manure of desired.

Trapping the moth is an old method, long since discarded by those of experience in this line, but occasionally people ask regarding it; for this reason it is inserted here. In early times this appeared to be an ideal remedy, as it was thought that the moths could easily be caught before the female deposited her eggs. A few years' practice proved the fallacy, as most of the moths caught were males or old females. Moreover, many beneficial insects were also taken in the same traps, and the harm nearly equaled the benefit.

The tin collar was tried last spring, and was found to be little better than nothing. When the cutworm comes to the collar it will travel around beneath until it comes to the lap, or where the two ends meet, and then will climb up almost as readily as on the bark. The tin collar is more difficult to fit to the tree than the band, and is more expensive.

The cone-shape paste-board collar I have found in more general use over the state than any other one method. The collars are cut to a scale from stiff glazed paper and, when pinned around the trunk, form an inverted funnel over which the cutworm must travel to go further. These paste-board collars were already on the grape vines on my arrival at Muskegon. Other bands were put on above, to see if the collars were a success. We found no instance, to my present remembrance, where a cutworm was known to pass over the paper funnel, and if it fitted tightly it appeared to be a protection; but the collars could not be made to fit every little irregularity of the trunk with sufficient accuracy to prevent the cutworms from finding a crevice to push their way through, and hence many were found above the paper cone. The cones are also very easily tilted or moved in cultivating and working around the trees and vines, and this unintentionally opens more crevices.

Three kinds of band were tested in the orchard, viz.: Wool, cotton, and one of material from Germany, resembling wagon grease, and known as caterpillar lime or "raupenleim."

The caterpillar lime was furnished by Wm. Menzel & Son, 64 Broad street, New York city, and did very nicely. It was applied directly to the trunk of the tree, in a band of from one to two inches in width. The cutworms did not attempt to climb over it except on a very cool night when the material became too stiff. This defect can quite likely be overcome; in fact, a

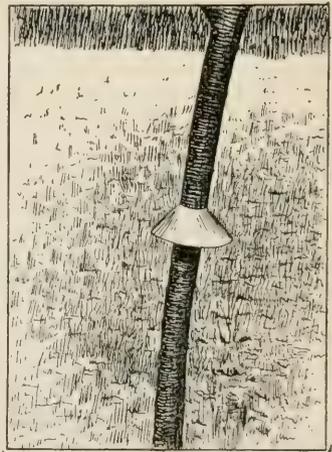


Fig. 7.—An illustration of a cone-shape paste-board collar.

similar substance known as "Dendrolene," compounded by Prof. F. L. Nason of New Brunswick, N. J., is said to obviate this difficulty. The former costs 13 cents and the latter 6 cents per pound in 25-pound cans. Neither of these materials, however, are so cheap or so quickly applied as either of the following bands.

The cotton band was tested very thoroughly by Mr. Rood the first year, who says of it, "So long as the cotton was kept dry, it stopped their upward climbing, and there would be a great mass of moving worms just beneath the cotton. After it rained on the cotton, they walked right over it and got in a good night's work. Next day, as I had no more cotton, I put a daub of tar on top of the band. That worked like a charm for awhile, but as soon as the tar got too cold and lost its smell they trotted over it and I had to put on another coat."*

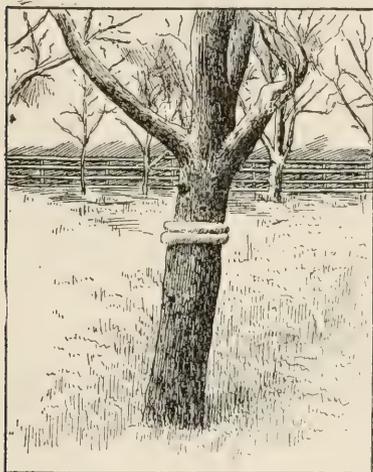


Fig. 8.—Illustrating the wool and cotton bands.

by common wrapping-twine wrapped once or twice about it in the middle. In practice it will be found essential to have the bands this narrow of either wool or cotton, as the birds appreciate this material for a downy nest, and if it is not securely held by a cord, large chunks will be pulled out, leaving holes through which the cutworms can easily climb. If the wool is properly cared for, the same material may be used for bands for several years in succession, thus reducing the expense to a minimum.

If to prevent the cutworms from reaching the tree tops were sufficient, the keeping of a wool band on the trunk would be enough; but every fruitgrower should try to rid his fields of them. He should not only keep them from his trees, but should keep them from developing on other plants when they can not get into the tree tops. He must at least protect the trunks of his trees below the band or they may be girdled. The following methods will be found helpful:

Crushing by hand was the method adopted by Mr. Rood, who found it a sure one, though rather laborious, as it kept one or more men at work all night. He would start out about ten o'clock with a lantern in one hand and a leather mitten on the other that crushed the cutworms without mercy. Usually each tree was visited about twice each night.

Around the base of each tree were placed three or four old boards or shingles, and a large share of the cutworms that escaped the crushing would hide under these traps for the day. Often hundreds would be found attached in a bunch to the under side of a single board, but it was either a rotten one or a rough one, for a smooth board for some reason was always avoided by the masses. Another thing worthy of note was that the white cutworm (*Carnocades scandens*) was never taken under the traps. This species always came to the trees much later at night than the

* Perhaps the statement should be made here that coal tar, if used at all on trees, should never be permitted to touch the bark, as a very small amount will leave a brown dead spot beneath. Young trees are very susceptible to injury by it.

others, and always came some distance from the trunk. The speckled and red cutworms are easily trapped, but they should be gathered early in the morning while it is yet cool, for as soon as the boards become heated the cutworms will bury themselves in the soil where it is cooler and there is more moisture.

Bran, given a green tinge with Paris green, was dropped around the base of each tree as an experiment. The cutworms ate it readily, both as they passed it in starting up the tree and as they came back hungry from their vain effort to get beyond the band. The next morning more than half of the cutworms were found hanging to the bark, limp and dead, or in the same condition on the ground. In some cases 90 per cent. were found dead. No doubt many that were not found buried themselves in the soil and died there from the effects of the poison. Where much bran was eaten the poison acted very quickly. Bran with and without sweetening was tried, but the cutworms seemed to eat one kind as readily as the other. Possibly a supply of freshly poisoned bran will be desirable every few days. The experiment of poisoned twigs was made by dipping freshly cut twigs in Paris green water and standing them in the ground around the trunk where the cutworms could easily reach them near the band. This served as a good decoy and killed about the same number that the bran did. This makes more work than distributing the bran but if one does not prune his orchard until this time, he can quite easily cut some fresh twigs every few days and apply poison to them.

Spraying the trees with the arsenites will be found to be of very little practical value. The leaves are still in the bud, and the cutworm eats comparatively little of the outside, and hence the poison is slow to act. Mr. Rood says of it, "I sprayed the trees twice, as it rained after the first application, and could not see that it did a particle of good. I had no idea that it would, but in my desperation I would try anything."

It is not uncommon for people to have their fruit trees injured by climbing cutworms for some time, or even for several seasons before they can ascertain what has done the injury. One may look carefully over the tree through the day, for an insect, but there will be nothing to indicate the identity of the depredator except the injured buds. To one who has had experience with this "thief in the night," the conspicuous absence is characteristic, for no other insect is likely to feed in this way and leave the tree during the day. Another method is to go out in the evening, if one suspects their presence, and listen for the chewing at the buds which is quite noticeable; or, better yet, put a band on the trunk of a few trees and examine below the bands for them by lantern light. If they have been troublesome in years past, or there is likelihood of their being present, the trees should by all means be protected against a sudden raid that might destroy a year's crop of fruit and endanger the life of the orchard as well.

VEGETABLE TESTS.

Part of Bulletin No. 131.

BY H. P. GLADDEN AND U. P. HEDRICK.

BUSH BEANS.

Forty varieties of bush bean were planted May 23 and 24. The plants started well and, when the drouth came on, water was supplied from the irrigating system. This always available supply of water kept the plants continually growing, and a large crop of pods with general freedom from rust was the result.

Variety.	Seedsman.	Time edible.	Variety.	Seedsman.	Time edible.
Blue Podded Butter.....	Vanghan.....	July 25	Marvel of Paris.....	Thorburn.....	July 19
Canadian Wonder.....	Dreer.....	Aug. 2	Nettle Leaved Bagno- let.....	".....	" 20
Challenge.....	Ferry.....	July 16	No. 71.....	A. N. Jones.....	" 23
Cylinder Black Wax.....	Henderson.....	" 21	Refugee.....	Ferry.....	" 23
David Kidney Wax.....	Hicks.....	" 18	Roides Vertes.....	".....	" 23
Davis Wax.....	Ferry.....	" 20	Queen.....	Hicks.....	" 18
Davis Wax.....	A. Brown & Co.....	" 20	Saddle-back Wax.....	Burpee.....	" 21
Detroit Wax.....	Ferry.....	" 20	Six Weeks Round Yellow.....	Ferry.....	" 23
Dwarf Horticultural.....	".....	" 23	Stringless Green Pod.....	Burpee.....	" 23
Flageolet Victoria.....	Henderson.....	" 23	Stringless Green Pod.....	Vanghan.....	" 23
Flageolet Wax.....	Dept. Ag.....	" 20	Speckled Wax.....	Ferry.....	" 21
German Wax.....	Ferry.....	" 23	Valentine—Cleve- land's Imp.....	Harris.....	" 23
Golden Wax.....	".....	" 18	Victoria Flageolet.....	Ferry.....	" 23
Golden Eye Wax.....	Buckbee.....	" 20	Wardwell's Kidney Wax.....	".....	" 20
Goddard.....	Ferry.....	" 23	Warren.....	Vanghan.....	" 23
Gold Dot.....	Hicks.....	" 18	Yosemite Wax.....	".....	" 28
Holstein.....	Buckbee.....	" 23			
Longfellow.....	Henderson.....	" 23			
Market New Prolific.....	Thorburn.....	" 23			
Marblehead Horti- cultural.....	Ferry.....	" 18			

Challenge, D. M. Ferry & Co., Detroit.—A small-growing sort and the first to mature edible pods. The pods are of good size, tender and of excellent quality, golden yellow in color. The plants are very productive, and maturing so early it is a valuable variety for the market or home garden.

Davis Wax, Alfred Brown & Co., Grand Rapids.—New. Plants of large growth, quite upright in habit; leaflets large, medium green, with slight yellowish tinge. Pods six to seven inches long, flat, straight, light golden color, tender and excellent in quality; valuable for vigorous growth of plant and productivity, for the large-size, regular pods of handsome appearance and good quality; bean white.

Dwarf Horticultural, Ferry.—Plants very productive; excellent as a shell-bean when partly ripened; also can be used as a green-podded snap sort.

Longfellow, Peter Henderson & Co., New York.—New. Plants strong, vigorous, upright growth; leaflets very large, slightly wrinkled, color medium dark green. Pods six to seven inches long, curved, somewhat flattened; quality fair, color light green; valuable for strong, healthy growth and productiveness.

New Prolific Market, J. M. Thorburn & Co., New York.—New. Plant a vigorous, growth; leaflets somewhat wrinkled dark brown color; pods five to six inches long, round, light green in color, flesh solid and of good quality; rather late, but plants very productive; an excellent sort.

Marblehead Horticultural, Ferry.—New. Earlier and superior to Dwarf Horticultural; an excellent early shell-bean.

Stringless Green Pod, W. Atlee Burpee & Co., Philadelphia, J. C. Vaughan, Chicago.—New. Plants of medium growth; pods $4\frac{1}{2}$ to $5\frac{1}{2}$ inches long, nearly round, slightly curved and twisted; light green in color; flesh tender and of best quality; the pods remain long in edible condition; even when the beans are large the pods are not stringy. Valuable for good quality and lack of stringiness.

Cleveland's Improved Valentine, Joseph Harris Co., Moreton Farm, N. Y.—Plants of medium growth and very productive. Pods four to six inches long, curved, round, green in color, tender and of best quality; an excellent green-podded variety.

Improved, Department of Agriculture.—Plants of vigorous, spreading growth, inclined to climb; pods three to four inches long, narrow, flattened, light green in color, tender, juicy, and of best quality; lacks productiveness.

No. 71, A. N. Jones.—New. Plants of strong, vigorous growth and very productive; pods five to six inches long, round, curved, golden yellow; flesh thick, tender, and of good quality; a good variety.

Holstein, H. W. Buckbee, Rockford, Ill.—New. Seed did not germinate well and but few weak plants grew; beans peculiarly marked in red and white.

David Kidney Wax, D. C. Hicks, North Clarendon, Vt.—New. Plants of strong growth; leaflets somewhat wrinkled, dark green color; pods five to six inches long, broad, flat, rich golden yellow color; flesh solid, crisp, and of best quality; very productive; an excellent sort.

Of the older and better known varieties, Cylinder Black Wax, Golden Wax, and Saddle-back Wax, among the yellow-podded sorts, and Red Valentine and Marvel of Paris among the green-podded, are up to the usual high standard of excellence. Gold Dot, Detroit Wax, German Wax, Queen and Blue-podded Butter are good varieties.

Goddard, Flageolet Victoria, Nettle-Leaved Bagnolet, Refugee, Roides Vertes, Speckled Wax, Wardwell's Kidney Wax, Warren, and Yosemite Wax are not so good as the varieties given above.

The following Wax sorts did best with us: Challenge, Cylinder Black Wax, Davis, and David Kidney Wax. Green-podded sorts: Cleveland's Improved Valentine, Longfellow, New Prolific Market, and Stringless Green Pod. As a green shell-bean, Marblehead Horticultural was the best grown.

POLE-BEANS.

The pole-beans were planted July 14-15. The following table shows the time the pods or beans reached edible maturity:

Variety.	Seedsman.	Time edible.	Variety.	Seedsman.	Time edible.
Black Lima	Dept. Ag.	Sept. 18	Mustiff	Johnson & Stokes	Sept. 7
Brockton	Ferry	Aug. 20	Southern Prolific	Ferry	" 10
Carolina	Landreth	Sept. 20	Sunshine Wax	Burpee	" 6
Golden Cluster	Ferry	Aug. 20	Willow Leaf	Dreer	" "
Golden Champion	"	" 15	White Creaseback	Ferry	Aug. 17
Kentucky Wonder	"	" 23	White Lima	"	" 21
King of the Garden	"	Sept. 21	White Zala	Burpee	" 20
Lazy Wife	Dept. Ag.	" 26	Worcester	Rawson	" 28

Brockton, Ferry.—Plants are small growers and most of the pods are borne low down; pods dark green, mottled with purplish red, and well filled with large beans; a good shell-bean variety.

Black Lima, Dept. of Agriculture.—The seeds did not germinate well and the plants were weak; usually the first of the Limas to mature beans, and an excellent variety.

Golden Cluster, Ferry.—The best snap pole-bean.

Golden Champion, Ferry.—The first of the poles to mature edible pods; valuable for earliness and good quality of pods.

Kentucky Wonder, Ferry.—Plants are very strong-growing, healthy, and productive. A very valuable green-podded variety.

King of the Garden, Ferry.—Plant a strong, healthy grower, bearing a large crop of pods; pods five to six inches long, one inch broad; beans large, four to five in pods, and of good quality; an excellent Lima bean.

Mastiff, Johnson & Stokes, Philadelphia.—New. Plants are of medium growth; pods somewhat resemble Golden Cluster, but not so broad nor so bright yellow, and each pod has a line of green on each side. It is later in maturing than Golden Cluster, but is a good variety.

Southern Prolific, Ferry.—Plants of strongest growth and very healthy; a wonderfully prolific variety; flesh thick, tender, and of high quality. It has a long season, pods in all stages of growth until frost comes. Valuable.

White Lima, Ferry.—Plants very strong growers, running to tops of poles, eight feet high. Plants are very productive, bearing pods in clusters from bottom to top of poles; beans medium in size, three to four in short pods, and of excellent quality; a good Lima bean.

Worcester, W. W. Rawson & Co., Boston.—Plants of low, stocky growth, quite productive; beans large, broad, thick, of good quality. An excellent shell-bean.

Sunshine Wax is similar to Golden Cluster.

White Creaseback, White Zulu, and Lazy Wife are not of special merit.

As snap poles, Golden Cluster, Golden Champion, Kentucky Wonder, and Southern Prolific are recommended.

Black Lima, White Lima, and King of the Garden are among the best Limas.

Brockton and Worcester are excellent as shell-beans.

BEETS.

The following table shows the time of maturity of the several varieties grown:

Variety.	Seedsman.	Date of maturity.	Variety.	Seedsman.	Date of maturity.
Beet from Persia.....	.....	July 8	Market Gardeners.....	Maule.....	July 8
Columbia.....	Burpee.....	" 5	Stinson.....	Burpee.....	Aug. 18
Crimson Chief.....	Johnson & Stokes.....	" 3	Surprise.....	J. & S.....	July 5
Eclipse.....	Vaughan.....	June 30	Crosby's Egyptian.....	Dept. Ag.....	June 28
Long Blood.....	Landreth.....	July 16	Sunset.....	Buckbee.....	July 11

Columbia, W. Atlee, Burpee, Philadelphia, Pa.—Tops small and of a dark bronzed color; flesh bright red with dark rings; quite early, of handsome appearance, solid flesh, and good quality; several seasons' trial has proved this to be a desirable sort.

Crimson Chief, Johnson & Stokes.—Root of Eclipse type, but darker color, tapers more slowly, and top of root larger and longer; flesh solid, sweet, dark crimson with light streaks; smooth, regular form; early; an excellent variety.

Stinson, Burpee.—New. Tops very small; leaves long and narrow and of a dark red color; round root, 2½ to 3 inches in diameter, rather long tap-root; flesh fine-grained, dark color, and of best quality; a late-maturing sort.

Surprise, Johnson & Stokes.—Root four to five inches in diameter at top, flat, tapering gradually to long tap-root; flesh light, almost white, dry, hard, and of fair quality; valuable for excellent form.

Sunset, Buckbee.—New. Top, quite large; root four to five inches in diameter; round top, tapering slowly to long tap-root; skin dark; flesh rich, dark red color, and of best quality; an excellent late sort.

Beet from Persia.—Leaf-stalk and leaves light green; root four to five inches in diameter, round top, cylinder-shape, tapering quickly to a spongy tap-root; very irregular and rough in form and appearance; flesh very hard, dry, and woody, almost clear white in color; of poor quality and little value.

Crosby's Egyptian, Dept. of Agriculture.—The earliest sort to mature; excellent form; flesh dark but not of best quality; valuable for earliness.

Eclipse, Vaughan.—One of the best early-maturing sorts.

Long Blood, D. Landreth & Sons, Philadelphia.—An excellent late sort and one of the best for winter use.

CELERY.

The place selected for planting the celery has a loose, black soil of considerable depth and was in a good state of fertility. The larger part of the plot was so arranged that a row of tile was placed at a depth of about six inches under each alternate row of plants. The ends of several rows were connected with cross tiles so that the water could be distributed through one opening. This plan worked very successfully and a good crop of celery was grown. Rows purposely left without this arrangement of underground tiles, but watered by surface irrigation to give the plants a good start, did not give as good growth, and much more rust was present than on the sub-irrigated portion.

Crawford, Burpee.—A medium-growing sort; stalks large, thick, yellowish white color, and of good quality; easy to blanch but does not keep well.

Dwarf Golden Heart.—A small-growing variety, but blanches very easily and is of fine quality; rusted quite badly and is not a good keeper.

Giant Pascal.—A large-growing sort; stalks large, thick, with a rich, nutty flavor; does not blanch very easily; rusted but little, and a good keeper; one of the best.

Golden Self-Blanching.—A rather short grower but close and solid; blanches readily; is of good quality and quite free from rust; a good keeper; an excellent variety.

Imperial Burpee.—A small-growing sort; rusted very badly, and many stalks were rotten; a poor keeper.

Perfection Hartwell, Burpee.—A large-growing sort; stalks large, thick; considerable rust present; hard to blanch, but of excellent quality when well blanched; a good keeper.

Pink Plume, Henderson.—A good grower; stalks medium large, thick, of excellent quality, and a good keeper; quite free from rust; an excellent pink sort.

Red Pascal, Vaughan.—New. Not so large a grower as Giant Pascal; outer stalks have a pink color; excellent quality and quite free from rust; does not seem to be as good a keeper as Giant Pascal.

White Plume.—Of small growth; tops almost white; stalks small, but blanch easily and of good quality; perhaps the best early variety, but not a good keeper.

CUCUMBERS.

The cucumbers were planted June 10 and 11. The following table gives the varieties planted and the dates when they became ready for use:

Variety.	Seedsman.	Date edible.	Variety.	Seedsman.	Date edible.
Albino	Ferry	July 25	Japanese Climbing	Vaughan	Aug. 21
Arlington White Spine	Vaughan	Aug. 2	Long Green	Gregory	" 12
Bennett's White Spine	"	" 4	Monarch White Spine	Buckbee	" 8
Chicago Giant	"	" 8	Giant Pera	Dept. Ag.	" 21
Commercial Pickle	Thorburn	" 9	Nichol's Medium		
Cool and Crisp	Henderson	" 4	Green	Vaughan	July 29
Everbearing	Thorburn	July 28	Parisian	"	Aug. 15
Everbearing	Vaughan	" 25	Russian	Gregory	July 22
Evergreen White Spine	Johnson & Stokes	Aug. 4	Sikkim	"	Aug. 21
Fordhook White Spine	Burpee	" 9	Westerfield	Vaughan	July 28
Green Prolific	Vaughan	" 1	White Wonder	Burpee	Aug. 2
Ivory Monarch	Childs	" 15	White Wonder	Dept. Ag.	July 31

Albino, Ferry.—Fruit when mature 8 to 10 inches long, 2 inches diameter; nearly round, with slight ridges; color, golden yellow, with few, short, black spines; the small fruits are white, but soon have a yellowish tinge; the flesh is thick and of a good quality, and seed cavity small; plants are productive; a good variety to furnish small, white pickles; also good for slicing.

Ivory Monarch, John Lewis Childs, Floral Park, N. Y.—Vines are the strongest and most vigorous in the patch. Fruit, when mature, 12 to 14 inches long, 2 to 3 inches in diameter, somewhat curved and twisted; color almost white, with few short, darker spines; flesh solid and of good quality; seed cavity small; plants are not productive.

White Wonder, Burpee, Dept. Agriculture.—Vines of medium growth and healthy; fruit, when mature, 5 to 6 inches long, $2\frac{1}{2}$ to 3 inches in diameter; smooth, triangular, regular form; color, white with mere dots for spines; seed cavity large and seeds numerous; quality fair but not enough flesh; attractive in appearance and plants productive.

Everbearing.—Plants are of small growth, but set a large amount of fruit; fruits, when mature, 4 to 5 inches long, nearly round, smooth, thickly set with fine black spines which come off easily; an excellent sort for early pickles; for slicing it is too small, has too many seeds, and lacks quality.

Russian.—Vines of vigorous, healthy growth, and very productive; fruits 3 to 4 inches long, smooth; perhaps the best sort for small, early pickles; also excellent as an early slicing variety.

Westerfield.—Vines are of medium growth, blossomed full and set many fruits, 5 to 6 inches long, two inches in diameter, somewhat triangular, smooth; small fruits have large, short, black spines and are quite rough; very productive; as a sort for general pickling, it is one of the best; good quality for slicing, but there are others better for this purpose.

Arlington White Spine, Vaughan.—Plants strong-growing, healthy, and the most productive of the White Spines; 5 to 6 inches long, $2\frac{1}{2}$ to 3 inches in diameter; differs from others of the class in having shorter fruits and ends more blunt; seed cavity large and quality not of the best.

Bennett's White Spine, Vaughan.—Plants are the strongest and best growers of the class; fruits 7 to 9 inches long, usually somewhat curved; flesh solid and of good quality; perhaps the best of the White Spines.

Evergreen White Spine, J. & S.; Fordhook White Spine, Burpee; Monarch White Spine, Buckbee, are quite similar in plant growth and in appearance of fruits; excellent sorts.

Cool and Crisp, Henderson.—Plants are of good growth and healthy, bearing a large crop of fruit; closely resembles the White Spine class, but perhaps more slender and tapering more from center to ends; excellent in quality and a good slicing sort.

Nichol's Medium Green.—Plants of good growth and very productive. One of the best varieties for slicing that matures medium early.

Green Prolific, Vaughan.—Plants are not of strong growth, do not spread far from hill, but are very healthy and productive for growth; fruit 5 to 6 inches long, $2\frac{1}{2}$ in diameter, quite prominent black spines until mature, when fruits are almost smooth; flesh solid and of best quality; a good table sort, and also good for pickling.

Parisian.—Plants of good growth and productive; a valuable sort for long, slender pickles.

Chicago Giant, Vaughan.—Vines of very strong growth, healthy, and productive; fruits, when mature, 12 to 14 inches long, $2\frac{1}{2}$ to 3 inches in diameter; flesh solid, small cavity and few seeds; of best quality; the pickling size are very solid and crisp; valuable for pickles or for slicing.

Giant Pera, Dept. of Agriculture.—Vines of strong growth, but set few fruits; very solid and crisp, and of best quality; good for pickling; lacks productiveness.

Japanese Climbing, Vaughan.—Vines are very strong-growing and very productive; fruits large and of best quality, but rather slow to mature; a most excellent variety; will climb if poles are provided, but does well on ground.

Sikkim, Gregory.—New. Plants of strongest growth, healthy and very productive; fruits 10 to 12 inches long, 2 inches in diameter, nearly straight, slightly smaller in middle; ends blunt; dark green color; smooth, a few blunt black spines; flesh very solid and firm; small seed cavity; seems to lack flavor and quality; might do for pickles, but others superior; not a table sort.

As pickling sorts, Russian and Westerfield for small, and Parisian for large-size, pickles are good varieties. As table sorts, Nichol's Medium Green, Cool and Crisp, Bennett's White Spine, and Japanese Climbing would make an excellent selection.

Albino is one of the best white varieties, either for pickling or table use.

LETTUCE.

Seed of the varieties thought to be suitable for hot-bed growing was sown in the forcing-house, March 25. April 18-19, the plants were transferred to hot-beds. The table shows the dates at which the several sorts were ready for market.

Variety.	Seedsman.	Date of maturity.	Variety.	Seedsman.	Date of maturity.
Black Seeded Simpson	Vaughan	June 5	Hanson	Vaughan	June 20
Black Seeded Butter	Ferry	" 11	Mignonette.	Henderson	" 18
Boston	Thorburn	" 1	Perpignan	Vaughan	" 9
Buttercup	"	" 7	Sensation	J. & S.	" 15
Cabbage	Burpee	" 7	St. Louis Butterhead.	Vaughan	" 5
Chicago Forcing	Vaughan	" 5	Tom Thumb	Burpee	" 9
Deacon	Burpee	" 5	Treasure	Henderson	" 7
Half Century	Childs	" 23	Denver Market	Dept. Ag.	" 20

Boston, Thorburn.—The first variety to mature. Heads rather small, 5 to 6 inches in diameter; light, rather golden yellow color; leaves small, somewhat waved and slightly notched; forms a loose head; tender and of excellent quality; a good forcing sort.

Black-Seeded Simpson, Vaughan.—A few days later than Boston. A most excellent loose-headed, large-growing sort; very valuable for hot-bed purposes.

Deacon, Burpee.—Heads 6 to 8 inches in diameter; loose-growing; leaves dark green, regular in outline, not waved nor notched; very tender and of best quality; a valuable sort.

St. Louis Butterhead, Vaughan; Perpignan, Vaughan; Black-Seeded Butter, Ferry; Silver Ball, Vaughan; Treasure, Henderson, and Buttercup, Thorburn, differ in shades of green, date of maturity, and in more or less loosely formed heads; all are good forcing sorts.

Blonde Beauty, Vaughan.—An excellent grower; leaves curled, wrinkled, and blistered; forms a loose curled head, yellowish green in color; good quality and tender; a few days later than Black-seeded Simpson.

Tom Thumb, Burpee.—Heads small, 5 to 6 inches in diameter, rather loose, dark green color; not a good-growing sort; runs to head quickly.

Sensation, Johnson & Stokes.—New. Matures a few days later than Silver Ball and is somewhat of same type, but leaves are more waved and crinkled; forms a loose, open head of good size; light green in color; does not seem to grow as tender or be of as good quality as some others.

Mignonette, Henderson.—New. Matures 5 to 6 days later than Silver Ball; heads 6 to 8 inches in diameter; forms a rather loose head; leaves large, crinkled, and waved; light purplish tinge on edges; inner leaves light, delicate green; a very handsome lettuce, tender and of best quality; very valuable but rather late in maturing.

Denver Market, Dept. of Agriculture.—A rather coarse-growing sort and late in maturing; some of the heading varieties are preferable for forcing use.

Hanson, Vaughan.—An excellent large-growing, loose-heading sort; color light yellowish green; later than some of the smaller-growing varieties.

Half-Century, Childs.—Matures 10 to 12 days later than Silver Ball; heads, 8 to 10 inches in diameter; when fully grown, forms a close head; leaves entire, a little wrinkled, very dark green color; excellent in quality and very tender; regard it as a very desirable sort, though its dark green color may be objectionable.

Lettuce out of doors.—The forcing varieties above mentioned, together with eleven other sorts, were transplanted to the garden May 23. The following are a few of the varieties that did best with us and are recommended for garden use:

Iceberg, Burpee.—The heads are of good size; leaves somewhat curled and wrinkled, edges brownish-red. Its high quality, handsome appearance, and its ability to form good heads during dry weather, make it a very desirable variety.

Hanson, Black-Seeded Simpson, and Blonde Beauty, are large-growing, loose-heading sorts, well suited for garden growing.

Prize Head, Chartier, and Onondaga form loose heads, with leaves curled and wrinkled; color, purplish. They are of excellent quality and have a long season.

Mignonette.—New. Mentioned above among the forcing varieties; is also an excellent out-door sort; one of the best.

RADISHES.

The seeds of twenty varieties were sown in the hot-beds early in March and careful notes taken of their behavior to determine their value for forcing purposes.

Rapid Forcing, Henderson.—This was the first variety to become of edible size; mature in 26 days after sowing; tops small; root irregular; olive-shape; red, white-tipped, with slender tap-root; does not remain long in edible condition; a valuable sort for early maturity and good quality.

Bright Breakfast, Burpee.—Mature in 34 days. Tops of medium size; root dark-scarlet color, round top, slightly olive-shape; tap-root long, tapering gradually, white; good quality and tender but not very early; not of special merit.

French Scarlet Turnip, Thorburn.—Mature in 36 days; tops of medium size; roots light scarlet color; vary in form from irregular tapering to round; tap-root long; flesh firm, crisp, and tender; not early, but of best quality.

White-Tipped Scarlet Turnip, Thorburn.—Mature in 34 days; form tends to olive-shape; rather sharp in flavor; nothing specially noticeable.

Scarlet Button, Burpee.—Mature in 32 days; tops quite small; roots deep dark scarlet color, round, with long, slender tap-root; handsome in appearance and quality of the best.

Bird, Salzer.—Quite similar to above.

Roman Carmine, Thorburn.—Mature in 34 days; tops of medium size; root round; bright, dark scarlet color; tap-root slender; excellent in quality and flavor mild.

Rose Turnip, Henderson.—Quite similar to above.

Garnet Turnip-rooted, Landreth. Mature in 38 days; tops quite large; roots deep, dark crimson color, flat top, tapering quickly; tap-root large and long; flesh white, very firm and crisp; excellent in quality but scarcely as early as most of the other small-growing sorts.

White Box, Harris.—Mature in 34 days; tops of medium size; root flat, turnip-shape; color white; flesh very firm, crisp, and of good quality; one of the best of the white class.

White Forcing, Burpee.—Mature in 30 days; top small; root long, olive-shape; an early-maturing sort of mild flavor; becomes pithy very soon.

White Olive-Shape, Henderson.—Mature in 36 days; not a good grower; some are small and irregular in shape.

White Summer Turnip, Thorburn.—Similar to White Box.

Golden Dresden, Burpee.—Mature in 38 days; this variety did not grow well here; too small in size; flesh firm and of good quality.

Olive-Shape Golden Yellow, Thorburn.—Mature in 40 days; excellent in form, but sharp in flavor and rather late in maturing.

Yellow Oval-Shape, Henderson; Surprise, Burpee.—Mature in 34 days; root large, oval-shape; light golden-yellow color; flesh crisp, tender, and mild in flavor; remains a long time in edible condition; perhaps the best of the yellow sorts.

Eldorado, Henderson.—Mature in 34 days; tops small; root flat-topped; turnip-shape, with long, slender, tap-root; golden-yellow color; flesh very firm and crisp; an excellent yellow sort.

White-Tipped Scarlet Ball, Burpee.—Mature in 30 days; tops very small; root round, bright scarlet color, with white tip; flesh mild, crisp; an excellent forcing sort.

Out-door radishes.—Long Scarlet Short-Top, Thorburn.—Edible in 33 days; a well-known sort and one of the best for out-door growing.

Chartier, Thorburn.—Edible in 34 days; roots larger in size, but usually not as long as the preceding; a most excellent sort.

Cardinal, Burpee.—New. Edible in 30 days; tops small; root 5 to 6 inches in diameter, bright scarlet color. Its handsome appearance, crisp, tender flesh, mild flavor, and early maturity, make it a very desirable sort for garden purposes.

Rose China, Ferry.—Edible in 41 days; tops large; root 6 to 8 inches long, one inch in diameter, pink-scarlet color, lower part nearly white; an excellent later-maturing sort, remaining a long time in edible condition.

White Lady Finger, Buckbee.—New. Edible in 30 days; in form closely resembles Long Scarlet Short-Top, though a little thicker; color white; flesh tender, crisp, and of mild flavor; an excellent white sort.

White Chartier, Henderson.—New. Edible in 36 days; similar in form and growth to Chartier; color white; a fine white variety.

White Vienna, Thorburn.—Closely resembles White Chartier, though a few days earlier in maturing; a good sort.

Wonderful, Landreth.—New. Edible in 18 days; tops quite small; root 3 to 4 inches long, $\frac{3}{4}$ to 1 inch in diameter; an excellent grower; perfect in form; color a bright scarlet; valuable for earliness and handsome appearance; it is as early as the ball forcing sorts, and as it is larger in size it should be largely grown.

Half-long Deep Scarlet, Thorburn.—Edible in 24 days; larger in diameter and shorter than the preceding; not so attractive in appearance nor so early; hence, the other preferable.

Unless the soil where radishes are grown is sandy and rich, the roots grow too slowly and become tough and wormy. For this reason, some of the smaller-growing sorts, like Wonderful, Rapid Forcing, or Scarlet Button, are preferable to the larger-growing varieties. If seed is sown every week or ten days a succession of good radishes can be had in every garden throughout the season.

SQUASHES.

Owing to the extreme drouth of the past season, many plants did not make a good growth and the crop was far below the average in size and number grown. Many varieties produced no mature squashes.

Bay State, Vaughan.—A recent introduction. In color it is dark green. It has a thick, hard shell, making it an excellent winter keeper. The flesh is thick, dry, fine-grained, and of good quality; an excellent winter variety.

Bush Scallop, Vaughan.—One of the best varieties to grow for early summer use; color, white.

Chicago Warty Hubbard, Vaughan.—Does not seem to differ greatly from ordinary Hubbard, which is a well-known and standard winter sort.

Chicago Orange Marrow, Vaughan.—An excellent fall and early winter variety. The skin is of a rich, deep, orange color. The flesh is thick and of good quality; perhaps the earliest of the long-keeping sorts.

Cocanut, Vaughan.—A small-growing sort having fine-grained flesh, sweet, and of good quality. This variety is almost sure to bear a large crop of fruit and can be relied upon when other sorts fail. It is also a good keeper; valuable.

Cozelle Bush.—A variety of little practical value.

Essex Hybrid, Vaughan.—Short, cylindrical-shape, having cap-shape enlargement at the blossom end; varies in color from light orange to green; flesh dry, thick, bright orange color, and of good quality. The plants are productive and the squash a good keeper.

Eureka, Vaughan.—New. Vines of strong growth and very productive; squash 10 to 12 inches long, 8 to 10 inches in diameter, surface roughened; color, a light grayish-green; good in quality and a late keeper.

Delicata, Henderson.—Plants strong-growing and productive; squashes 6 inches long, 3 to 4 inches in diameter; rich, creamy-yellow color; flesh dry and of excellent quality; quite similar to Fordhook, but not so ridged and is more oval in shape; a fine variety and a good keeper.

Der Wing, Burpee.—A small-growing and early-maturing sort, scarcely as good as Fordhook or Delicata.

Faxon, Vaughan.—This variety as grown here varied from light Orange Marrow color to dark Pike's Peak; also, form varied greatly; type probably not fixed.

Fordhook, Burpee.—An excellent early-maturing sort of good quality; not of large size, but a good keeper.

Golden Heart, Vaughan.—New. Squashes 6 to 8 inches in diameter; round, with deep grooves, tapering to sharp point; color golden-yellow with green point and splashes of green around base; flesh thick, yellow, fine grained, and of best quality; matures early in the fall but is a good keeper.

Perfect Gem, Vaughan.—The squashes are from 4 to 6 inches in diameter, white or light yellow in color; skin thin, smooth, slightly ribbed; flesh dry and of good quality; good for fall or winter use, but too small in size.

Pike's Peak, Vaughan.—Vines of good growth and productive; squashes of a pale green color, good size and form; skin thin, but hard; flesh very dry, of fine grain and best quality; a little later than Hubbard, but a longer keeper and of better quality; an excellent winter sort.

Summer Crookneck, Vaughan.—One of the best early summer varieties.

Golden Cluster, Dept. of Agriculture.—Vines of small, bushy growth; very few squashes on vines; resembles bush scallop, but more circular in form, and not dented on edges so much; color dark, golden yellow; very early in maturing.

TOMATOES.

The seed of seventy varieties was sown in the forcing-house, March 27. When the plants were two inches high they were removed to flats and plenty of space allowed for stocky growth.

The ground, a light sandy loam, was well manured and thoroughly prepared, and the plants set out June 6 and 7. The rows were five feet apart and the distance between the plants in the row was four feet.

The plants were thoroughly irrigated during the season, as occasion required, and a very large crop of fruit was grown. No trellis was provided, but the plants were allowed to spread over the ground. Very little rot made its appearance and no spraying was required.

In the table below will be found the date of first fruit ripening; the number of fruits and weight grown on one plant; the average weight in ounces of a single fruit, and the amount in pounds of green fruit on one plant at the time of killing by frost, October 1. The yield from the one plant is divided into two periods, so that the early productiveness, often an important point, can be noted.

Variety.	Seedsman.	Date of first ripe fruit.	Yield of ripe fruit to Sept. 15.		Yield of ripe fruit Sept. 16-Oct. 1.		Total weight of ripe fruit.		Total No. of ripe fruits.	Average weight of a ripe fruit.		Weight of green fruit on vines after frost.	
			lbs.	oz.	lbs.	oz.	lbs.	oz.		oz.	lbs.	oz.	
			Acme	Vaughan	Aug. 29	3	3	4		3	7	6	33	3.58	10	---
Advance	M. A. C.	" 5	4	9	13	---	17	9	113	2.40	14	---	
Atlantic Prize	Buckbee	" 10	19	1	7	7	26	8	103	4.11	32	8	
Autoerat	Thorburn	" 12	4	10	11	9	16	8	32	5.09	24	---	
Baltimore Prize Taker	Landreth	" 17	5	14	5	11	11	9	41	4.47	26	0	
B. B.	J. & S.	" 19	2	13	12	---	14	13	32	7.41	19	0	
Beauty	Vaughan	" 29	2	4	---	10	2	14	11	4.50	6	8	
Bermuda	Landreth	" 29	10	14	8	10	19	8	70	4.33	12	4	
Brandywine	M. A. C.	" 29	7	0	7	15	14	15	41	5.30	27	8	
Brooke's No. 2	F. W. Brooke	" 17	9	18	8	14	18	11	38	7.34	26	12	
Buckeye State	Vaughan	" 29	---	6	2	4	2	10	7	6.00	---	---	
Cardinal	"	Sept. 6	2	1	2	2	4	3	12	5.58	15	---	
Chemin	Thorburn	Aug. 29	3	10	7	3	10	13	53	3.25	12	---	
Conqueror	"	" 29	10	9	8	11	19	4	124	2.41	15	---	
Crimson Cushion	Henderson	" 29	6	2	3	0	9	2	24	6.08	34	---	
Cross No. 1	Va. Ag. Col.	" 29	5	7	3	9	9	---	27	5.25	26	12	
" 2	"	Sept. 6	3	7	2	0	5	7	18	4.33	23	---	
" 3	"	" 6	3	1	6	11	9	12	26	6.00	25	---	
Democrat	Thorburn	Aug. 17	4	4	2	10	6	14	19	5.78	17	---	
Dwarf Aristocrat	Buckbee	" 10	16	14	6	3	23	1	82	4.31	---	---	
Dwarf Champion	Vaughan	" 10	3	10	0	13	4	7	28	2.55	6	---	
Early Ruby	Henderson	" 5	25	---	9	7	34	7	114	3.95	5	0	
Ferris wheel	M. A. C.	Sept. 2	2	14	9	4	12	2	30	6.46	---	---	
Fordhook	Vaughan	Aug. 29	2	7	5	14	8	5	36	3.68	9	8	
Golden Queen	"	Sept. 6	---	5	6	4	6	9	22	4.79	38	4	
Golden Sunrise	Henderson	Aug. 17	2	14	7	5	10	3	38	4.15	36	---	
King Humbert—white	W. A. Mandala	" 29	2	---	9	4	11	4	63	2.85	---	---	
—yellow	"	" 10	---	14	5	14	6	12	66	1.61	---	---	
Hybrid No. 1	Landreth	" 29	2	12	5	15	1	4	40	6.00	26	8	
" 4	"	" 20	2	3	11	3	13	6	41	5.29	34	8	
" 22	"	" 29	6	---	22	12	28	12	64	6.00	15	---	
" 25	"	" 20	4	---	8	3	12	3	55	3.55	23	---	
" 50	"	" 24	4	11	11	2	15	13	69	3.72	35	8	
Imperial	Manle	" 24	8	2	10	15	19	1	47	6.5	30	---	
Ivory Ball	Landreth	" 29	---	11	1	13	2	8	27	1.5	16	---	
Jersey Ex. Early	"	" 10	3	6	2	11	6	1	24	4.00	5	---	
La Crosse	M. A. C.	" 10	4	12	4	2	8	14	34	4.17	14	8	
Large Red	"	" 20	2	8	19	8	22	---	66	5.34	25	---	
Lemon Blush	Thorburn	" 20	1	8	3	9	5	1	19	4.24	21	8	
Liberty Bell	Vaughan	" 23	3	---	1	---	4	---	23	2.78	11	---	
Livingston's Favorite	"	" 26	2	1	8	1	10	2	34	4.45	19	---	
Long Keeper	"	" 24	5	8	6	4	11	12	53	3.73	24	8	
Meteor	M. A. C.	" 14	---	12	1	4	2	---	13	2.5	3	8	
McCullum's Hybrid	"	" 20	1	13	7	7	9	4	26	5.69	21	---	
Money Maker	Landreth	" 17	7	11	10	3	17	14	72	4	7	5	
New Stone	Vaughan	Sept. 2	5	13	5	5	11	2	29	6.15	8	5	
Northern Light	M. A. C.	" 2	3	9	5	12	9	5	18	8.25	22	8	
Optimus	Vaughan	" 2	1	6	7	10	9	---	83	4.39	26	---	
"	Dept. Ag.	Aug. 29	6	11	9	12	16	7	40	6.47	26	---	
Paragon	Vaughan	" 29	8	5	6	14	15	3	41	5.95	25	8	
Peach, new	Dept. Ag.	" 17	6	1	10	2	16	3	76	3.53	7	---	
Pear-shaped Yellow	Landreth	" 26	---	1	1	15	1	15	96	0.4	---	---	
Perfection	Vaughan	" 29	5	15	9	12	15	11	43	5.38	25	8	
Ponderosa	Henderson	" 29	2	15	7	1	10	---	17	9.44	29	---	
Potato-leaf Ignotum	M. A. C.	" 29	8	4	17	2	25	5	62	6.54	25	8	
Primita	Thorburn	" 20	2	5	8	---	10	5	31	5.31	26	---	
Seedling	W. Va. Station	Sept. 12	2	12	10	14	13	10	18	12.11	4	8	
Shah	M. A. C.	Aug. 29	2	7	10	---	12	7	31	6.75	11	8	
Ten Ton	Landreth	" 24	5	10	10	9	16	3	49	4.87	18	---	

Variety.	Seedsman.	Date of first ripe fruit.	Yield of ripe fruit to Sept. 15.		Yield of ripe fruit Sept. 16-Oct. 1.		Total weight of ripe fruit.		Total No. of ripe fruits.	Average weight of a ripe fruit.		Weight of green fruit on vines after frost.	
			lbs.	oz.	lbs.	oz.	lbs.	oz.		oz.	lbs.	oz.	
			Terra Cotta.....	Thorburn.....	Aug. 29	10	4	5		4	15	22	3.63	25	----	----
Tom Thumb.....	M. A. C.....	Sept. 6	1	7	9	9	8	49	3	----	----	----	
Tree.....	Dept. Ag.....	Aug. 29	5	18	14	23	14	95	4.03	17	8	----	
Turner's Hybrid.....	Vaughan.....	" 29	3	15	10	4	14	3	29	7.86	5	----	
Turkenbund.....	M. A. C.....	Sept. 2	10	5	9	6	8	86	1.16	----	----	----	
Vick's Criterion.....	".....	Aug. 10	3	9	11	4	14	13	85	2.8	----	----	
Volunteer.....	Vaughan.....	" 20	7	5	7	5	14	10	43	5.45	2	8	

The following are sorts of recent introduction:

Autocrat, Thorburn.—Fruits very large, round, slightly flattened, and irregular; purplish pink; flesh very solid and cells small, few-seeded; skin thick, making a good keeper and shipper; closely resembles Ponderosa.

Dwarf Aristocrat, Buckbee.—In plant closely resembles Dwarf Champion, though leaflets are larger and grow closer together; fruits are round, regular in shape, and of a bright red color; early; productive; an excellent variety.

King Humbert Yellow, W. A. Manda.—An improved and enlarged yellow, pear-shaped tomato.

King Humbert White, W. A. Manda, South Orange, N. J.—Similar in shape to preceding, though much lighter in color.

Hybrid No. 1, Landreth.—Fruit of medium size, round, inclining to heart-shape; dark red in color; flesh firm, solid, and of excellent quality; plants of strong and healthy growth; productive.

Hybrid No. 4, Landreth.—Fruit of medium size, almost spherical; light red in color, firm, and an excellent keeper; type not yet fixed.

Hybrid No. 22, Landreth.—Fruits medium to large in size; Acme color; almost spherical in shape; solid, and an excellent keeper; of best quality; an excellent sort.

Hybrid No. 25, Landreth.—Fruit about the size and shape of an egg; rather tender skin, but of fine quality; plants of low, spreading growth; fruits are too small.

Hybrid No. 50, Landreth.—Fruits larger and more spherical than preceding; Acme color; quality of the best, but skin tender; productive.

Seedling, W. Va. Station.—Plants of low, spreading growth; leaflets small, deeply cleft, thin, and papery; fruits very large; considerably larger than any other grown here; round, often quite irregular; Ponderosa color; cells small, with few seeds; thick walls; flesh rather coarse, but of fair quality; late in ripening.

The varieties of tomato catalogued by seedsmen are numerous. Often but slight differences mark varieties. Many appear identical. An attempt has been made to group together the similar sorts grown here the past season:

Ignotum Group.—Fruits large, round, regular, flattened, medium red in color.

Democrat, Thorburn.—New. Perhaps a brighter red, and colors better around stem. Cross No. 1 and Cross No. 3, Va. Ag. College, Brandywine; New Stone, Vaughan; Ten Ton, Landreth, and Optimus, Ferry, differ slightly in plant growth; otherwise similar to Ignotum.

Volunteer, Vaughan, and Paragon, Vaughan, are a darker red and have a thinner skin. Liberty Bell, Vaughan, and B. B., J. & S., are smaller in size, not so firm, and leaflets are larger and coarser.

Livingston's Favorite is of Ignotum type, though a brighter red, more regular in form, and usually smaller in size. The periods of ripening of above sorts differ as seen by table given.

Atlantic Prize, Buckbee; Early Ruby, Henderson; and Jersey Extra Early, Landreth, appear identical in fruit and plant. These have fruits of good size. The

plants are vigorous and productive and as early market sorts are excelled by none grown here.

Dwarf Champion and La Crosse are similar, though La Crosse fruits will average larger in size.

Autocrat, Thorburn.—New. Appears identical with Ponderosa, though ripening earlier.

Golden Queen and Lemon Blush are quite similar, though Lemon Blush is earlier and usually has more of light red around stem and apex. If a yellow-fruited sort is desired, one of above would give satisfaction.

Beauty, Imperial, and Northern Light are of Acme type and closely resemble that well-known variety.

Buckeye State, Cross No. 2, Ferris Wheel, and Turner's Hybrid are of Acme color, but differ slightly in form and in period of ripening from that variety.

Vaughan's Earliest still holds its place as the best early-ripening sort. The fruits are small and somewhat irregular in form.

Of the smooth, rather small-fruited, early sorts, Advance is one of the best.

For an early-ripening sort, having fruits of good, marketable size, Early Ruby or Atlantic Prize is recommended.

For the general crop any of the following would give good satisfaction: Ignotum, Beauty, Perfection, Acme, Optimus.

AN EXPERIMENT IN IRRIGATION.

Four rows of equal length, set with plants of the same variety, were used to test different methods of applying water.

Row No. 1 was watered by having a row of two-inch tile placed at a depth of eight inches beneath the surface and close to the row of plants. The hose was placed in the opening at one end and the water allowed to distribute itself through openings at the end of each tile close to the roots of the plants.

Row No. 2 had a row of tile close to the plants, but the top of the tile was so placed as to be even with the surface of the ground and water was allowed to flow through the tile as in Row No. 1, but was applied near the surface.

Row No. 3 had a furrow made close to the plants and water was thus applied at the surface. After the water had soaked away the soil was replaced and the surface leveled.

Row No. 4 had no irrigation but was used as a check row.

Water was applied the same number of times to rows 1, 2, and 3, and the hose allowed to run the same length of time, about 750 barrels of water being used per acre at each application.

The table below shows the dates of picking and the amount gathered from each row during the season.

Row.	Dates of picking and amount of fruit gathered.								Total amount picked.	Green fruit on vines at time of frost.
	Aug. 26.	Sept. 4.	Sept. 11.	Sept. 14.	Sept. 18.	Sept. 20.	Sept. 25.	Oct. 3.		
1.....	32 lbs.	25½ lbs.	114 lbs.	84 lbs.	212 lbs.	160 lbs.	232 lbs.	57 lbs.	886½ lbs.	580 lbs.
2.....	33 "	32 "	79 "	50 "	216 "	143 "	217 "	88 "	887 "	568 "
3.....	28¼ "	37 "	87 "	47 "	138 "	190 "	200 "	116 "	843¼ "	500 "
4.....	25 "	28 "	63 "	44 "	103 "	135 "	149 "	112 "	859 "	421 "

An examination of the table shows that row 1 gave a little better yield, though the difference is but slight between the irrigated rows.

The yield from row four is considerably less than from any other.

The water was applied to the tomatoes at a very slight expense after the plant was once in. If the plot had been much larger the expense of watering would have been proportionately less.

The experiments will be repeated the coming season.

PEAS.

Work with peas has been carried forward this year on a somewhat extensive scale. All the named sorts offered by the United States seedsmen, that have not been tried and discarded before, were grown. The varieties were 60 in number, about 200 plants of each sort occupying a double row 22 feet long. The peas were planted May 17, but a rather poor stand was obtained. A rain following the planting was the only one until after the peas had ripened. They were, however, irrigated several times and a very good crop was the result.

The numerous varieties were not grown for the single purpose of testing varieties. Three objects were kept prominently in view.

The prime object was, perhaps, testing varieties, for at this station it has always seemed worth while to grow all vegetables, especially the novelties, offered by the seedsmen, simply to give the public information regarding them. Secondly, the determination of duplicates as synonyms was considered a practical problem, for the varieties of pea have become so numerous, the nomenclature so confused, and the individual merits of each one so highly praised, that even the experienced gardener is sometimes perplexed in making his selection of seed. Lastly, it is apparent that the limit of improvement of varieties is by no means yet reached. Since so many varieties are grown under the eyes of the experimenter, it is possible for him to throw some light upon the matter of improvement, thus enabling an intelligent gardener to do something toward improving and originating new varieties. So we have attempted to describe the ideal pea of the several types, and to give a few hints regarding cross-breeding and selecting seed.

Class I.—Plants tall, exceeding four feet; seeds white or cream-colored; pods curved.

White Marrowfat.—Plant four to six feet high, much branched at the base; stem slender, foliage light green; stipules large; pods very light green, two to three inches long; borne singly; very plump; blunt at the apex; peas light green, round or compressed when quite old; seeds smooth and round; season late; very prolific; quality excellent. An old variety, at one time extensively grown in this country. Introduced by Thorburn in 1880 from England.

Black-Eyed Marrowfat.—Very similar to the former; distinguished from it because of a round, dark brown or black spot on that part of the seed called the hilum. It is a little later than White Marrowfat, and matures its crop more slowly. Also introduced by Thorburn from England.

French Canner.—Plant three and a half to five feet high, branching at base; stem slender; dark green foliage; stipules small; pods dark green, long, slim; apex pointed; peas small, round, dark green; quality good when young; very productive. Used almost exclusively for canning, for which it is probably the best variety grown, because of quality, productiveness, and the fact that it retains its dark green color after canning. Introduced from France a few years ago.

Marblehead Early Marrowfat.—An early marrowfat pea; vines strong and vigorous; pods large; crop matures slowly. Introduced by Gregory in 1890.

Petit Pois.—The same as French Canner.

Class II.—Plants more than four feet tall; seeds green, bluish-green, or green and cream-color; seeds shrivelled; pods nearly straight.

Champion of England.—Plants three to five feet high, branching both at base and above; stem rather stout; foliage pale green; stipules numerous and large; pods three to four inches long, often borne in pairs, curving slightly, plump, blunt at apex when fully developed; peas five to nine in a pod, light green, very large, compressed; season late; quality unsurpassed; very productive. One of the oldest and most extensively grown varieties.

Telephone.—Differs from Champion of England in being dwarfer, several days earlier, and in having larger pods, which are slightly incurved instead of recurved, as are the Champion of England.

Sanders' Marrow.—Differs from Champion of England but little. It is a great favorite in England where it is said to be superior to the Champion of England.

Telegraph.—Very similar to Telephone; it is a little dwarfer and a few days earlier; foliage darker green, and the plants are stouter.

For a late main crop the wrinkled marrowfats, as the class just described is called, are the best, since in quality and productiveness they are unsurpassed. They need to be staked, however, and this by many gardeners is considered a serious defect.

Class III.—Plants half dwarf, two to four feet high; seeds smooth or slightly indented; seeds white or cream-color; pods straight or nearly so. Type, Daniel O'Rourke.

Daniel O'Rourke.—Vines two to three feet high, branching at base; slender; foliage dark green; pods lighter green than foliage, two to three inches long, borne in pairs, rather blunt at apex; peas five to eight in pod, somewhat compressed, small; seed very round and smooth, sometimes shaded with green; extra early; not very productive; quality fair. The progenitor of this type of pea originated about 1850 in England. Now superseded by newer sorts.

First and Best.—Most of the peas called First and Best and Earliest of All are improved strains of the old Daniel O'Rourke. They differ but little, though some strains are far superior to others, and care should be taken to get seed from a carefully selected stock.

Kent.—An old variety of this class, not much grown now. It matures its crop too slowly, and is not prolific. Introduced by Sibley in 1883.

Hancock.—An improved strain of Daniel O'Rourke; old, but still grown by some gardeners; hardly so good as the newer sorts of this last. Introduced by Gregory.

Morning Star.—A variety obtained by the Station from Buist in 1890. The pea is a poor strain and not worthy much attention.

Maud S.—Another pea from Buist, introduced a year later. Seemingly the same as Morning Star.

Bergen Fleetwing.—A good strain of the early smooth varieties, introduced by Gregory in 1889. It is enormously productive, with peas and pods of good size; said to be a great favorite with Long Island market gardeners.

Sunol.—A carefully selected strain of this class, in which earliness has been obtained at the expense of productiveness. To be recommended for the very earliest.

Class IV.—Vines half dwarf, seeds blue, or bluish white; pods straight; type, Kentish Invicta.

Kentish Invicta.—Vines two or three feet high, stem much blanched at base; foliage glaucous; pods pale green, usually single, two to three inches long, blunt at the apex; peas four to six in a pod, light green, round, small; seeds round, dull bluish white, smooth and small; season extra early; quality rather poor; crop matures slowly. Introduced from England in 1870; not grown much now.

Alaska.—An improved strain of Laxton's Earliest of All, which, in its turn, was a selection from Kentish Invicta. Alaska is a little earlier and ripens its crop more promptly than either of the former. The crop can generally be gathered at one picking. One of the best of the early blue peas.

Sitka.—The same as Alaska.

Clipper.—Introduced by Rawson several years ago; now almost out of date.

Lightning.—Superseded by new varieties.

Sapphire.—A blue pea introduced by Northrop, Braslan, Goodwin Co., in 1892. It is a few days later than others of the early blue sorts, but is a little better in quality. A good feature of the pea is that most of the peas may be gathered in one picking.

Blue Imperial.—Differs from others of this class in being taller; foliage deeper green; pods borne in pairs, long, tapering to apex; peas few in the pod, oblong; seeds bluish green, shading to cream-color, somewhat flattened; season late, crop maturing at one time; quality good; very productive. A very old variety, said to have been introduced in 1828; still grown by some gardeners.

Blue Beauty.—Vines very stocky, the distinctive feature of the variety being its regular habit of growth; a second-early variety, following American Wonder; quality is not so good as that of the wrinkled sorts, and because of this, since it follows them, its value is impaired. Introduced by Henderson in 1890.

Class V.—Vines half dwarf; seeds green, bluish green, or green or blue and white, and cream-color; seeds shrivelled. Type, Alpha.

Alpha.—Vines two and a half feet high; foliage light green, scanty; pods usually single, two or three inches long, plump, blunt at apex; peas four to six in a pod, compressed, large; seeds greenish white, much shrivelled; very early, crop maturing at one time; prolific; quality good.

Originated by Laxton in 1867, often called Laxton's Alpha, said to be a cross between Laxton's Long-Pod and Advancer. Introduced by Thorburn in 1882.

Bliss' Everbearing.—A variety of this class introduced by Bliss in 1884, at one time largely grown; season medium; quite prolific; crop matures slowly; quality fair.

Abundance.—Much like Bliss' Everbearing; season a little earlier; more prolific, thus making it a better strain.

Yorkshire Hero.—Another pea resembling Bliss' Everbearing; differs in being dwarfer, later, more prolific, in ripening its crop more promptly, and in better quality.

Market Garden.—One of the best of the second-early peas; pods are rather small but are very numerous and of very best quality. Originated with Hosford, who secured it by crossing Alpha and American Wonder.

Paragon.—A new, late pea of this class, somewhat resembling Stratagem. It is productive and of good quality, its point of superiority, however, being its handsome, plump pods and large peas. Introduced in 1894.

Quantity.—Very similar to Bliss' Everbearing. Introduced by Burpee.

Profusion.—A strain of Bliss' Everbearing similar to above, a little later in season. Introduced by Burpee.

Queen.—An English pea introduced by Henderson a few years ago; resembles Stratagem very much, except that it is not so dwarf. It is just a little later than that pea. One of the most promising of the new peas.

Advancer.—A second-early variety bearing an abundance of long, well-filled pods; peas tender and of good flavor. One of McLean's peas, introduced a number of years ago.

Dwarf Champion. Almost identical with Advancer, except that it follows in a few days. Said to be a favorite with Long Island gardeners.

Duke of Albany.—A pea very much like Telephone, placed in this class because of its dwarf vines; plants about four feet high; stems stout and coarse; light green foliage; pods large, straight, dark green; peas very large; tender, and of excellent flavor; season late, ripening with Telephone and Stratagem; productive.

American Champion.—Practically the same as Duke of Albany.

Fillbasket.—A second-early pea of this class, once largely grown, not so now.

Shropshire Hero.—Said to be an improved Yorkshire Hero, which is doubtful; more likely an improved Stratagem, which it resembles very much, though earlier; originated with Mr. Eckford; a good acquisition for the market gardener, since it is very prolific; handsome pods, good flavor, ripens its peas at one time.

Station.—An early wrinkled pea which should become popular from the fact that it is almost as early as the smooth white and blue varieties. It is several days earlier than American Wonder, which it resembles, except that the plants are not so dwarf. Originated at the Geneva experiment station, and introduced by Gregory in 1894.

Class VI.—Vines dwarf, one half to two feet high; seeds green, bluish-green, or green and white or cream-color; seeds much shrivelled; pods straight or nearly so. Type, McLean's Little Gem.

McLean's Little Gem.—Plant 18 inches high, branching much, dark green in color; pods light green; borne singly; two or three inches long, blunt at apex; peas six to eight in a pod, compressed and slightly flattened, large; seeds cream-color or pale bluish green, much shrivelled; second-early, very prolific; crop matures promptly. Originated by Dr. McLean in England in 1863; still grown, though better kinds have largely taken its place.

American Wonder.—A pea remarkable for its earliness, productiveness, and quality; vines very dwarf, 8 to 10 inches. It is said to be a cross between Champion of England and McLean's Little Gem, and was originated by Charles Clark of Canada, introduced by Bliss in 1882; for a long time the best early wrinkled pea.

Premium Gem.—An improved strain of McLean's Little Gem, introduced in 1882; later, dwarfer, more productive than Little Gem.

William Hurst.—A very dwarf variety of this type. Plants 8 inches to a foot in length, branching but little; pods recurved, tapering at apex; peas four to seven in a pod, large; seeds flat and shriveled. Very prolific, one of the earliest wrinkled varieties, and of excellent quality; the crop ripens rather slowly and the vines are so dwarf that it is not profitable for the market gardener. Introduced by Gregory.

Chelsea.—Almost identical with William Hurst, except in color of seeds, which are white; if anything, a better strain than William Hurst.

Admiral.—The same as William Hurst.

King of Dwarfs.—A variety growing a little taller than Little Gem and is a day or two earlier; a good bearer, but the pods are rather small.

Nott's Excelsior.—An introduction of a few years ago which promises well; larger pods, and more prolific than American Wonder, but a few days later; quality about the same.

SYNONYMS.

Probably no garden plant is more difficult to study in regard to synonymy than the pea. Varieties are characterized almost entirely by qualities which are variable at best. Height of vine, color of pea, shape of pod, smoothness of seed, are characteristics upon which classification must depend; yet they are not always constant, and this makes an accurate synopsis difficult. Add to this the haste of seedsmen in securing so-called new varieties, the variation of varieties on different soils and under different cultivation, the mixing of stock by careless or unscrupulous seedsmen, and the task of determining duplicates becomes exceedingly difficult. But when seedsmen are annually introducing great numbers of new varieties it becomes important that garden nomenclature should be exact. Inexperienced buyers need a guide, that they may not purchase old varieties at fancy prices under a new name.

Old market gardeners know well that seedsmen constantly transfer names for the smooth, round, early pea generally known as First and Best, that pea being now known under nearly a score of different names. Other well-known varieties have their names less frequently transferred. The same pea from different seedsmen often varies as much as different peas from the same seedsmen. Varieties differ somewhat from year to year and in different places, if descriptions given are accurate. Modifications are often slight and variable, making a certain strain differ from another in some minor characteristic, which soon disappears, so that it is almost impossible to distinguish many market varieties from a written description, and one can hardly ever be sure that his varieties are true to name. In order to be sure of the identity of a variety the grower must raise it in considerable quantity for several seasons, observing closely those characteristics which are constant.

It is at once apparent that in determining synonyms there are many chances of error, and if the expert gardener can not endorse the disposition of varieties in the foregoing selection, he will bear in mind the difficulties to be surmounted, and that he can obtain some good from it. It may aid him somewhat in selecting a desirable strain, as undoubtedly he can choose from a few varieties better than from many.

For home use it is a good practice to plant one of the early blue varieties as soon as the ground can be worked; then, about ten days later, plant Premium Gem, Advancer, and Champion of England. These peas follow each other so closely in the order named that they will afford a constant supply for three or four weeks. Additional plantings of Champion of England or other good late varieties may be made at intervals after the second planting. The varieties here named may not be absolutely the best, but they are all good, and experience has proved that they can be trusted to come into bearing in such regular succession as to make the supply continuous. For home use an early pea is wanted, and one that will continue to supply the table for some time. Fine flavor is essential and productiveness of less importance. The early market pea sold by every seedsman need not be planted in the home garden, as the market gardener wants a pea that is early and matures its crop all at once, so that he can clear the ground and prepare for a succession.

It will pay those who are fond of green peas to use a spot otherwise vacant for sowing a crop of Premium Gem peas with a succession a few days later. The chief trouble will be with mildew, and if they escape that, the crop is reasonably sure.

PEA MILDEW.

Late peas, especially when grown in damp ground, are often so badly mildewed that it is not worth while growing them. The pea mildew is one of the powdery mildews, *Erysiphe communis*, belonging to the same family as the powdery mildew of the grape. It grows entirely on the surface of the host plant, covering it with a white coating of delicate, interwoven fungous threads. At certain points protuberances appear on the threads, which serve as suckers, drawing from the cells the nourishment required for the growth of the fungus. The spores are produced

in delicate sacs which in turn are enclosed in dark-colored spore cases. The latter appear as black specks, just visible to the naked eye, among the fungous threads. The disease attacks leaves, leaf-stalk, pod, and stem so that the pea plant is thoroughly infested with it, much to the detriment of its growth. Frequent cultivation or irrigation will do much to hold the disease in check, but the use of some fungicide will be desirable upon late varieties in hot, dry seasons. Among the best for the purpose is a solution of 1 pound of copper sulphate in 500 gallons of water.

DO VARIETIES OF PEA RUN OUT?

It is apparent to any one who has had much to do with peas, that varieties run out, or at least lose their original characteristics. In all cases, running out does not mean deterioration. Sometimes it is simply a changing of character. In our work with peas, accurate descriptions, often illustrated with drawings, are kept of the varieties grown. From these biographical records of the varieties it is easy to see that varieties change from year to year, even the old standard sorts, the characters of which are supposed to be firmly fixed. Studies of the question have been made, too, by growing the same variety from different seedsmen, and if seedsmen really sell the same thing under a certain name, varieties of pea vary greatly in the course of their history. It may be said that in the cases to be cited the variations were due to a change made in the seed by a careless or unscrupulous person; but such is hardly the case, because some of the characters appear well marked and distinctive of that variety throughout all the samples. It is specially noticeable that the foliage and habit of the plant is less variable than the peas, they being generally the object of selection.

Stratagem was grown from three seedsmen. In all, the characteristic dark green foliage, stalky, angular veins, and exceedingly short nodes of the Stratagem were apparent and varied but little. But the pods, though irregular and varying in each sample, yet taken as a whole were distinctly different. Pods were fairly uniform, but in the third they were so irregular, probably reversions to one of the parents, that the peas were almost worthless.

It is a matter of common observation that seed peas of the same variety, especially the wrinkled peas, differ in color when sold by different seedsmen. In several cases peas grown on the Station grounds and described four years ago have changed color of seed.

The extra early peas of the Kentish Invicta type are earlier, more vigorous, and more productive than the extra early peas of the Daniel O'Rourke type. But neither class is of sufficiently high quality to make it the best stock to work upon for improvement. In the mere matter of earliness both excel, but we ought to develop an extra early variety of fine table quality, vigorous growth, and productiveness. What we need is the production of some well-flavored early sort which will bear in sufficient abundance to be profitable for market and supersede the flavorless extra early sorts which are now universally sold. This ought not to be an impossibility, as the earliest varieties of the American Wonder type now come hard after the Daniel O'Rourke.

PEACH-GROWING FOR MARKET.

Bulletin No. 33, U. S. Department of Agriculture.

BY ERWIN F. SMITH.

This bulletin is intended for the man who contemplates peach culture rather than for the one who is successfully raising this crop. The latter needs no advice, but is rather in a condition to give it; and if he who thinks of planting an orchard can find a successful grower, by all means let him seek that man's counsel.

In what part of the United States can peaches be grown, is one of the first questions likely to be asked by a foreigner or a person unacquainted with the subject. This question admits of two answers. If peaches are desired simply for family use, the answer is that they can be grown in nearly every state in the Union, and in almost any part of any state, care of course being taken to select the right kind of site, to plant varieties adapted to the climate, and to give suitable winter protection in the extreme north and in high mountain regions. Even in the inhospitable climates along our northern border, peaches may be grown out of doors with considerable success if the trees are dug under, tipped over, and covered with straw each autumn, and not uncovered and righted up until danger from late spring frosts has passed. Some of the finest peaches the writer has ever seen were grown in this way at the Kansas state experiment station, following a winter and spring which destroyed every blossom on unprotected trees for miles around. The growing of peaches in large orchards for commercial purposes is quite another matter, and what follows will relate especially to such orchards.

Climate is one of the first considerations in the selection of a place for the planting of commercial peach orchards, and the wide variety we have in the United States affords every opportunity for selecting a suitable location. The old notion that the peach is a tropical tree and must have a warm climate is not well founded. It is a tree of middle latitude and does not like extreme cold nor extreme heat. The climate of China, which is probably its native home, is in many respects like parts of our own country.

Commercial orchards should not be planted in regions much subject to severe winters or to late spring frosts. It is well also to avoid regions where the winters are very mild, such as the extreme southern parts of the United States, owing to the fact that the blossoms are likely to be forced out in late winter or early spring, and afterward injured by frosts. It is best to select a climate which is not given to violent extremes of any sort, and which has a considerable rainfall, fairly well distributed throughout the year. Thirty-six to fifty inches of rainfall annually is about the proper amount. If the quantity of water precipitated is much below this the deficiency should be made up by irrigation.

There are many kinds of soil in which orchards can be grown successfully. At present there are commercial orchards in New England on stony and gravelly soils of poor character; in Maryland, Delaware, and New Jersey, on fertile loams and on very light pine sands; in Pennsylvania, on mountain soils derived from limestones and sandstones; in South Carolina and Georgia, on light pine sands and on stiff red clay lands derived from the local decomposition of granites; in Michigan, on rather heavy clay hills, and also very successfully on loams and light pine sands, even on beach sand so light as to be blown about by the winds; in northwestern New York, on quite a variety of clays, gravels, and sands, forming the old lake

bottom of Lake Ontario; in Florida, on flat pine sands; in Kansas, on deep black prairie soils. On all of these soils there are now growing very successful and profitable peach orchards.



FIG. 1.—Peach tree in a Maryland orchard, showing customary way of pruning. Stake about 3 feet high.

ern regions a water front is preferable to an inland location; in inland regions, a hillside with a northern exposure is generally better than one with a southern exposure, this being due to the fact that the northern exposure will somewhat retard the opening of the blossoms, and in this way orchards will escape late spring frosts, while if set in more sunny situations they might be induced to open blossoms a week or two earlier and then be caught by late frosts. In the Michigan peach orchards bordering on lake Michigan it has been found that the cold air from the lake retards the opening of the blossom a week or ten days, the inland orchards being in full blossom before those on the lake front have opened. The advantage of this in case of late frosts is obvious.

The fear has sometimes been expressed that the ravages of yellows and other diseases would finally put an end to peach-growing in the United States, but there is certainly no immediate danger. In North Carolina, South Carolina, Tennessee, Georgia, Missouri, Arkansas, Texas, and California, there are many admirable locations for peach-growing as yet unoccupied. California alone could grow enough peaches to supply the whole United States.

Having decided on climate, soil, site, and location with reference to market, the next thing is the preparation of the land for planting. This should be plowed and cultivated as carefully as for a crop of wheat, corn, or cotton. The land should then be cross-marked and holes dug for the trees at the intersections. In general it is best to plant trees not closer together than 20 by 20 feet, especially if the soil is in good condition. In some places, however, where the soil is poor and where the orchards are not expected to last more than a dozen years, the trees may be planted closer—for example, 10 feet one way by 20 feet the other.

In general it may be said that the peach prefers light, warm, well drained, sandy or loamy land with a clay subsoil, although some very successful orchards have been grown upon rather heavy clays and many on deep sands. Muck soils, heavy clays retentive of moisture, and in general all wet lands and flat, frosty lands are especially to be avoided.

In the planting of commercial orchards, proximity to large markets and ease of shipment should never be forgotten. An excellent location may be worthless, owing to lack of facilities for transportation. There are thousands of acres of land in the United States suitable for peach-growing which it would be folly to plant at present, owing to lack of shipping facilities. Competing railway and steamboat lines are a great advantage in securing low freights. One of the great drawbacks to successful peach-growing in the south, until recently, and one which still exists in many parts, is the fact that the growers are not able to secure favorable freight rates.

In selecting a site for the orchard, several things should be borne in mind. Some fields on a farm may be much better adapted to the peach than others. In general, the higher lands are to be selected rather than the lower, and in north-



FIG. 2.—Peach tree in a Delaware orchard, showing customary way of pruning. Stake about 3 feet high.

At the time of planting, a map of the orchard, showing the location of each variety, should be made for future use. The neglect of this frequently causes much inconvenience. The preparation of the soil, the digging of the holes for the trees, and all necessary work in connection with the planting should be done in advance, so that when the trees are received there need be no delay and consequent drying of the roots before planting. If it is absolutely necessary to utilize flat land retaining moisture, furrows should be turned toward the center of 20-foot lands for several years in succession, and the trees finally planted on the middle portion of these artificial ridges.

The selection of the trees themselves is a matter of great importance. It is not necessary that they should be very large, but the trunks should be smooth and well-grown and the roots abundant and as little injured as possible. To secure these desirable qualities it is well in ordering trees to have a written agreement touching the points in question, so that inferior trees may be rejected. The roots should not be close pruned, except for the removal of mangled or splintered portions, and the holes in which they are set should be of such dimensions that it will not be necessary to twist and cramp them in planting. Care should be taken that they are not set shallow—that is, on top of the earth—nor buried much deeper than they stood in the original nursery. They should not be set into hard earth, nor should the holes be filled with stones and rubbish,



FIG. 3.—Peach tree in the same orchard as fig. 2.



FIG. 4.—Peach yellows the fourth year.

but with mellow earth well tramped down. Experience in the United States has shown pretty clearly that peach trees in open orchards do best on peach roots, but if the situation is low and the soil rather heavy, plum roots* may be substituted, in which latter case the trees should then be closer together, say 15 by 15 or 15 by 12 feet. In the United States peaches are not grown to any extent on espaliers or in houses.

Judgment differs as to whether it is best to set June-budded or August-budded trees. Generally it will be found convenient to buy the trees of some reliable nurseryman, and such are usually propagated from buds set in August, but if the planter prefers to grow his own trees, and time is a matter of consequence, the seedlings should be budded in June so as to obtain a grafted top the same year.

In the selection of trees special attention should be paid to secure those which are free from fungi and injurious insects. The greatest care should be taken that the trees are not infested by

* In selecting plum stocks care should be used to secure a variety which makes a good and lasting union. The Marianna should not be used for a stock.

borers, scale insects, or root aphides. Unfortunately, trees of this character are sometimes sent out, and orchards planted from them are sure to give trouble. In general it is best to avoid trees grown in regions much subject to peach yellows and peach rosette. In buying trees the planter will do well to deal only with nurserymen who have by honest dealing gained a well-merited reputation. It is better to pay two prices for trees of an assured character than to take as a gift trees from doubtful sources.

The selection of varieties is a matter of considerable importance, and no general rule applicable to the whole United States can be laid down. Many choice peaches

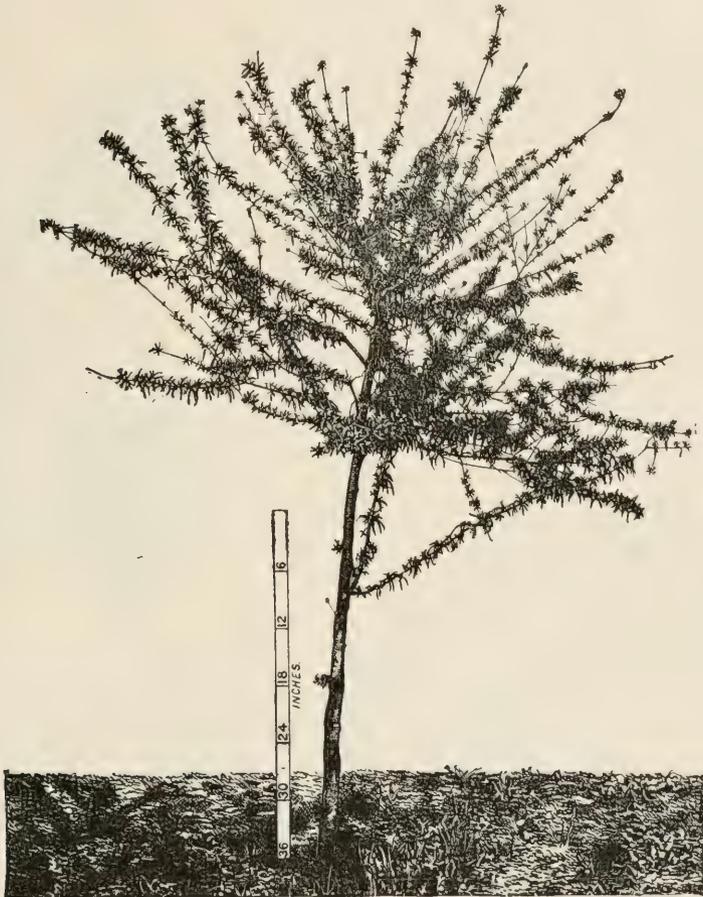


FIG. 5.—Peach rosette. A budded tree attacked in spring and photographed in June.

do well only in restricted localities. Some are likely to be winter-killed or to be caught in bloom by late frosts; some are uncertain bearers; some mildew and others rot badly; some are too tender for long shipment by rail; some ripen at the same time as better sorts, which are to be preferred; some, like Elberta, have many good qualities but fall short of the finest flavor. A variety for commercial purposes must combine as many good points as possible. The tree must be hardy and productive; the fruit must be of good size, fine color, and superior flavor, and must be firm enough to stand shipment. The grower who contemplates setting an orchard for profit will do well to stick closely to the old and well-tried sorts. If he

is planting for home use or pleasure, then he may select a wider range of varieties, including all the choicer sorts, irrespective of other considerations. The man who is in the business to make money can well afford to let his neighbors try all the new sorts. The remarks which follow on the selection of varieties apply especially to the eastern United States, and with the limitations already expressed.

For market orchards the following have been found the most generally profitable varieties: Alexander, Amsden, Troth, Rivers, Louise, Hale, St. John, Mountain Rose, Crawford Early, Foster, Oldmixon, Stump, Elberta, Crawford Late, Reeves, Wager, Fox Seedling, and Beers Smock. These varieties ripen in about the order named. Owing to special conditions which prevail in the extreme north and at the far south, some of these varieties would not be successful. For instance, in Michigan it has been found that Crawford Early is very likely to be winter-killed or caught in blossom by late spring frosts, and a number of other hardier varieties have been substituted for it. The same is true in Connecticut, where many of the old varieties are likely to be caught by late spring frosts and where Crosby has proved exceptionally hardy. On the other hand, in Florida many of our choice sorts are nearly worthless, owing to the earliness with which they bloom. There and in Texas the so-called Chinese sorts—Peen-to, Honey, and crosses—



FIG. 7.—Peach curl (*Tapharina deformans*).

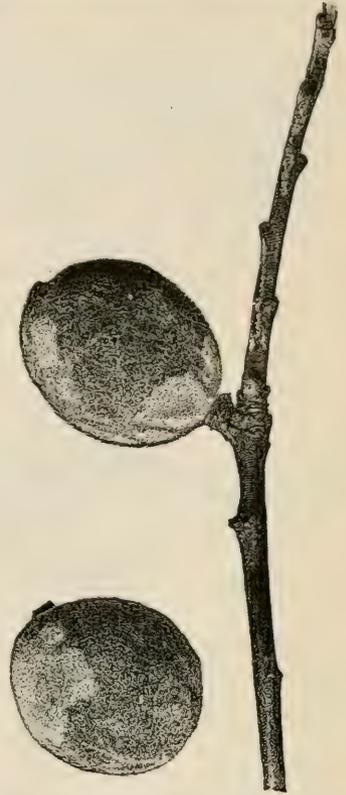


FIG. 6.—Peach mildew (*Sphaerotheca pannosa?*) on stem and fruit.

have proved more successful. In middle and upper Georgia, Elberta has proved one of the best peaches. Husted No. 80 is also an excellent peach for that locality, ripening a few days after Alexander. In general for that region, early varieties are to be recommended rather than late sorts, which, however fine, would come into competition with Delaware and New Jersey peaches on a falling market. In the mountains of Maryland certain late varieties, not suitable for the lowlands of Delaware and New Jersey, have proved exceed-

ingly remunerative, reaching good size and fine color, and coming in late, when the markets are comparatively empty and prices are high. Among these might be mentioned Salway and Bilyeu.

The orchard subsequent to planting should be cultivated as carefully as a field of corn. The practice of successful growers varies a good deal in this particular. Some cultivate the orchard from the start without crops; others plant corn or tomatoes between the trees for the first two or three years—that is, until the orchard comes into bearing. There is no objection to this, provided the soil is strong and well fertilized; on the contrary, there appear to be some advantages. There is a choice, however, in crops that should be grown, and on no account should potatoes or wheat be cultivated in orchards. So soon as the trees come into bearing no crop of any sort should be grown between them, but each year the orchard should receive a shallow spring plowing and frequent cultivation until July. Most of the growers in the middle eastern states prefer not to cultivate the soil later than this, but in some regions it is the practice to cultivate almost the year round, and even in Delaware very successful growers have followed this practice, keeping the soil stirred from early spring until late autumn. As a rule, deep plowing should be avoided. The peach tree is almost as sensitive to clean cultivation as cotton or tobacco, and no man can expect to be very successful in the cultivation of the peach who allows his trees to stand in sod or fails to give them clean tillage during at least a part of the season.

Opinions differ as to the proper method of pruning. When the trees are planted they should be cut back to within one or two feet of the ground, the entire branched top being removed. The remaining buds will push vigorously, and three or four

of these should be selected to form the new top, care being taken that they come out from different sides of the stem and not too close together, but at a distance of several inches up and down the trunk. When the branches from these buds have grown to be several inches in diameter they should support a spreading or vase-shape top (figs. 1, 2, 3). The proper starting of the new top is a matter of some importance, for if all of the branches have been allowed to grow out from nearly the same point on the trunk, when the tree has matured, the giving way of a single limb under weight of fruit or stress of wind is very likely to involve all the rest and split the trunk from top to bottom. Such mishaps could be readily avoided by starting the main branches at different heights.

For orchards on most of the peach lands of the eastern states, comparatively little pruning appears to be necessary. Some growers practice "shortening in" annually over the whole top, but in general this is

not desirable. However, if the tree has made an exceedingly vigorous growth it can be practiced to good advantage, and is generally best done in early spring. The aim in pruning should be to get a tree free from dead wood and full nearly to the main trunk of small branches capable of bearing fruit. Care should be taken in pruning to avoid cutting away bearing branches from the base of the limbs, for by this method long, straggling branches, having fruit-bearing limbs at the top only, are often produced. Some growers prune the trees so that the main trunk shall be four or five feet high, but in general this is not to be recommended. It is much better to make them branch low in vase form. The only advantage of the other method is greater ease in cultivating close to the tree, and it has on the whole disadvantages which more than counterbalance, one of which is the greater exposure of the trunk to hot suns and another the increased danger of injuring the bark of the tree by plows and cultivators.

Some words are necessary on the use and misuse of fertilizers. Unless the trees are on strong land it will be necessary, as soon as they come into bearing, and yearly thereafter, to give them each spring or autumn some special fertilizer. There can be no objection to the use of well-composted barnyard manure. Where this is not procurable dependence must be put on clover and commercial fertilizers, taking care always that the latter are obtained from reliable sources. In general the dependence should be on potash salts and phosphates rather than on nitrogenous fertilizers. The peach can be injured readily by excess of nitrogen. Its effect upon the trees is to produce an excessive growth of wood and foliage at expense of fruit. Fifty to a hundred pounds per acre of nitrate of soda or its equivalent in dried blood or sulphate of ammonia is usually as much nitrogenous fertilizer as

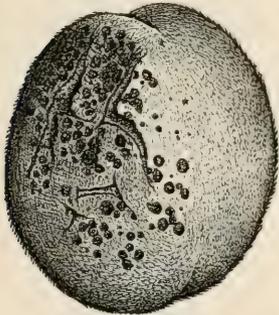


FIG. 8.—Black spot of the peach
Cladosporium carpophilum.

any orchard requires, and many orchards do not need it at all. Muriate of potash, kainit, or sulphate of potash may be used in large quantities without injury. Four to five hundred pounds per acre will do no harm, provided it is not put too close to the trunks of the trees.

The same remarks apply to dissolved rock phosphates and to bone superphosphates and various bone mixtures. They have been applied in large quantities, even as high as a thousand pounds per acre, without injury; generally lesser quantities will suffice. Potash salts and phosphates should be put on and plowed down in the autumn and nitrogenous fertilizers always in the spring. Usually the effects of the latter disappear the same season. Where the grower has opportunity to procure unleached hardwood ashes these also may be used, and can be applied in large quantities without injury. A good home-made fertilizer can be prepared by composting broken or coarsely ground bones with unleached hardwood ashes until the bones become soft. The grower who has not tried the effects of regularly fertilizing bearing orchards will be surprised at the difference in quantity and quality of the fruit which will result from careful fertilization. Judicious fertilization will bring large returns in the way of fine crops and good prices. Even the most barren-looking yellow sands without clay subsoils can be made to produce enormous crops of luscious fruit year after year by proper attention to cultivation and fertilization. Where it is impossible to procure fertilizers the grower must depend on prolonged cultivation of the soil

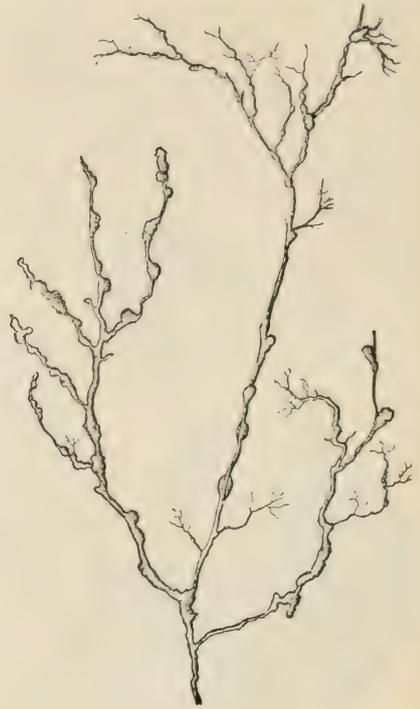


FIG. 9.—Root knots due to nematodes.

and the occasional growth in the orchard of green crops for plowing under, such as cow peas, crimson clover, etc. Much can be done in the way of furnishing an orchard food by repeated stirring of the soil.

The peach tree is subject to various diseases, and no one should venture upon peach-growing in a commercial way without having a reasonably good understanding of what the difficulties are in this direction. Peach yellows (fig. 4) and peach rosette (fig. 5) are two of the most destructive diseases. No remedy is yet known for either, but experience seems to show clearly that yellows may be held in check by the destruction of affected trees as soon as it appears, provided all the growers of a community unite in practicing it. In planting an orchard the grower will of course, if possible, select a region free or nearly free from such diseases. These diseases attack all varieties. Mildew (fig. 6), on the contrary, is a fungous disease

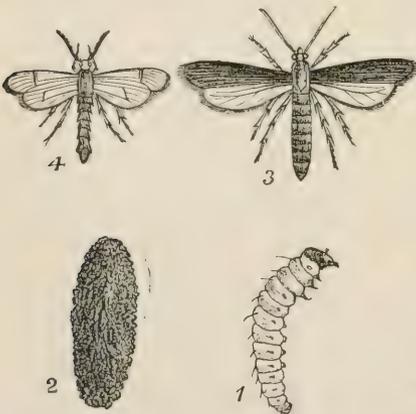


FIG. 10.—1 the peach tree borer (*Sannina exitosa*). (1 and 2, original; 3 and 4, after Riley).

diseases attack all varieties. Mildew (fig. 6), on the contrary, is a fungous disease

which appears to be restricted principally to certain sorts—the serrate-leaved varieties. It is seldom troublesome except on the Pacific coast. In the eastern states

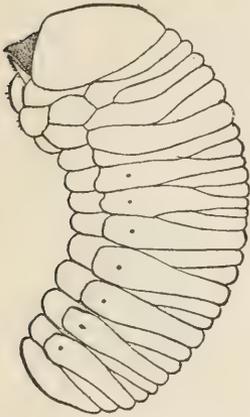


FIG. 11.—Larva of the pin borer (*Scolytus rugulosus*), enlarged 22 diam. (Forbes.)



FIG. 12.—Pupa of the pin borer. Side view, 20 diam. (Forbes.)



FIG. 13.—Pin borer beetle, 2 diam. (Forbes.)

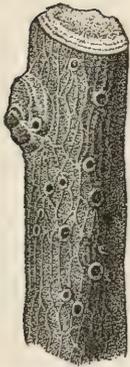


FIG. 14.—Branch of peach, showing perforations of the pin borer, natural size. (Forbes.)

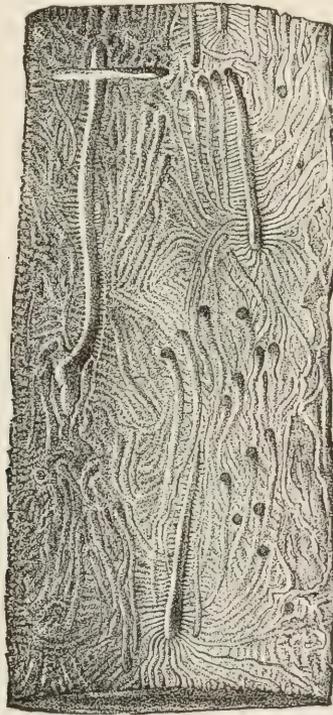


FIG. 15.—Denuded branch showing breeding chambers, larvæ channels, and pupa chambers of the borer, natural size. (Forbes.)

the only remedy yet known is to pull out the affected varieties and plant others. Peach curl (fig. 7) is a disease distorting the foliage and causing it to fall in spring.

It is widespread and very serious some years; other years it is but little prevalent. This disease has also been more troublesome in California. It is due to a fungus which may be held in check by spraying, as appears clearly from recent experiments in California by Newton B. Pierce. The peach cercospora has also given some trouble in California. A fungous trouble known as black spot (fig. 8) often leads to cracking of the fruit and subsequent rot, especially in rainy periods. This is most prevalent on late varieties. Rot is one of the most serious troubles that visit the grower. The disease is due to a fungus, and in wet, hot weather, it spreads with great rapidity from fruit to fruit, and even attacks the peaches in baskets on the way to market and while on the fruit stands. It is a disease that winters over in the rotted fruits of the previous year which either remain hanging on the tree or have fallen to the ground, and is to be combatted by carefully removing and burning all affected fruit. If this is not done systematically the crop may be destroyed even before it is out of blossom. Spraying with copper fungicides has been recommended for this disease, but as yet the evidence in their favor is not entirely conclusive. Sulphur dust blown into the trees during the prevalence of the rot has also been recommended and appears to have some value. A safe, efficient powder or spray for prevention of this disease would be invaluable.

Crown galls or root galls are irregular tumors on the trunk and roots. These are often of large size and occur most frequently at the junction of the root and stem. This disease occurs in many parts of the United States, in nurseries as well as in orchards, and is seriously prevalent in parts of New Jersey, Texas, and California. No remedy is known, and even the cause is yet to be determined. Many growers think the



FIG. 16.—Black peach aphid (*Aphis persicae niger*), the common, wingless, viviparous form. (Slingerland)

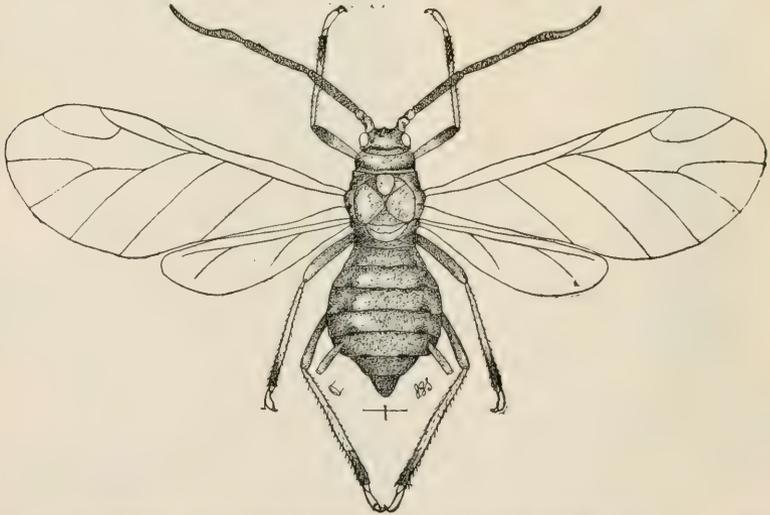


FIG. 17.—Black peach aphid (*Aphis persicae niger*), viviparous, winged form. (J. B. Smith.)

disease is communicable, and in planting orchards it is safe to reject all trees showing any signs of it.

The root knot, which should be carefully distinguished from the preceding, is a disease caused by a small "eel worm" or nematode. The knots (fig. 9) due to this cause are generally much smaller than the preceding, and on microscopic examination of fresh knots it is usually not difficult to find cavities containing the eel worm in various stages of development. This nematode attacks the roots of a great variety of plants and is quite troublesome to the peach in parts of Georgia,

Florida, and other gulf states. The only symptom which the writer has seen above ground was scanty growth. No good remedy is known. Of course trees affected with root-knot should never be planted.

Borers (fig. 10), are exceedingly troublesome in some regions, especially on sandy soils.

A great number of washes and various labor-saving devices have been recommended, but the best method for dealing with them is the old one of carefully uncovering the trunk of the tree at the earth surface and digging them out with a sharp knife. In sandy lands they should be attended to twice a year—spring and fall. It is back-aching work, but can scarcely be trusted to an inexperienced hand, who will often do more injury to the trees than an army of borers. Of labor-saving devices, one of the best, especially for young trees, is the covering of the base of the trunk in early spring with straw or cheap Chinese matting, the lower end of which should be buried an inch or two in the soil. This compels the insect to oviposit on the upper part of the trunk and on the branches, where the larvæ are easily found and where they do less general and permanent injury.

The pin borer, a scolytid beetle of European origin (figs. 11, 12, 13, 14, 15), has in recent years become rather troublesome in the eastern part of the United States. No good remedy is known, but some trouble can be avoided by annually removing all dead wood from the orchard and taking care that it is not piled anywhere in the vicinity. This should be done in the fall or winter. The insects prefer sickly trees, but while the larvæ are generally confined to such trees, the mature beetle often migrates to healthy trees and feeds upon them, to their great injury, the gummy trunks appearing

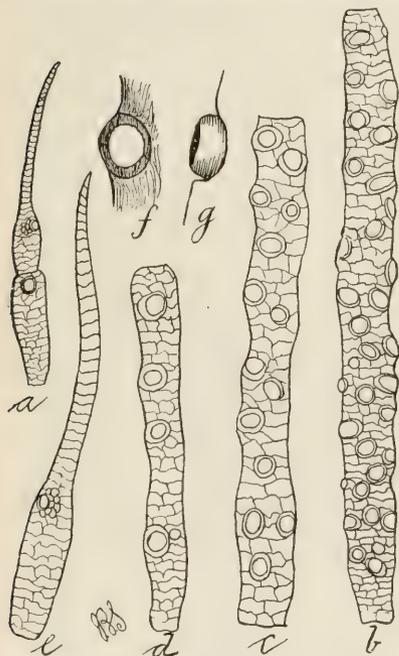


FIG. 18.—Black peach aphid—joints of antenna: a, of young lice; b, first long joint of winged form; c, second; d, third; e, whip joint; f, top view; and g, side view of a single sense pore. (J. B. Smith.)

as if peppered with fine shot. The most serious depredations the writer has seen on healthy trees were where piles of dead wood from old peach orchards were placed near healthy trees. Two cases in particular—one in Maryland and the other in western New York—were very striking, the injuries beginning in trees near large piles of dead wood and becoming less and less in trees more remote from these piles until all trace of injury disappeared.

Brown or black root aphides (figs. 16, 17, 18) are very common in the sandy lands of New Jersey and Delaware, and also occur in other parts of the eastern states. The insect sometimes appears on parts above ground, but the chief injury is done while it is out of sight. As before stated, care should be taken that this insect is not introduced into the orchard on the roots of the trees when they are planted, and if there is any reason for thinking that the roots are infested the trees should either be discarded or dipped in some insecticide before planting. The underground depredations of this insect stunt the tree so that it dies or makes very little growth for several years. Stunted trees may, however, be started into a more vigorous growth by heavy applications of tobacco dust dug into the earth, and they may sometimes be brought out and induced to make a good growth by the application of strong stable manure.

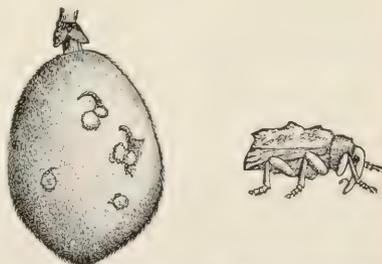


FIG. 19.—The curculio (*Conotrachelus nenuphar*) 1, Natural size (original); 2, much enlarged (after Howard).

The curculio (fig. 19) is always present, and no safe remedy is known. It can be depended on to take a considerable part of the crop each year, and in years when the yield is scanty it is sometimes content with nothing short of the whole crop. This is especially likely to be the case when spring frosts have unduly thinned the crop or have restricted it to particular orchards. Arsenical sprays will hold the curculio in check, but are scarcely to be recommended for the peach, since they are very likely to cause its leaves and fruit to fall and may even kill small branches. If used at all the greatest care should be exercised. In some cases it might pay to capture and destroy the beetles by jarring them upon a framework covered with sheets.

Scale insects have thus far done but little injury to peach trees in the eastern states; but the enemy is present, and one species in particular, recently introduced from the West Indies (a white scale entirely covering trunk and limbs and quickly killing the tree), is already so far north as Washington, D. C., and is likely to be very troublesome when more generally distributed. Growers should be on the lookout for this pest (fig. 20) and burn infested trees at sight.

A word about sprays and tree washes in connection with peach tree diseases is



FIG. 20.—The whitewash scale (*Diaspis lanatus*). *a*, section of peach trunk with male and female scales *in situ*, natural size; *b*, scale of adult female; *c*, *do.* in natural position, enlarged. (Howard.)

not out of place. Many have been recommended without proper inquiry as to their merits, and the results of their use have been in some cases so disastrous as to prejudice the whole community against any kind of fungicidal or insecticidal treatment. Twice the writer has known of fine orchards being ruined by the application to the trunks of washes containing tar, soap, and arsenites. In one case the grower was obliged to remove a whole orchard seven years old, the trees being either killed by the application or injured beyond recovery. Spraying the foliage for insect and fungous diseases must also be followed with unusual caution. The leaves of the peach tree are very sensitive to acids and to arsenical poisons. However, peach trees may be sprayed with Bordeaux mixture without danger, provided proper care be taken in its preparation. The lime must be freshly slaked and must be in excess.

The first crop of fruit is always a matter of special interest, and the inexperienced grower is likely to allow the trees to overbear if not specially cautioned. After the June drop has passed, if the trees are heavily laden a very considerable number of the peaches should be pulled off. It takes much less labor to pick them at this time than when they are ripe, and the remaining fruit will be enough larger and better in flavor and color to more than compensate for this thinning. Thinning is not very generally practiced by peach-growers in the United States, but if judiciously done no work in the orchard will give better results. Some of the qualities specially desirable in a crop of peaches are size, flavor, and color. These desirable points can not be expected when the tree is allowed to overbear, in which event the fruit is likely to be small and green and inferior in color, and will bring a corresponding poor price when put upon the market. The extra labor involved in handling a large crop of inferior fruit is also a matter not to be forgotten. Some

years thinning will not be necessary, but in years when the trees are burdened with fruit it should not be omitted.

Picking and packing are matters which require the personal attention of the grower. These can not be trusted to hired labor without strict oversight. The peach should be picked and packed as carefully as an orange; should never be poured from basket to basket; should never be bruised in handling; should be carefully assorted by grades; and should be put up for market with an eye to attractiveness, so that the best prices may be obtained. It is not strictly proper, however, to put red netting over green fruit. There is just the right time to pick for market, and this is something to be learned by experience—a day too early and the peaches are green, a day too late and they are overripe and will be soft and bruised and unsalable before they reach the consumer. No fruit requires greater expedition and better judgment in picking and marketing, and in these particulars the peach is strikingly in contrast with the orange, which never worries the grower, but may be picked and marketed any time from November to April, barring accidents from unexpected frosts.

In general, peach-growers in the eastern states are very careless—almost indifferent—as to manner of shipping fruit to market, and the result is such that fruit, while often of a very superior quality, rarely brings as good prices as inferior fruit put up with special pains to make it attractive. The baskets in general use in the eastern states are too large for retail trade. Growers of peaches on a large scale in New Jersey, Delaware, and Maryland seem to think that they can not handle their vast quantities of fruit in small baskets. Growers in Michigan and California* have learned better and send their fruit out in much more attractive form, the result being that they get better prices. Florida fruit also comes to market in good shape, and the Florida crate is one of the best. The choicest grades of peaches should never be sent to market in large baskets, but each fruit should be wrapped separately and sent with as much care as eggs if the best prices are desired. For the canning-house and the wholesale trade the Delaware basket is undoubtedly one of the most convenient forms for shipment. Inferior fruit should be kept at home and dried or fed to the pigs. The unprofitable handling of a large part of such fruit might be avoided by thinning, as already suggested.

On some accounts it is highly desirable that the fruit should be transported by water if the distance is not great and the journey can be made rapidly, otherwise it must go into cars and the extra jar must be compensated for by rapid delivery and sale. Of course when peaches are shipped long distances in warm weather particular pains must be taken to see that the cars are properly iced and that there are no delays in transit, and when they come from the Pacific coast they must necessarily be picked green. Eastern growers have an advantage over those on the Pacific coast in the much finer quality of fruit grown and in being near to market, so that their peaches may be allowed to ripen on the tree, something very necessary to the full perfection of this fruit; but these great advantages are largely lost by carelessness in packing and shipping, and consequently the California peach-growers are generally able to command a better price in New York markets than eastern growers. Mention has already been made of the desirability of planting orchards where competition in transportation exists. This affords to growers of the choicest fruit a reasonable guarantee that the whole of their profit will not be swallowed up by exorbitant freight rates.

In years of great abundance another serious cause of loss is what are known as "slumps" in the market. Most eastern-grown peaches find their way to a few large markets, where prices necessarily break down when a large quantity of fruit is suddenly thrown upon them. At times when a glut exists even the best fruit will scarcely pay for the baskets in which it is shipped, much less for transportation, picking, packing, etc., and this may happen several times during the season. This ruinous state of affairs is not attributable to overproduction, but to maldistribution. The crying need in the eastern states is for a system of distribution which will prevent gluts in the market. It is well known that at the very time when these "slumps" occur in New York and other large centers, hundreds of smaller towns in the interior can not procure peaches at any price.

The writer has frequently paid five cents apiece for quite ordinary peaches in interior towns of New York and Pennsylvania and further west, when the finest

*The California crate brings the fruit safely in car load lots so far as Chicago, but from this point eastward, in the hands of express companies, sometimes as much as 20 per cent. of the peaches are bruised so as to be unsalable, owing to the thin side of the crate. These packages should be made of thicker material or should have a partition through the middle.

peaches could scarcely be given away in New York and Philadelphia. This suggests that much loss could be avoided by a well-organized system of distribution. Just how this shall finally be brought about is a difficult problem to solve, but it is certainly one of the things which peach-growers must study to accomplish. It is worth the earnest consideration of pomological associations, boards of agriculture, and all who are interested in growing peaches.



FIG. 21.—Peach crates. 1, California; 2, Florida; 2', single basket from same; 3, Michigan; 4, Delaware; 5, North Carolina.

It would seem that there might be some arrangement with the local dealers in many of the smaller towns in the eastern United States, and with large dealers in the cities, whereby telegraphic advice could be sent every day during the season, to some centrally located place in each peach region, and thence communicated to all the growers. In this way it would be known where the market was full and where empty, and shipment could be arranged accordingly. Co-operation is the keynote of success. Indeed, without hearty co-operation and compact organization little or nothing can be accomplished, and yet to secure and maintain such organization presents the chief difficulty. Home consumption is another way to avoid gluts in the market; also, the judicious use of canning and drying houses.

One of the chief difficulties in the way of successful peach-growing is undoubtedly the ignorance of the grower. The man who will not grow choice varieties, prefers seedlings, will not properly thin his fruit, will not properly grade it, will not keep the culls at home, will send to the market when he pleases and where he pleases, and who will not combat insect and fungous pests, can not make peach culture profitable, and the only thing for him to do is to go out of the business.

Many of the serious troubles which beset growers can be measurably overcome by intelligent foresight. The thing which is least within the range of control is the weather; yet, while growers can not entirely avoid the mischief of spring frosts or the results of hot and rainy weather, even these may be guarded against. The judicious selection of advantageous orchard sites, and, in special cases, smudges and spraying with water, will tend to avert the former, while prompt removal of rotting fruit, extra prompt marketing, and particular care in packing for shipment will do much to remedy the effects of the latter.

In conclusion it may be stated that the labor involved in peach-growing is great and the discouragements not a few. The proportion of failures to successes is at least as ten to one, and very few indeed are the men who become "peach kings." The man who is not full of energy and does not enjoy seeing the sun rise every day in the year would better venture his money in some other business.

LAWS OF MICHIGAN RELATING TO HORTICULTURE.

YELLOW S AND BLACK KNOT.

AN ACT to prevent the spread of the contagious diseases known as yellows, black knot, peach rosette, and pear blight, among peach, plum, cherry, prune, almond, apricot, nectarine, and pear trees, or the fruit thereof, by providing measures for the eradication of the same, and to repeal act number one hundred twelve of the public acts of eighteen hundred ninety-three, approved May twenty-fifth, eighteen hundred ninety-three.

Section 1. The People of the State of Michigan enact, That it shall be unlawful for any person to keep any peach, almond, apricot, plum, prune, cherry, nectarine of pear tree infected with the contagious diseases known as yellows, black knot, peach rosette, or pear blight, or to offer for sale or shipment, or to sell, or to ship any of the fruit thereof, except the fruit of the plum, cherry and pear tree; that both tree and fruit so infected shall be subject to destruction as public nuisances as hereinafter provided. No damages shall be awarded in any court in the state for entering upon the premises and destroying such diseased trees or parts of trees, or fruit, if done in accordance with the provisions of this act. It shall be the duty of every person as soon as he becomes aware of the existence of such disease in any tree, parts of trees, or fruit owned by him, to forthwith destroy, or cause said trees or fruit to be destroyed.

Sec. 2. In any township or city in this state in which such contagious diseases exist, or in which there is good reason to believe they exist, or danger may be justly apprehended of their introduction, it shall be the duty of the township board or city council, as soon as such information becomes known to either such board or council, or any member thereof, to appoint forthwith three competent freeholders of said township or city, as commissioners, to be known as yellows commissioners, who shall hold office during the pleasure of said board, or city council, and such order of appointment and of revocation shall be entered at large upon the township or city records: Provided, That the commissioners now appointed and in office shall continue in said office until their successors are appointed and qualified: Provided, That in case commissioners have already been appointed to prevent the spreading of bush, vine, and fruit tree pests, such commissioners shall be ex officio commissioners under this act.

Sec. 3. It shall be the duty of said commissioners, within ten days after appointment as aforesaid, to file their acceptances of the same with the clerk of said township or city, and said clerk shall be ex officio clerk of said board of commissioners, and he shall keep a correct record of the proceedings of said board in a book to be provided for the purpose, and shall file and preserve all papers pertaining

to the duties and actions of said commissioners, or either of them, which shall be a part of the records of said township or city.

Sec. 4. It shall be the duty of the commissioners, or any one of them, upon, or without complaint, whenever it comes to their notice that either of the diseases known as yellows, black knot, peach rosette or pear blight exist, or are supposed to exist within the limits of their township, village or city, to proceed without delay to examine the tree or fruit supposed to be infected, and if the disease is found to exist, a distinguishing mark shall be placed upon the diseased trees, and the owner notified personally or by a written notice left at his usual place of residence, or if the owner be a non-resident, by leaving the notice with the person in charge of the trees or fruit, or the person in whose possession said trees or fruit may be. The notice shall contain a simple statement of the facts as found to exist, with an order to effectually uproot and destroy, by fire or as the commissioner shall order, the trees so marked or designated, or such parts thereof, within five days, Sundays excepted, from the date of the service of the notice, and in case of fruit so infected, such notice shall require the person in whose possession or control it is found to immediately destroy the same, or cause it to be done, or the commissioner may destroy the same. Said notice and order to be signed by one or more of the commissioners.

Sec. 5. In case any person who is interested in any tree or trees so ordered to be destroyed shall feel aggrieved by such order and shall believe that such trees are not so diseased, he may serve a written notice upon all of the commissioners in the township in which such trees are situated, which notice shall specify the part of such order to which objection is made and the particular tree or trees included in such order which it is claimed are not so diseased, and shall request an examination of such tree or trees by all of said commissioners, which notice shall be served personally upon each of said commissioners within the five days given for the destruction of said trees, and it shall thereupon be the duty of all said commissioners who have not already done so to personally examine such tree or trees as soon as practicable and within said five days, and if a majority of all the commissioners shall agree that such tree or trees are so diseased, they shall order the same to be destroyed forthwith by the owner or custodian thereof; but if a majority shall decide that such tree or trees, or any of them are not so diseased, they shall revoke the order of the commissioner to destroy the same as far as it relates to the trees so found to be free from disease, but this section shall not apply to fruit ordered to be destroyed.

Sec. 6. Whenever any person shall refuse or neglect to comply with the order to remove and destroy the trees or parts of trees so designated and marked by the commissioner as aforesaid, it shall become the duty of the commissioner to cause said trees or parts of trees to be removed and destroyed forthwith, employing all necessary aid for that purpose. The expenses for such removal and destruction of trees or parts of trees to be a charge against the township or city, and for the purpose of such removal or destruction the said commissioners, their agents and workmen shall have the right and power to enter upon any and all premises within their township or city.

Sec. 7. If any owner neglects to uproot and destroy, or cause to be removed and destroyed, as aforesaid, such diseased trees, or parts of trees or fruit, after such examination and notification, and within the time hereinbefore specified, or any other person who shall sell or offer for sale such diseased fruit, such person shall be deemed guilty of a misdemeanor, and punished by a fine not exceeding one hundred dollars, or by imprisonment in the county jail not exceeding three months, or both, in the discretion of the court, and any justice of the peace of the township or city where such trees may be, or where such nursery stock or fruit is sold, shipped, disposed of, or delivered, as aforesaid, shall have jurisdiction thereof. The words "parts of trees" wherever used in this act, shall refer to black knot and pear blight only, and not to trees affected with yellows.

Sec. 8. The commissioners shall be allowed for services under this act two dollars for each full day, and one dollar for each half day, and their other charges and disbursements hereunder, to be audited, as well as any other charges and disbursements under this act, by the township board, or city council, all of which costs, charges, expenses and disbursements may be recovered by the township, or city, from the owner of such diseased fruit or nursery stock, or from the owner of the premises on which said diseased trees stood, in action of assumpsit: *Provided*, Said owner has refused or neglected to remove said diseased fruit or nursery stock in compliance with the order of said commissioner or commissioners.

Sec. 9. All of act number one hundred and twelve of the public acts of eighteen hundred and ninety-three be and the same is hereby repealed.

This act is ordered to take immediate effect.

Approved May 4, 1895.

SPRAYING.

AN ACT to prevent the spreading of bush, vine, and fruit tree pests, such as canker-worms and other insects, and fungus and contagious diseases, and to provide for their extirpation.

Section 1. The People of the State of Michigan enact, That it shall be the duty of every owner, possessor, or occupier of an orchard, nursery, or vineyard, or of land where fruit trees or vines are grown, within this state, to spray with a poisonous solution or disinfectant, of sufficient strength to destroy such injurious insects or contagious diseases, all fruit trees or vines grown on such lands which may be infested with any injurious insects or worms, or infected with any contagious disease known to be injurious to fruit or fruit trees or vines: *Provided*, That no such spraying shall be done while said fruit trees or vines are in blossom, except in case of canker-worms.

Sec. 2. In any township in this state where such injurious insects or contagious diseases are known to exist, or in which there is good reason to believe they exist, or danger may be justly apprehended of their introduction, it shall be the duty of the township board, upon the petition of at least ten freeholders of such township, to appoint forthwith three competent freeholders of said township as commissioners, who shall hold office during the pleasure of the board, and such order of appointment and of revocation shall be entered at large upon the township record: *Provided*, That in townships having a board of yellow commissioners, such commissioners shall be *ex officio* commissioners under this act.

Sec. 3. It shall be the duty of said commissioners, within ten days after appointment, as aforesaid, to file their acceptance of the same with the clerk of said township, and said clerk shall be *ex officio* clerk of said board of commissioners, and he shall keep a correct record of the proceedings of said board, in a book to be provided for that purpose, and shall file and preserve all papers pertaining to the duties and actions of said commissioners, or either of them, which shall be a part of the records of said townships.

Sec. 4. It shall be the duty of said commissioners, or any one of them, upon, or without, complaint, whenever it comes to their notice, that any orchard, fruit trees, or vines, are infested with canker-worm or other injurious insects or contagious disease, within their townships, to proceed without delay to examine such orchards or vineyards supposed to be infested, and if such injurious insects or contagious diseases are found to exist, the owner shall be notified personally, or by a written notice left at his usual place of residence; or if the owner be a non-

resident, by leaving the notice with the person in charge of the trees or vines, or the occupant of the lands upon which such trees or vines shall be growing. The notice shall contain a simple statement of the facts as found to exist, with an order to effectually destroy such injurious insects or worms, or contagious disease by spraying such trees or vines with a poisonous solution, or, in case of contagious disease, to effectually disinfect said diseased trees or vines, within such time from the date of the service of the notice as such commissioners shall designate, said notice and order to be signed by the full board of commissioners.

Sec. 5. Whenever any person shall refuse or neglect to comply with the order to spray or disinfect the orchards or vineyard designated by the commissioners, as aforesaid, it shall become the duty of the commissioners to cause said trees or vines to be effectually sprayed with a poisonous solution, or disinfected, as occasion should require, forthwith, employing all necessary aid for that purpose, and the expenses for the same shall be a charge against the township; and for said spraying or disinfecting, the said commissioners, their agents or workmen, shall have the right and power to enter upon any and all premises within their township.

Sec. 6. If any owner, township officer, or commissioner, neglects or refuses to comply with the requirements of this law as set forth in the preceding sections, and within the time therein specified, such persons shall be deemed guilty of a misdemeanor, and punished by fine not exceeding fifty dollars, or imprisonment in the county jail not exceeding sixty days, or by both such fine and imprisonment, in the discretion of the court; and any justice of the peace of the township where such trees or vines may be growing shall have jurisdiction thereof.

Sec. 7. The several commissioners shall be allowed for service under this act, two dollars for each full day, and one dollar for each half day, and their other charges and disbursements hereunder, to be audited, as well as any other charges and disbursements under this act, by the township board, all of which costs, charges, expense, and disbursements shall be recovered by the township from the owner of said infested or infested orchards or vineyards, from the owner of the premises on which said trees or vines may be growing, in an action of assumpsit. The provisions of this act shall not apply to the contagious disease known as yellows.

This act is ordered to take immediate effect.

Approved May 4, 1895.

PILFERING FROM ORCHARDS.

AN ACT to protect vineyards, orchards, and gardens, and to repeal act number 131, public acts of 1869, entitled "An act to protect vineyards in the state of Michigan," being section 9195 of Howell's annotated statutes.

Section 1. The People of the State of Michigan enact, That any person who shall enter a vineyard, orchard, or garden, during the months of July, August, September, or October, without the consent of the owner, and pick, take, carry away, destroy, or injure any of the fruits, vegetables, or crops therein, or in anywise injure or destroy any bush, tree, vine, or plant, shall be guilty of a misdemeanor, and on conviction thereof shall be punished by imprisonment in county jail, not more than ninety days, or by fine not less than five nor more than one hundred dollars, or by both such fine and imprisonment in the discretion of the court.

Sec. 2. That act number 131 of the public acts of 1869, entitled "An act to protect vineyards in the state of Michigan," being section 9195 of Howell's annotated statutes of Michigan, be and the same is hereby repealed.

Approved April 17, 1895.

MARKING FRUIT PACKAGES.

AN ACT to provide for marking on packages, designed for the shipment of certain specified kinds of fruit, the number of pounds which each of said packages shall contain.

Section 1. The People of the State of Michigan enact, That all manufacturers of peach baskets and other fruit packages designed for the shipment of peaches, grapes, and plums, and all shippers and dealers in the same, shall mark or cause to be marked, in a plain manner, on the outside, otherwise than the bottom, of such baskets or packages, the capacity of each basket or package, in pounds, at the rate of one pound for each 43.008 cubic inches of space contained in such basket or package.

Sec. 2. Any manufacturer of or dealer in peach baskets or other fruit packages designed for the shipment of peaches, grapes, and plums, who shall sell or offer to sell such baskets or packages without complying with the provisions of this act, shall be deemed guilty of misdemeanor, and upon conviction thereof in any court of competent jurisdiction, shall be fined not less than twenty-five dollars nor more than one hundred dollars, and stand committed to the county jail until such fine and costs are paid.

Sec. 3. All acts or parts of acts contravening the provisions of this act are hereby repealed.

This act is ordered to take effect January 1, 1896.

Approved May 31, 1895.

FRUIT CATALOGUE 1896-7.

ARRANGEMENT OF THE CATALOGUE.

In making the present revision few radical changes have been made and the same plan of arrangement has been used; in fact with an occasional note the explanations given for the last catalogue would apply to the present one.

So many improvements have been made, particularly in small fruits, that the starring has been considerably altered.

Each variety is given a number in the column at the left and this is repeated on the opposite page to prevent mistakes in carrying the variety across. In the columns given up to the descriptions of the varieties, the usual abbreviations are used, the explanations for which are given at the head of each section. As in previous lists the columns headed "Use and value" show on a scale of 1 to 10 the value of the fruits for the different purposes, but attention is called to the fact that, in the sub-columns headed "Dessert" and "Cooking" the quality of the fruit and its adaptation to the purpose alone are considered, without regard to the productiveness and other characteristics of the varieties.

In the third column under "Market" all of the qualities which go to make a variety profitable for market are considered. If a variety stands high in the "Market" column and has either the "Dessert" or "Cooking" that will bring the total to fifteen or over, it indicates that it is a valuable one for the purpose noted.

From the fact that a variety does not prove equally valuable in all parts of the state, the columns under "Locality" are arranged to show by means of symbols their value in the various sections. When two stars (***) are given, it shows that the variety is very generally successful and that it is one of the most desirable kinds for planting. When one star (*) is used, the variety is one that has much merit, but it is less valuable under most conditions than those of the first class; there are also many sorts which will do well in some localities, but are not generally successful and at any rate are of less value than those given one star; these we have marked with a star (*) followed by an interrogation point (?) to indicate that they are at best of doubtful value.

To show the sorts that are of even less value, but which have been found profitable in some localities and for some purposes, we have included them in the list, but have left blank the columns which show their value in the different sections of the state. In using the list one should select the sorts that bear two stars, if only a few kinds are wanted, and, if a longer list is desired, the kinds that have the highest marks in the columns of "Use and value" can be drawn from to complete the number, those with one star being as a rule most likely to succeed.

We have also included in the list quite a number of new sorts that seem to be especially promising, and have marked each of them with a dagger (†).

In dividing the state into districts for the sub-columns we have followed the previous lists and have grouped the counties of the lower peninsula into sections as follows, viz.: first district, the eastern tier of counties; second, the central counties of the state, omitting the row of counties along the east, south and west sides; third district, the counties along the south border of the state from Lenawee to Cass; fourth district, the counties bordering lake Michigan from Berrien to Muskegon inclusive; fifth district, from Muskegon county northward along the lake shore. In reality the eastern district does not extend much above Bay county, although many

of the hardier fruits can be grown with success even to the north of Alpena, while the central district can not be relied upon for the tender fruits for the counties north of Gratiot.

As will be seen from the rejected list that is placed at the end of the regular catalogue, a large number of sorts have been excluded. Many of them have shown themselves unworthy to be longer carried in the regular list, while others have considerable value and have for a long time been known, but hardly a tree can be found in the state, and, moreover, they are not offered by any of the nurserymen. By rejecting them we are able to reduce the number of sorts mentioned in the catalogue and thus lessen the confusion that a long list makes for many persons. The foreign grapes and nectarines are so little grown that it was thought well to leave them out, especially as no changes would have been made in the last list.

NOMENCLATURE.

The nomenclature used in this revision is in accordance with the "Rules of Pomology" of the American Pomological Society, and several changes have been made that bring the list in harmony with the names recommended by the Division of Pomology of the Department of Agriculture.

In preparing this list, errors have without doubt crept in and, that they may be corrected in future lists, any person who notices any rating that is incorrect for a given locality is urged to inform the writer.

L. R. TAFT,

Chairman of Committee on Revision of Catalogue.

Agricultural College, Aug., 1896.

FRUIT CATALOGUE FOR 1896 AND 1897.

ABBREVIATIONS, APPLICABLE THROUGHOUT THE CATALOGUE.

Size:
l. large.
m. medium.
s. small.
v. very.

Quality.
b. best.
g. good.
v. very.

Adhesion.
c. cling.
f. free.

SECTION I.—APPLES.

ABBREVIATIONS FOR THIS SECTION.

Form.

a. angular.
c. conical.
f. flattened.
l. lop-sided or oblique.

o. oblong.
ob. oblate or obtuse.
ov. oval or ovate.
r. roundish.

Number.	Names.	Description.					Use and value. Scale 1 to 10.			
		Size.	Form.	Color.	Quality.	Season.	Origin.	Dessert.	Cooking.	Market.
1	Alexander	v l	rc	gyr	g	Oct. Dec.	Rus.	2	10	6
2	American Golden Russet	s	rov	yru	b	Oct. Jan.	Am.	9	6	12
3	Autumn Swaar	l	rc	oyru	v g	Sept.	Am.	7	7	4
4	Autumn Bough	m	ca	y	v g	Aug. Oct.	Am.	5	5	2
5	Bailey Sweet	l	rc	y dr	v g	Nov. Mar.	N. Y.?	6	7	4
6	Baldwin	l	rc	y cro	v g	Nov. Mar.	Mass.	7	9	10
7	Belmont	m	r f c	y v	v g	Nov. Mar.	Penn.	9	6	6
8	Ben Davis	m l	rc	yr	g	Dec. May.	Ken.?	3	5	9
9	Benoni	m s	rob c	y dc	v g	Aug. Sept.	Mass.	7	6	5
10	Black Gilliflower	m	oc	g dr	b	Nov. Feb.	Am.	4	2	4
11	Blenheim	l	rob c	y odr	g	Oct. Dec.	Eng.	5	7	6
12	Blue Pearmain	l	rc	d pr	v g	Oct. Feb.	Am.	6	5	4
13	Broadwell	m	ob c	y b	v g	Nov. Feb.	Ohio.	7	7	4
14	Buckingham	m l	ob c	gy cr	v g	Nov. Feb.	Vir.?	6	5	5
15	Buffington	m	ob	y wr	v g	Aug.	Penn.	7	5	3
16	Chenango	m l	oc	w c	v g	Sept. Oct.	N. Y.	9	7	8
17	Clyde	l	r ca	gr	g	Oct. Jan.	N. Y.	5	5	6
18	Cogswell	m l	rob	yr	b	Dec. Mar.	Conn.	8	7	8
19	Cole Quince	l	rob	gyr	v g	Oct. Dec.	Maine.	6	8	6
20	Colvert	l	ob c	gyr	g	Oct. Nov.	N. Y.?	4	7	7
21	Cooper	l	rob	gyr	g	Oct. Dec.	Am.?	4	6	7
22	Cooper Market	m	ob c	yr c	g	Dec. May.	Am.?	4	6	6
23	Cornell	m	oc	yc	v g	Oct. Nov.	Penn.	7	6	6
24	Cranberry Pippin	m	rob	ys	g	Nov. Mar.	N. Y.	5	7	8
25	Danvers	m	ro	yo	v g	Nov. Apr.	Mass.	5	7	5
26	Domine	m	rob	gyr	v g	Dec. Apr.	Am.?	6	6	6
27	Dyer, <i>Pomme Royal</i>	m	r	gyr	b	Sept. Oct.	Fr.?	8	6	4
28	Early Harvest	m	rob	yw	b	July Aug.	N. Y.?	7	7	5
29	Early Joe	s	ob c	yr	b	Aug. Sept.	N. Y.	8	6	4
30	Early Strawberry	s	rc	yr	v g	July Aug.	N. Y.	8	6	7

FRUIT CATALOGUE FOR 1896 AND 1897.

ABBREVIATIONS APPLICABLE THROUGHOUT THE CATALOGUE.

Season.		Origin.	
The usual abbreviations for months.	b. beginning. e. end. m. middle.	The usual abbreviations for countries.	h. hybrid. ? doubtful.

SECTION I.—APPLES.

Color.		Color.	
b. brown.	o. orange.	v. vermilion.	
c. carmine.	p. purplish.	w. whitish.	
d. crimson.	r. red.	y. yellow.	
e. dark.	ru. russet.		
g. green.	s. scarlet.		

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*	*	*	*	*	Tree vigorous, spreading, productive; very beautiful. For cooking superior. Better farther south. Tree upright. Fruit often scabby and worthless.
3	*?	*?	*?	*?	----	Hardy, vigorous, spreading. Excellent, but not productive enough for the market.
4	*	----	----	----	*	One of the best dessert sweet apples of the season.
5	*	**	*	*	*	For vigor, productiveness, size, beauty and quality combined, this has few if any superiors.
6	**	**	**	**	*	Tree lacks hardiness. Fruit drops badly. Bitter rot in large specimens. Stands first on light soils in southern Michigan.
7	*	*	*	*	*	Fruit often defective in this climate. Best for home markets. Suits the popular taste.
8	*	**	*	**	*	Vigorous, hardy, prolific. Fruit beautiful and handles well, but very poor in quality. Sells well in the market.
9	*?	*?	*	*	*?	Tree upright, vigorous, very productive. Fruit too small on old trees.
10	----	----	----	----	----	Very mild flavor. Soon gets dry and mealy. Prized by a very few persons.
11	*?	*?	*?	*?	----	In vigor and productiveness, also character of fruit, this is very desirable for market and cooking.
12	*?	*?	*?	*?	*?	Beautiful; but lacks both productiveness and quality.
13	*	*	*	*	*	Vigorous, hardy, spreading, irregular, productive. A desirable sweet apple.
14	*?	*?	*?	*?	*?	Little grown here. More popular farther south.
15	*?	*?	*?	*?	*?	A desirable dessert apple. Not as generally known as it deserves to be.
16	**	**	**	**	*	Tree vigorous, spreading, productive. Fruit of very delicate texture. Popular wherever known.
17	*?	*?	*?	*?	----	Tree vigorous, upright, very productive. A desirable market apple.
18	*?	*?	*?	*?	----	The tree and fruit are both satisfactory, whether for the home or market.
19	*	*?	*?	*?	----	Upright, spreading, productive. A desirable family fruit with quince aroma.
20	*?	*?	*?	*?	*?	Tree vigorous, hardy, prolific. Fruit large, showy, but not of high quality. Popular with the masses. Sells well in market.
21	----	----	----	----	----	Tree very vigorous, upright, spreading. Fruit even sized, very attractive.
22	*?	*?	*?	*?	*?	Hardy, vigorous, upright, productive. Profitable.
23	*?	*?	*?	*?	*?	Vigorous, productive. A desirable fruit for general purposes.
24	*?	*?	*?	*?	----	Tree a good grower, productive. Fruit much like the Maiden's Blush. Even more beautiful. Worthless at the extreme north.
25	*	*	*	*	*	Strong grower and very productive. Deserves more attention.
26	*?	*?	*?	*?	*?	Tree has long, stout, spreading branches, which are very liable to be broken by the heavy crops of fruit. Scabs on old trees.
27	*?	*?	*?	*?	----	One of the very finest dessert apple. A poor grower. Unprofitable as a market fruit.
28	*	*	*	*	*	Tardy, irregular bearer. Fruit often imperfect. Valued mainly for its earliness. Fails on old trees.
29	*	*	*	*	*	For the garden. With light culture the fruit is beautiful and excellent.
30	**	**	*	*	*	One of the most attractive dessert apples of its season. Ripens in succession. By some considered profitable.

SECTION I.—APPLES.—CONTINUED.

Number.	Names.	Description.					Use and value Scale 1 to 10.			
		Size.	Form.	Color.	Quality.	Season.	Origin.	Dessert.	Cooking.	Market.
31	English Russet.....	s m	r c	g y ru	g	Jan. May.	Am.?	4	5	6
32	Esopus.....	m	o c	y r	b	Dec. Apr.	N. Y.	7	8	4
33	Fallowater.....	v l	r c	y g r	g	Nov. Mar.	Penn.	4	7	7
34	Fall Jenetting.....	l	o b c	g y r	g	Sept. Oct.	Conn?	5	4	4
35	Fall Orange.....	l	r	y r	g	Oct. Nov.	Mass.	4	8	8
36	Fall Pippin.....	v l	r f	y g b	b	Oct. Dec.	Am.	8	9	7
37	Fall Wine.....	m	r o b	r y	b	Sept. Nov.	Am.	7	6	4
38	Fameuse, <i>Snow</i>	m	r o b	g y r	v g	Oct. Nov.	Can.?	9	6	7
39	Flushing.....	m	r c	g y r	g	Nov. Mar.	N. Y.?	6	6	7
40	Garden Royal.....	m s	r o b c	g y r	b	Aug. Sept.	Mass.	9	5	4
41	Garretson.....	m	r c	y	v g	Sept.	N. J.	6	6	6
42	Genesee.....	l	r c	w c r	g g	Sept.	Am.	6	6	5
43	Gilpin, <i>Carthouse</i>	m	r o r	r y	g g	Dec. May.	Vir.	5	4	5
44	Gloria Mundi.....	v l	r o b	g y	v g	Oct. Feb.	Eur.?	3	5	5
45	Golden Russet (W. N. Y.).....	m s	r o b	y ru	v g	Dec. May.	Eng.?	9	6	8
46	Golden Sweet.....	l	r	g y	g	Aug. Sept.	Conn.	6	5	6
47	Golding (<i>Am. Golden</i>).....	m l	r o b c	y b	v g	Nov. Feb.	Am.	7	7	5
48	Good Peasant.....	m	o c	y r	v g	Oct. Dec.	Rus.	9	9	9
49	Gravenstein.....	l	r o b a	y r o	v g	Sept. Oct.	Ger.	7	7	8
50	Green Newtown.....	m	r	g b r	b	Dec. May.	N. Y.	10	8	3
51	Green Sweet.....	m	r o b c	g y	g	Dec. Mar.	Mass.?	7	6	7
52	Grimes Golden.....	m	r o c	y o	v g	Dec. Mar.	Va.	9	7	8
53	Hartford Sweet.....	l	r f	y g r	g	Dec. June.	Conn.	6	7	4
54	Haskell Sweet.....	m l	o b	g y r	v g	Sept. Oct.	Mass.	6	7	2
55	Hawley, <i>Douse</i>	l	r o c	y	v g	Sept.	N. Y.	7	5	5
56	Hawthornden.....	m l	r f	w y r	g	Sept.	Scotch.	3	8	8
57	Hightop Sweet.....	m s	r	y	v g	Aug.	Mass.	6	6	5
58	Hubbardston.....	l	r o c	y r	b	Nov. Feb.	Mass.	10	5	9
59	Jabez Sweet.....	m	r c	y	g	Dec. Feb.	Conn.	6	7	3
60	Jefferis.....	m	o b c	y c r	v g	Sept. Oct.	Penn.	9	6	7
61	Jersey Sweet.....	m	r o v c	g y r	v g	Sept.	N. J.	8	7	6
62	Jonathan.....	m s	r c	y r	v g	Nov. Feb.	N. Y.	9	7	9
63	Keswick.....	m l	o v c	g y r	g	Sept. Oct.	Eng.	2	10	8
64	Lady.....	v s	f	y r	v g	Dec. May.	Fr.	8	1	5
65	Lady Sweet.....	l	r o v c	y r	v g	Dec. May.	N. Y.	7	7	7
66	Late Strawberry.....	m	r c	w r	v g	Oct. Dec.	N. Y.	8	4	5
67	Limber Twig.....	m	r o b	y r	g g	Jan. Apr.	N. C.?	5	7	8
68	Longfield.....	m	o c	y r	g g	Oct. Dec.	Rus.	9	9	9
69	Lowell.....	l	r o v c	g y	v g	Sept. Oct.	Penn.?	7	7	8
70	Lyscom.....	l	r	g y r	v g	Sept. Nov.	Mass.	7	3	5
71	Maiden Blush.....	m	r f c	y r c r	g	Sept. Oct.	N. J.	7	8	10
72	Mann.....	m l	r o b	y b r	v g	Jan. Apr.	N. Y.	6	7	9
73	Manomet.....	m	r o b	y r	v g	Aug. Sept.	Mass.	7	7	4
74	McLellan.....	m	r o b	y r	v g	Dec. Mar.	Conn.	9	7	8
75	McMahon.....	l	r c	y r	g	Nov. Dec.	.....	9	9	9
76	Melon.....	m l	r o b c	y c r c	b	Nov. Mar.	N. Y.	10	8	7
77	Mexico.....	m	r o b	c r y	b	Sept. Oct.	Conn.	10	6	5
78	Miller (N. Y.).....	l	o o b c	y r	v g	Oct. Nov.	N. Y.?	7	6	8
79	Minister.....	l	o c	g y r	g	Oct. Feb.	Mass.	6	7	5

SECTION I.—APPLES.—CONTINUED.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
31	*?	*?	*?	*?	*?	Strong, upright, very productive, tender. Fruit very even sized, often small. Keeps easily a year. Poor quality.
32	*?	*?	*?	*?	*?	Tree lacks vigor. Fruit much called for in the market, but rarely offered. Best on rich, warm soils.
33	*	*	*	*	*	Grows and produces well. Too poor in quality. Size its chief recommendation. Always sells well.
34	*?	*?	*?	*?	*?	Tree vigorous, spreading, productive. Its season and color detract from its value.
35	*	---	*	---	---	The apple grown in this State under this name proves to be the one known as "Newell" in Hillsdale county.
36	*	*	*	*	*	Tree strong, spreading, productive; liable to scab. Often keeps till spring. In central district lacks productiveness.
37	---	---	---	---	---	Grows and bears well. Fruit often scabby. Not extensively grown.
38	*	*	*	*	*	Fruit scabby and imperfect on old trees. Best on new, rich soils. Good at the north. Profitable where it succeeds.
39	*	*	*	*	*	Strong, reddish brown shoots. Very productive. Sometimes scabby. Not esteemed valuable, except perhaps at the north.
40	*	*	*	*	*	Moderate grower. Upright, roundish. Best dessert apple of its season.
41	*?	*?	*?	*?	*?	Vigorous, upright, spreading. Very promising.
42	---	---	---	---	---	Strong, vigorous. The showy fruit is the chief attraction.
43	---	---	*?	*?	---	A good cider apple, and passable for the table.
44	---	---	*	*	*	Vigorous; not productive. Size its only attraction. Worthless everywhere.
45	**	**	*	*	*	Hardy, vigorous. Shoots slender. Very productive. Brings a high price in late spring, if wintered in close packages.
46	*?	*?	*?	*?	*?	A hardy, spreading, prolific tree. Very popular in its season. Tree tender at the extreme north. Often fed to stock.
47	*?	*?	*?	*?	*?	An old sort; superior to many better known.
48	**	**	*	*	**	A promising Russian sort.
49	**	**	*	*	**	A fine culinary fruit. Tree a fine grower and hardy; lacks productiveness. Bears better at the north.
50	*?	*?	*?	*?	*?	A weak, slender grower. Fails generally at the west. Unprofitable. Best on "opening" soils.
51	*	*	*	*	---	Tree vigorous, productive. Desirable. More than one variety grown under this name.
52	**	**	**	**	*	Tree spreading, vigorous, hardy, prolific. Fruit beautiful. Flavor fine, peculiar.
53	---	---	---	---	---	Moderate grower, hardy, productive. A good baking sweet apple.
54	*	*	*	*	**	Vigorous, productive. One of the finest of sweet apples.
55	*?	*?	*?	*?	*?	Annual bearer. Fruit beautiful and good, but soon decays. A dessert fruit. A better keeper north.
56	*?	*?	*?	*?	*?	Tree vigorous, spreading. Productive alternate years. A beautiful culinary market fruit.
57	*?	*?	*?	*?	*?	Tree upright, vigorous. Very productive. Fruit very beautiful and good.
58	**	**	**	**	**	Should be in every orchard. A very good market variety. Of the highest quality.
59	---	---	---	---	---	A very productive and desirable dessert fruit for early autumn.
60	*	*	*	*	*	Prolific. One of the richest early sweet apples. Tree tender in cen. districts.
61	**	**	**	**	**	Good bearer alternate years. Fruit small, very beautiful and good. Popular.
62	*	**	**	**	**	Cooks well, even when but half grown. Very early bearer. Very hardy and prolific.
64	*?	*?	*?	*?	*?	A beautiful little fancy apple. Brings large prices in market in eastern cities. Little known west. Sometimes scabs.
65	*?	*?	*?	*?	*?	A fair baking apple. Desirable as a long keeper. Retains its juice and flavor.
66	*	*	*	*	*	Regular, early bearer. Chenango is often grown under this name.
67	*?	*?	*?	*?	*?	Popular west and south as a long keeper. Distinct from Willow Twig.
68	*	*	*	*	**	A very handsome variety for either dessert or cooking.
69	*	*	*	*	*	Strong grower, bears heavily in alternate years. Popular. Profitable.
70	*	*	*	*	*	Generally fair. Tree vigorous, upright, spreading. Not largely planted.
71	**	**	**	**	**	Spreading, vigorous, prolific. The most popular early autumn market apple. Rather acid for dessert.
72	*	*	*	*	*	Hardy, upright, annual bearer. Not much disseminated. A long keeper.
73	*	*	*	*	---	Vigorous, productive. Fruit excellent. Worthy of increased attention.
74	*	**	*	*	---	Thrifty, upright, productive. An excellent variety for home and market. Bears alternate years.
75	*	**	*	*	**	One of the very best dessert apples. Tree hardy, with short, wiry shoots.
76	*	**	*	*	*	Very productive alternate years.
77	*?	*?	*?	---	---	Moderate grower, hardy, productive. One of the finest of dessert apples.
78	*?	*?	*?	---	---	Vigorous, productive. A promising fruit for market and general purposes.
79	*?	*?	*?	*?	---	Moderately vigorous, very productive. Not widely disseminated.

SECTION I.—APPLES.—CONTINUED.

Number.	Names.	Descriptions.						Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Origin.	Dessert.	Cooking.	Market.
80	Monmouth <i>Red Cheek Pippin.</i>	l	ob c a	y r	v g	Nov. Mar.	N. J.	6	7	9
81	Morris Red <i>Steele's Red erroneously.</i>	m l	ov c	r ru	v g	Jan. Apr.	Conn.?	8	8	7
82	Mother	m	r c	y r	b	Nov. Feb.	Mass.	7	6	7
83	Munson Sweet	m	ob	y r	v g	Sept. Feb.	Mass.?	6	7	7
84	Newtown Spitzenburg <i>Vandevere of N. Y.</i>	m	ob c	y r	b	Oct. Feb.	N. Y.	9	7	5
85	Northern Spy	l	r c	g y r	b	Dec. Apr.	N. Y.	10	9	10
86	Oakland	m	r ob	y r	v g	Nov. Mar.	Mich.	8	7	8
87	Oconee	l	r f	y b	g	Nov. Dec.	Ga.	6	6	7
88	Ohio Nonpariel	l	r ob	y r	v g	Nov. Dec.	Ohio.	8	9	9
89	Oldenburgh	m	r ob	y r	g	Sept.	Rus.	5	9	9
90	Paw Paw, <i>Rubicon.</i>	m	r o	y r	v g	Dec. June.	Mich.	9	5	5
91	Peach Pond Sweet	m	ob	y r	v g	Sept. Nov.	N. Y.	6	6	6
92	Peck Pleasant	m l	r f	g y r	v g	Nov. Mar.	R. I.?	9	8	9
93	Pennock	l	r f l	r y	g	Nov. Mar.	Penn.	1	1	5
94	Perry Russet	m	r c l	y r u b	g	Nov. Dec.	N. Y.	6	6	5
95	Pewaukee	m l	r ob	r y	g	Dec. Apr.	Wis.	7	8	8
96	Pomme Gris	s	ob r	ru r	b	Dec. Mar.	Eur.	10	6	5
97	Porter	m l	o c	y r	v g	Sept.	Mass.	8	7	8
98	Primate	m	r ob c	g w e r	v g	Aug. Oct.	N. Y.?	10	5	6
99	Pumpkin Sweet, <i>Pound Sweet.</i>	v l	r	w g y	g	Sept. Dec.	Conn.?	2	8	4
100	Rambo	m	r ob	y w r	v g	Oct. Feb.	N. J.?	8	5	5
101	Ramsdell Sweet, <i>English Sweet.</i>	m l	o c	d r	v g	Oct. Feb.	N. E.?	6	9	4
102	Rawle Janet	m l	ob c	y r c r	g	Feb. June.	Vir.	3	1	5
103	Red Astrachan	m l	r c	g y c r	g	Aug.	Rus.	5	9	10
104	Red Beitigheimer	v l	o b	r g y	g	Oct.	Rus.	6	9	9
105	Red Canada, <i>Old Nonsuch.</i>	m	r ob c	y r c r	v g	Dec. June.	N. E.?	9	8	10
106	Red June	s	ov c	dr	v g	Aug.	N. C.?	7	6	2
107	Red Russet	m l	r c	y r ru	v g	Jan. Apr.	N. H.	8	7	5
108	Ribston	m	r c	y r ru	v g	Nov. Apr.	Eng.	7	7	4
109	Rhode Island Greening	l	r ob	g y r	v g	Nov. Apr.	R. I.?	9	10	9
110	Roman Stem	m	r	y b ru	v g	Nov. Mar.	N. J.	7	7	4
111	Rome Beauty	l	r c	y r	v g	Nov. Feb.	Ohio.	6	7	5
112	Roxbury Russet	m l	r ob a	y r u r	v g	Jan. June.	Mass.	6	9	7
113	Shiawassee	m	o b	w r	v g	Oct. Jan.	Mich.	10	6	8
114	Smith Cider	m l	r ob c	y r	g	Dec. Mar.	Penn.	5	4	7
115	Smokehouse	m l	r ob	y c r	g	Sept. Feb.	Penn.	5	7	8
116	Sops of Wine	m	r	y r	g	Aug. Sept.	Eur.	4	6	6
117	Stark	l	r c	g y r	g	Jan. May.	Ohio.?	6	7	8
118	St. Lawrence	l	ob c	y c	v g	Sept. Oct.	Can.?	8	8	9
119	Summer Hagloe	l	r ob	w y r	v g	Aug. Sept.	N. J.?	6	7	7
120	Summer Pearmain <i>American Summer.</i>	m	o	y r	b	Sept.	Am.	10	5	5
121	Summer Pound Royal	l	r ob c	g w	g	Aug. Sept.	Am.	6	8	7
122	Summer Queen	l	r c	y r	g	Aug. Sept.	N. Y.?	6	7	6
123	Summer Rose	s	r	y r	b	Aug.	N. J.	10	7	5
124	Summer Paradise		r f	g y	v g	Aug. Sept.	Penn.	9	7	4

SECTION I.—APPLES.—CONTINUED.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
80	*?	*?	*?	*?	---	Vigorous, upright, productive. Is a good market variety.
81	*?	*?	*?	*?	---	Vigorous, stocky; leaves large. Buds prominent. May be an old variety. Also known in Fulton county, Ohio.
82	*	**	*	*	---	Productive. An excellent dessert apple. Deserves more attention.
83	*	*	*	*	*	Tree spreading, vigorous, prolific. Fruit very perfect, even sized, and beautiful.
84	*?	*?	*?	*?	---	Requires warm soils. Sometimes scabs or cracks. One of the best apples when perfect.
85	**	**	**	**	**	Strong, upright, hardy. Tardy bearer. Fruit sometimes uneven and imperfect. Requires good culture and careful handling.
86	*	*	*	*	*	Popular in Oakland county. Less disseminated elsewhere.
87	*?	*	*	*	---	A vigorous, hardy, southern apple. Does well in eastern Michigan.
88	*	**	*	*	**	Very vigorous, productive. One of the most valuable late autumn apples.
89	**	**	**	**	**	Hardy, vigorous, very productive. Of little value except for cooking and market. Sells well, but soon decays.
90	*?	*?	*?	*?	*?	Hardy, moderate grower, regular bearer. Must have suitable soil and good culture.
91	---	---	---	---	---	Tree vigorous, spreading, productive. A beautiful, desirable sweet apple.
92	*	*	*	*	*	Habit of tree like R. I. Greening, but less vigorous. Generally and deservedly popular. Fruit beautiful and excellent.
93	---	---	---	---	---	Sometimes profitable to ship south. Poor flavor. Very subject to bitter rot.
94	*?	*?	*?	*?	*?	Distinct from Golden Russet. An early, abundant bearer. More than one variety is probably grown under this name.
95	*	*	*?	*?	*	Hardy and productive.
96	*?	*?	*?	*?	*?	Moderate, upright grower. Good early bearer. An excellent fine dessert apple. Less successful on light soils.
97	*	**	*	*	*	Usually very fair. Valuable for market as well as dessert.
98	*	**	**	**	*	One of the best dessert apples. Subject to water core and other defects. Ripens in succession.
99	*?	*?	*?	*?	*?	Tree strong, upright, spreading. Fruit often water cored. Culinary.
100	*	*	*?	*?	*?	A vigorous but tender tree. Overbears and produces small fruit. A very common farmer's apple.
101	*	*	*	*	*	Very vigorous and productive. Best sweet apple of its season for cooking and market.
102	---	---	---	---	---	Hardy, vigorous, spreading. Better farther south. Blossoms late.
103	**	**	**	**	**	Strong grower; early bearer; hardy. Fruit beautiful; showy; profitable; too sour for dessert.
104	*	**	*	*	**	Large and handsome; generally productive and an excellent cooking sort.
105	**	**	**	**	**	Very popular for market where fully proved. Tree not vigorous. Should be top-grafted in all cases. Best on strong soils.
106	*	*	*	*	---	Often small, scabby and imperfect. Quality excellent. Ripens in succession. Better farther south.
107	*?	*?	*?	*?	*?	Tree much like Baldwin. The same is true of fruit except the russet, and higher flavor.
108	*?	*?	*?	*?	*?	Tree a good grower, productive. High, sharp flavor. Succeeds at the north.
109	*	**	*	**	**	Tree spreading, vigorous; generally productive on strong soils; best at lake shore. One of the old favorites.
110	---	---	---	---	---	Moderately vigorous, spreading. Very productive. Not very much known in this State.
111	*?	*?	*?	*?	*?	Moderate grower, productive. inclined to overbear on old trees.
112	*	*	*	*	*	Very liable to attacks of the codlin moth. Tree strong, spreading, productive, tender. Not profitable on light soils.
113	**	**	**	**	**	Tree hardy, vigorous, upright, spreading, productive. Like Fameuse, but superior to it.
114	*?	*?	*?	*?	---	Very productive, vigorous, straggling. Valued for market purposes.
115	*?	*?	*?	*?	*?	Vigorous, spreading, productive. Culinary, market.
116	*?	*?	*?	*?	*?	Tree vigorous, upright, productive. Widely disseminated, but not valuable.
117	*	**	**	**	*	Tree vigorous, hardy, productive. Fruit good enough to sell. Valued as a market fruit.
118	*	*	*	*	*	Tree very vigorous, productive. Highly and justly valued. Sometimes cracks and scabs.
119	*?	*?	*?	*?	*?	Vigorous, productive. An old and useful culinary variety.
120	---	---	---	---	---	Slow grower, hardy. Fruit, when perfect, mild, rich, excellent. Very beautiful.
121	---	---	---	---	---	Very vigorous. Productive. A profitable market apple for its season.
122	*?	*?	*?	*?	*?	Liable to scab. One of the best cooking apples. Popular.
123	*?	*?	*?	*?	*?	Tree moderately vigorous, productive. One of the finest dessert fruits of its season.
124	*?	*?	*?	*?	*?	Tree spreading, drooping, moderate regular bearer. Very desirable among sweet apples.

SECTION I.—APPLES.—CONCLUDED.

Number.	Names.	Description.						Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Origin.	Dessert.	Cooking.	Market.
125	Sutton.....	l	r ov	y r	v g	Dec. Feb.	Mass.	9	8	9
126	Swaar.....	l	r ob	y ob	b	Dec. Apr.	N. Y.	10	6	4
127	Sweet Bough..... <i>Large Yellow Bough.</i>	l	o ov	g y r	v g	Aug.	Am.	8	7	6
128	Talman Sweet.....	m	r	w y r	v g	Nov. Apr.	R. I.	6	8	6
129	Tetofski.....	m	r ob c	y r	g	Aug.	Rus.	5	7	---
130	Tewksbury.....	s	ob	y r	v g	Jan. July.	N. J.	7	7	5
131	Thaler.....	l	r ov	ly	g	Sept.	Rus.	7	---	---
132	Tompkins King.....	l	r f c a	y r cr	v g	Dec. Mar.	N. J.?	8	6	8
133	Titovka (<i>Titus</i>).....	l	r ob	---	---	---	---	---	---	---
134	Townsend.....	m	ob c	y r	g	Aug. Sept.	Penn.	6	6	7
135	Trenton Early.....	m l	r ov	y r	g	Aug.	Am.?	6	6	8
136	Twenty Ounce..... <i>Cayuga Red Streak.</i>	v l	r	g y r	g	Oct. Jan.	Conn.	5	7	9
137	Vandevere.....	m	ob	y r	g	Nov. Mar.	Del.	6	8	9
138	Wagener.....	m	r ob	y cr	v g	Nov. Mar.	N. Y.	9	6	6
139	Warfield.....	l	ob c	y r	v g	Sept. Oct.	Iowa.	10	8	10
140	Washington Strawberry.....	l	r c f	y r	v g	Sept. Oct.	N. Y.	7	7	8
141	Wealthy.....	m	r ob	y cr	v g	Autumn.	Minn.	8	6	8
142	Westfield.....	m l	r c	g r ru	b	Oct. Mar.	Conn.	9	5	7
143	Western Beauty.....	m	o b c	y r	g	Oct. Dec.	-----	8	8	8
144	White Pippin.....	l	r ob l	g w y	v g	Jan. Apr.	Am.?	6	7	5
145	Williams.....	m	r oc	r	g	Aug. Sept.	Mass.	6	5	7
146	Willow Twig, <i>James River</i>	m	r c	y r	g	Dec. May.	Vir.	5	7	7
147	Wine, <i>Hays Winter</i>	m l	r f	d r y	g	Oct. Mar.	Del.	7	7	6
148	Winesap.....	m	r ob c	d r y	v g	Nov. May.	N. J.	6	6	4
149	Yellow Bellflower.....	v l	o c	g y r	v g	Dec. Mar.	N. J.	8	10	7
150	Yellow Newtown.....	m	r ob l	y r	b	Dec. May.	N. Y.	10	8	3
151	Yellow Transparent.....	m	r ob	y	g	Aug.	Rus.	8	8	7

SECTION I.—APPLES.—CONCLUDED.

Number.	Locality.					Remarks.
	East.	Center	South.	Southern lake shore.	Northern lake shore.	
125	*	*	*	*	†	Promising for home use and market.
126	---	---	---	---	---	Can only be recommended as an amateur fruit. Tree lacks hardiness. Fruit often imperfect. Requires rich, warm, dry soil.
127	*	**	*	*	*	Tree a little tender and lacks productiveness. The most popular early sweet apple.
128	**	**	**	**	**	Best winter baking apple. The most popular and profitable sweet market apple.
129	---	*?	---	---	*?	Of little value, except where great hardiness is required.
130	---	---	---	---	---	Tree vigorous, upright, productive. A fine, long-keeping table fruit.
131	†	†	†	†	†	One of the best early Russian sorts.
132	**	**	*	*	**	Apt to blow down. A good early winter dessert fruit. Improves at the north.
133	†	†	†	†	†	A promising Russian variety.
134	*?	*?	*?	*?	*?	Tree vigorous, upright, spreading, productive. Little known; almost "very good."
135	*?	*?	*?	*?	*?	Tree moderately vigorous, productive, hardy. A fine, profitable, orchard fruit.
136	**	**	*	**	**	Fruit sometimes imperfect in Lenawee county. Very profitable for market.
137	*?	*?	*?	*?	*?	Distinct from N. Y. Vandevere. This variety is widely planted. Valuable.
138	**	**	**	*	**	Very early bearer; ruining the tree unless thinned and highly cultivated. Fine dessert apple. Sells well in market.
139	**	**	*	*	*	A large and handsome dessert variety. Trees very productive.
140	*	**	**	*	*	Tree vigorous. Bears early and abundantly. A valuable variety for general purposes.
141	**	**	**	**	**	Originated with Peter M. Gideon. Valuable at the north. Very hardy.
142	*	**	*	*	*	Popular old variety for home use. Somewhat lacking in productiveness, and hence unprofitable.
143	*	*	*	*	*	A desirable variety for home use or market.
144	*?	*?	*?	*?	*?	Tree vigorous, upright, productive. Fruit of the Newtown Pippin class. Popular south.
145	*?	*?	*?	*?	*?	Tree a good grower; productive. Valued by some as a market variety.
146	*?	*?	*?	*?	*?	Hardy, vigorous, productive. Fruits vary greatly in size. Keep and sell well.
147	---	---	---	---	---	Hardy, prolific. A fine, though little known, winter fruit.
148	*?	*?	*?	*?	*?	Irregular grower; good, early bearer. Good for dessert, market or cider—Downing. Valuable in Lenawee county.
149	*?	*?	*?	*?	*?	Needs dry, warm soils. High, rich flavor. Uneven in size. Often unproductive. Not successful at the north. Fruit much in demand.
150	*?	*?	*?	*?	*?	Tree and fruit like the Green Newtown. Some doubt their distinctness.
151	*	**	*	*	**	One of the best of the early summer sorts for cooking purposes.

SECTION II.—APPLES—CRABS.

ABBREVIATIONS FOR THIS SECTION.

b. brown.	g. green.	ru. russet.
c. carmine.	o. orange.	s. scarlet.
cr. crimson.	p. purplish.	v. vermillion.
d. dark.	r. red.	y. yellow.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	**	**	**	**	**	An exceedingly rich looking crab. Keeps well. Sells well. A vigorous tree, productive. Has the calyx large and prominent. One of the most beautiful and prolific. Bears in alternate years.
2	**	**	**	**	**	
3	*	*	*	*	*	
4	**	**	**	*	**	Unexcelled in beauty of appearance. Said to be less beautiful at the north. One of the largest, most productive and beautiful of the older crabs. Very large, beautiful and excellent. Tree vigorous, upright, productive.
5	**	**	**	**	**	
6	*	**	*	**	*	

SECTION III.—APRICOTS.

Apricots are recommended for dessert or amateur purposes, with little reference to actual profit as owing to occasional loss of the very early bloom, and liability to injury from extreme cold in unfavorable localities, together with extreme liability to the depredations of the curculio, little pecuniary return can be confidently anticipated from them. Since they are recommended only as amateur fruits, they are not quoted for cooking or market.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*	*	*	*	*	Hardy, productive, excellent. Kernel sweet. Tree vigorous. Branches long, slender. Freestone. Vigorous. One of the best early varieties. Freestone. Kernel bitter.
2	+	+	+	+	+	
3	+	+	+	+	+	
4	*	*	*	*	+	One of the most popular. Stone perforated. Kernel bitter. Considered the finest variety. Stone perforated. Kernel bitter.
5	*	*	*	*	*	

SECTION IV.—BLACKBERRIES.

ABBREVIATIONS FOR THIS SECTION.

Form.

c. conical.
o. oblong.ov. oval.
r. roundish.

Number.	Name.	Descriptions.						Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Origin.	Dessert.	Cooking.	Market.
1	Agawam.....	l	ro	b	v g	m	Am.	9	9	7
2	Ancient Briton.....	l	oov	b	v g	l	Ark.	8	7	7
3	Early Harvest.....	s	ro	b	v g	ve	Ill.	8	8	8
4	Eldorado.....	l	ro	b	v g	e	Ohio.	8	8	7
5	Erie.....	l	ro	b	v g	m	Pa.	10	10	7
6	Kittatinny.....	l	rc	b	b	m	N. J.	8	8	7
7	Lucretia (Dewberry).....	l	oob	b	v g	ve	Va.	8	8	7
8	Minnewaski.....	l	oov	b	v g	m	N. Y.	9	9	7
9	Snyder.....	m	rov	b	v g	e	Ind.	7	7	10
10	Stone.....	ms	r	b	v g	e	Wis.	7	7	7
11	Taylor.....	l	ro	b	v g	e	Am.	10	10	9
12	Wallace.....	l	oov	b	v g	m	Am.	9	9	9
13	Western Triumph.....	m	ov	b	v g	ml	Am.	9	9	8
14	Wilson (Junior).....	l	oov	b	g	e	N. J.	9	9	8

SECTION V.—CHERRIES.—HEART AND BIGARREAU.

ABBREVIATIONS FOR THIS SECTION.

Form.

a. angular.
co. compressed.c. conical.
o. ovate or oval.l. long.
h. heart shaped.ob. obtuse.
r. roundish.

The numbers under the head of "cooking" recommend strictly for canning or drying with sugar as raisins.

Number.	Names.	Descriptions.							Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Class.	Origin.	Dessert.	Cooking.	Market.
1	American Heart.....	l	h	a br	g	m June	h	Am.	6	7	7
2	Bigarreau, <i>Yellow Spanish</i>	vl	ob h co	y cr	b	e June	b	Eur.	10	9	7
3	Black Eagle.....	m	ob h	b	b	b July	h	Eng.	9	8	9
4	Black Hawk.....	l	ob h co	p b.	v g	e June	h b	Ohio.	9	6	9
5	Black Heart.....	l	h	b	v g	e June	h	Eur.	9	6	9
6	Black Tartarian.....	vl	ob h	p b	v g	m June	h b	Rus.	9	8	9
7	Cleveland.....	l	r h	r y	v g	m June	b	Ohio.	9	6	8
8	Downer.....	m	r h ov	a r	v g	b July	h	Mass.	9	6	10
9	Early Purple.....	m	r h	d r p	v g	b June	h	Eur.	9	6	6
10	Elton.....	l	l h	y br r	v g	m June	b	Eng.	9	7	9
11	Governor Wood.....	l	v h	y r	v g	m June	h	Ohio.	9	6	8
12	Kirtland Mary.....	l	r h	y r	v g	b July	b	Ohio.	8	7	7
13	Knight Early.....	l	ob h	d p b	v g	m June	h	Eng.	8	6	6
14	Mezel, <i>Bigarreau De Mezel</i> <i>Great Bigarreau.</i>	vl	ob h	d r b	g	b July	b	Eur.	6	6	8
15	Napoleon.....	vl	l h	y r	g	b July	b	Eur.	6	6	8
16	Rockport.....	l	r ob h	a r	b	m June	h	Ohio.	9	7	9
17	Vilne Sweet.....	l	r h	r y	g	e June	b	Rus.	7	7	7
18	Windsor.....	l	---	---	---	b July	b	Ont.	---	---	---

SECTION IV.—BLACKBERRIES.

ABBREVIATIONS FOR THIS SECTION.

Color.
b. black.
w. white.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*	*?	*?	*	---	Not fully hardy, but productive and fine.
2	*	*	*	*	---	Strong grower and prolific. Well worthy of extended trial.
3	*	*	*	*	*	Brunton has been disseminated under this name. The genuine is claimed to be hardy, but does best with protection.
4	*	**	*	*	*	Plants hardy and fruit of good size.
5	*?	*?	*?	*?	---	A strong spreading grower. Productive in some localities.
6	*?	*?	*?	*?	*?	Too well known to need description. Sometimes rusts or mildews.
7	---	*	*	*	---	The largest, most productive and best.
8	*?	*	*?	*?	*?	Vigorous, hardy, productive.
9	**	**	**	**	**	Not large, but good. Very hardy and prolific.
10	*?	*?	*?	*?	*?	Bears heavily. Size rather small. Hardy. In Lenawee county equals Snyder for market.
11	*	*	*	*	*	Nearly as hardy as Snyder.
12	*?	*?	*?	*?	---	Nearly hardy; vigorous; productive.
13	*	*	*	*	---	Hardy, vigorous and prolific. Valuable in Lenawee county.
14	*	*	*	**	*	One of the largest. Lacks richness. Needs winter protection.

SECTION V.—CHERRIES.—HEART AND BIGARREAU.

ABBREVIATIONS FOR THIS SECTION.

Color. Class.
a. amber. cr. crimson. w. whitish. b. bigarreau.
b. black. d. dark. y. yellowish. h. heart.
br. bright. p. purplish.
c. carmine. r. red.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*	*	*	*	---	Vigorous, spreading, productive; but variable in quality.
2	**	**	**	**	**	Downing says: "Largest, most beautiful, and delicious of cherries." Often cracks and rots in wet seasons.
3	*	*	*	*	*	Excellent. Requires age before it will bear profusely.
4	*	*	*	*	---	Fine tree. Fruit much like Bigarreau in its general qualities.
5	*	*	*	*	*	Very old. Tree large and hardy. The abundant fruit is of fine quality.
6	**	**	**	**	**	A rapid, erect grower. Prolific. Fruit very large and showy, but not of the highest quality. Tree lacks hardness.
7	*	*	*	*	*	A seedling of the late Dr. Kirtland, of Cleveland, Ohio. Tree thrifty, spreading, productive.
8	**	**	*	**	---	One of the finest and most valuable late cherries. Of New England origin.
9	*	*	*	*	*	A moderate grower. One of the best of the very early cherries. Hardy for a Mazzard; but tender at the north.—[Parmelee.]
10	*	**	**	*	**	Originated in England in 1806. One of the best of its class and season.
11	**	**	**	**	**	Seedling of the late Dr. Kirtland. Every way desirable except for its liability to rot.
12	*	*	*	*	---	Seedling of the late Dr. Kirtland. Desirable for either dessert or market.
13	*?	*?	*?	*?	*?	A week earlier than Black Tartarian. Fine quality. Tree spreading.
14	*?	*?	*?	*?	*?	Supposed to be identical with Great Bigarreau and large Red Pool.
15	**	*	*	**	**	Very large and showy. Very firm. Most valued for the market.
16	**	*	*	**	**	Seedling of the late Dr. Kirtland. Very highly esteemed. A good bearer
17	†	†	†	†	†	A very promising sweet cherry.
18	†	†	†	†	†	Promising, but less hardy than is claimed.

SECTION VI.—CHERRIES—DUKE AND MORELLO.

ABBREVIATIONS FOR THIS SECTION.

Form.
co. compressed.
h. heart shaped.
ob. oblate.
ov. oval.
r. roundish.

Color.
a. amber.
b. bright.
d. dark.
p. purplish.
r. red.
y. yellow.

Number.	Names.	Descriptions.							Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Class.	Origin.	Dessert.	Cooking.	Market.
1	Brusseler Braune.....	l	r h	p r	v g	m July.	m	Rus.	7	9	1
2	Carnation.....	l	r	y w r	v g	m July.	-----	Fr.?	6	6	
3	Choisy.....	m	r ob	y a r	b	m June.	d	Fr.	10	6	
4	Early Richmond, <i>Kentish</i>	m	r ob	d r	v g	m June.	m	Eur.	5	9	10
5	Eugenie.....	l	r ob	d r	v g	m June.	d	Eur.	7	6	
6	Late Duke.....	l	ob h	d r	v g	m July.	d	Eur.	7	7	6
7	Late <i>Kentish</i> , <i>Common Red</i>	m	r ob	d r	v g	m July.	m	Eur.	4	8	8
8	Leib.....	m	r	r	s	July.	m	Eur.	-----	-----	-----
9	Louis Phillippe.....	l	r	d p r	v g	e July	m	Fr.	4	10	10
10	Magnifique.....	l	ob	r	v g	e July.	d	Fr.	6	8	
11	May Duke.....	l	r ob h	d r	b	m June.	d	Eur.	8	8	1
12	Montmorency ordinaire.....	l	r ob	d r	v g	e June.	m	Eur.	5	8	10
13	Montreuil.....	l	-----	r	g	-----	d	Eur.	-----	-----	-----
14	Morello.....	l	ob h	d r	v g	m July.	m	Eur.	5	10	1
15	Ostheim.....	m	r ov	d r	g	e July.	m	Rus.	5	8	
16	Reine Hortense.....	v l	r ov	d r	v g	m July.	d	Fr.	6	7	
17	Royal Duke.....	l	r ob	d r	v g	e June.	d	Eur.	6	7	
18	Shadow Morello.....	l	r h	p r	v g	m July.	m	Rus.	7	9	1
19	Wragg.....	m	r ob	r	g	m July.	m	Iowa.	5	7	

SECTION VII.—CURRANTS.

ABBREVIATIONS FOR THIS SECTION.

Form of bunch.
l. long.
m. medium.
s. short.

Color.
b. black.
br. bright.
d. dark.
r. red.
w. white.

Number.	Names.	Descriptions.						Use and value. Scale 1 to 10.		
		Size.	Form of bunch.	Color.	Flavor.	Season.	Origin.	Dessert.	Cooking.	Market.
1	Cherry.....	l	s	r	v a	m July.	Eur.	7	8	8
2	Fay.....	l	l	r	a	July.	N. Y.	7	8	7
3	Lee.....	l	s	b	a m	m July.	Eur.	1	8	9
4	London Red.....	m	m	r	a	m July.	Eur.	7	8	8
5	Naples.....	l	s	b	a m	m July.	Eur.	1	8	9
6	North Star.....	m	s	r	a	m July.	Minn.	-----	-----	-----
7	Prince Albert.....	m	m	d r	a	e July.	Eur.	8	8	8
8	Red Dutch.....	m	m	d r	a	b m July.	Eur.	9	10	9
9	Versailleise.....	l	s	d r	a	m July.	Fr.	7	8	8
10	Victoria.....	m	l	b r r	v a	e July.	Eng.	6	7	9
11	White Dutch.....	m	m	w	a	b m July.	Eur.	10	7	6
12	White Grape.....	m	m	w	a	b m July.	Eur.	9	8	8

SECTION VI.—CHERRIES—DUKE AND MORELLO.

ABBREVIATIONS FOR THIS SECTION.

Class.

d. duke.
m. morello.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	†	†	†	*	†	Very hardy. Large fruit of fine quality. Productive.
2	*?	*?	*?	*?	*?	A beautiful, large, light-red cherry, highly esteemed where known.
3	*	*	*	*	*	One of the best dessert cherries of any class, but a thin bearer. When on sandy soil, or top-grafted on Morello, proves productive.
4	**	**	**	**	**	One of the most profitable market cherries. Not as good as several of the Dukes.
5	*?	*?	*?	*?	*?	A new French cherry. An early and prolific bearer.
6	*	*	*	*	*	Valuable for dessert or cooking. Ripening after May Duke.
7	*	**	**	*	*	Emphatically the pie cherry of this country.
8	---	---	---	---	---	A newly introduced variety. Claimed to withstand the winters of the northwest. Unproductive.
9	*	*	*	*	*	A strong, healthy tree of the Morello class. Productive, valuable.
10	*	*	*	*	*	Moderate grower, productive. Good for dessert when fully ripe.
11	**	**	**	**	**	The type of its class. One of the oldest and most popular cherries.
12	*	*	*	*	*	Larger than Early Richmond and ten days later.
13	*	*	*	*	*	Well worth planting.
14	*	*	*	*	*	Highly esteemed for preserving and other culinary purposes.
15	---	---	---	---	---	---
16	*	*	*	*	*	A healthy and beautiful tree. A popular and desirable variety.
17	*	*	*	*	*	An upright, compact grower. Later than May Duke.
18	†	†	†	†	†	Fruit like Brusseler, but the tree is smaller.
19	†	†	†	†	†	Very hardy. Bears young.

SECTION VII.—CURRANTS.

ABBREVIATIONS FOR THIS SECTION.

Flavor.

a. acid.
m. musky.
v. very.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*	*	*	*	*	Its size renders it popular. One of the most acid of currants.
2	*?	*?	*?	*?	*?	Long bunch. Large berry. Seldom productive. Injured by borers.
3	†	†	†	†	†	Possibly a slight improvement upon Black Naples.
4	*	*	*	*	*	A promising market sort.
5	*	*	*	*	*	Good culinary fruit. Much sought in the market by foreigners.
6	*	**	**	*	*	One of the most valuable of the new sorts.
7	**	**	**	**	**	Little injured by the worms. Good as a late sort.
8	**	**	**	**	**	Has no superior except in size. The best for all purposes.
9	*	*	*	*	*	By some believed to be superior to the Cherry currant. Others think them identical.
10	**	**	**	**	**	Valuable, rather late sort. Nearly exempt from the attacks of the borer.
11	**	**	**	**	**	Better in quality, and in the habit of the plant than White Grape.
12	*	**	*	*	**	Plant of spreading, straggling growth. Larger, but not as good as White Dutch.

SECTION VIII.—GOOSEBERRIES.

ABBREVIATIONS FOR THIS SECTION.

Form of berry.

ov. oval.
r. round.

Number.	Names.	Descriptions.					Use and value. Scale 1 to 10			
		Size.	Form of berry.	Color.	Quality.	Season.	Origin.	Dessert.	Cooking.	Market.
1	Champion.....	mtol	r ov	w g	v v r r	Aug.	-----			
2	Columbus.....	l	r ov	y	v v r r	Aug.	Am.	8	8	8
3	Downing.....	m l	r ov	w g	v v r r	Aug.	N. Y.	8	10	10
4	Houghton.....	s	r	b	v v r r r r	Aug.	Mass.	6	9	8
5	Industry.....	l	r ov	r	v v r r r r	Aug.	Eur.	9	9	7
6	Keepsake.....	e l	r ov	y g	v v r r r r	Aug.	Eur.	9	9	8
7	Lancashire Lad.....	l	r ov	r	v v r r r r	Aug.	Eur.	9	9	8
8	Pale Red.....	s	r ov	r	v v r r r r	Aug.	Am.	6	8	8
9	Pearl.....	m	r ov	y g	v v r r r r	Aug.	Can.	9	10	9
10	Red Jacket.....	l	r ov	r	v v r r r r	Aug.	Am.	8	8	8
11	Smith.....	l	ov	g	v v r r r r	Aug.	Ver.	10	10	9
12	Triumph.....	l	r ov	y	v v g	Aug.	Am.	8	8	8

SECTION VIII.—GOOSEBERRIES.

ABBREVIATIONS FOR THIS SECTION.

Color.

b. brown.
g. green.r. red.
w. whitish.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	†	†	†	†	†	Very productive. Worthy of trial.
2	†	†	†	†	†	A productive and promising sort. Needs spraying.
3	**	**	**	**	**	Fine, stocky, vigorous plant; quite thorny. The highest quality of fruit.
4	*	*	*	*	*	Slender and straggling, but vigorous, prolific and excellent.
5	*?	*?	*?	*?	*?	Subject to mildew. Unproductive unless sprayed.
6	†	†	†	†	†	A promising European variety.
7	†	†	†	†	†	A little later than Industry, and less subject to mildew. Promising.
8	*	*	*	*	*	An old sort of slender but upright growth.
9	*	*	*	*	*	Although small, its productiveness makes it valuable.
10	†	†	†	†	†	With spraying the plants are healthy and productive.
11	*	*	*	*	*	Some doubt as to the vigor of the plant. An excellent variety.
12	*?	*?	*?	*?	*?	A large attractive sort. Valuable only with spraying.

SECTION IX.—GRAPES.—NATIVE.

ABBREVIATIONS FOR THIS SECTION.

Bunch.

Form.

Berry.

b. broad.
c. compact.
l. long.

o. open or loose.
s. short.

sh. shouldered.
v. very.

r. round.
o. oblong.
ov. ovate or oval.

Number.	Names.	Descriptions.								Use and value. Scaled to 10.		
		Size.		Form.		Color.	Quality.	Season.	Origin.	Dessert.	Cooking.	Market.
		Bunch.	Berry.	Bunch.	Berry.							
1	Adirondac	l	l	c sh	r	p b	v g	b Sept.	N. Y.	8	---	4
2	Agawam, <i>Rog. 15</i>	l	l	c sh	r	d r	v g	m Sept.	h Mass.	7	---	7
3	Aminia, <i>Rog. 39</i>	l	l	c sh	r	b	v g	m Sept.	h Mass.	8	---	7
4	Barry	l	l	s b c	r	b	v g	m Sept.	h Mass.	7	---	9
5	Brighton	m	l	c sh	r	r	v g	m Sept.	W. N. Y.	10	---	9
6	Catawba	m	l	sh o	r	r	v g	Oct.	Md.	9	---	6
7	Champion, <i>Talman</i>	m	l	s c sh	r	b	g	b Sept.	Am.	4	---	4
8	Clinton	m	s	c sb	r	b	g	Oct.	N. Y.	3	---	3
9	Concord	l	m l	c sh	r	b	v g	m Sept.	Mass.	7	---	10
10	Cottage	l	l	l	r	b	g	b Sept.	Mass.	6	---	5
11	Delaware	s	s	c sh	r	l r	b	m Sept.	N. J.?	10	---	9
12	Diamond	l	l	l sh	r	w	v g	m Sept.	N. Y.	9	---	6
13	Diana	l	l	c l	r	r l	v g	e Sept.	Mass.	6	---	6
14	Eaton	v l	v l	l sh	r	b	g	m Sept.	Mass.	4	---	8
15	Empire State	l	m	sh	r o v	w	v g	m Sept.	N. Y.	8	---	6
16	Eumelan	l	m	c sh	r	p b	v g	m Sept.	N. Y.	9	---	2
17	Goethe	m	l	o v	r	y g	v g	e Sept.	Mass.	8	---	3
18	Hartford	l	l	c sh	r	b	g	b Sept.	Conn.	4	---	6
19	Hayes	m	m	s b	r	y w	v g	Sept.	Mass.	8	---	6
20	Herbert, <i>Rog. 44</i>	l	l	l	r	b	v g	m Sept.	h Mass.	8	---	7
21	Iona	l	l	o ch	r o	r	b	m Sept.	N. Y.	10	---	6
22	Isabella	l	l	c sh	o	b	v g	e Sept.	S. Car.	6	---	3
23	Ives	m	m	c sh	r o	b	g	m Sept.	Ohio.	4	---	8
24	Janesville	s	m	s c	r	b	g	m Sept.	Am.	4	---	8
25	Jessica	m s	m s	---	r	y g	b	b Sept.	Ont.	9	---	7
26	Jewel	s	s	s	r	b	v g	b Sept.	Kans.	8	---	7
27	Lady	m	l	l c	r	y g	b	m Sept.	Ohio.	10	---	7
28	Lady Washington	v l	m	sh c	r	y	g	e Sept.	N. Y.	7	---	3
29	Lindley, <i>Rog. 9</i>	m	m	l c	r	r	v g	m Sept.	h Mass.	7	---	8
30	Martha	m	l	sh o	r	y g	g	m Sept.	Mo.	4	---	6
31	Massasoit, <i>Rog. 3</i>	m	l	s sh	r	r	g	m Sept.	h Mass.	7	---	7
32	Merrimac, <i>Rog. 19</i>	l	l	s b c	r	b	g	m Sept.	h Mass.	6	---	6
33	Michigan	m	m	l	r	g w	v g	m Sept.	Mich.	6	---	---
34	Mills	l	l	l	r	b	v g	e Sept.	N. Y.	8	---	8
35	Moore Early	l	l	c sh	r	b	v g	b Sept.	Mass.	6	---	8
36	Moyer	s	s	c sh	r	w	v g	b Sept.	Ont.	8	---	7
37	Niagara	l	m	c sh	r	g y w	v g	m Sept.	N. Y.	8	---	10
38	Pocklington	l	l	l sh	r	y	v g	e Sept.	N. Y.	7	---	6
39	Requa, <i>Rog. 28</i>	l	l	s o	r	r	r	m Sept.	h Mass.	7	---	7
40	Salem, <i>Rog. 53</i>	l	l	s b c	r	d r	g	e Sept.	h Mass.	7	---	8
41	Telegraph, <i>Christine</i>	l	l	c	r	b	g	m Sept.	Penn.	5	---	7
42	Ulster	l	l	sh	r	r	b	m Sept.	N. Y.	9	---	9
43	Vergennes	m	l	o s	r	r	v g	b Sept.	Ver.	7	---	7
44	Victor	s	s	c sh	r	b	v g	b Sept.	Kan.	8	---	7
45	Wilder, <i>Rog. 4</i>	l	l	c sh	r	b	v g	m Sept.	h Mass.	7	---	8
46	Winchell	m	m	sh	r	w	b	b m Sept.	Ver.	10	---	10
47	Woodruff	s b	l	sh	r	r	v g	m Sept.	Mich.	6	---	7
48	Worden	l	l	c sh	r	b	v g	m Sept.	N. Y.	8	---	10
49	Wyoming	s	m	c	m	b r	v g	m Sept.	N. Y.	4	---	6

SECTION IX.—GRAPES.—NATIVE.

ABBREVIATIONS FOR THIS SECTION.

Color.
 a. amber. l. light. r. reddish.
 b. black. li. lilac. w. whitish.
 d. dark. p. purple. y. yellowish.
 g. greenish.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*	*	*	*	*	Subject to mildew of the foliage. Rarely successful.
2	*	*	*	*	*	Keeps well after gathering.
3	*	*	**	**	*	Very well esteemed by those who have fruited it. Excellent keeper.
4	*?	*	*?	*	*	One of Rogers' very numerous hybrids. Inclined to mildew.
5	**	**	**	*	*	One fourth foreign. Highly satisfactory. Needs pollenizing.
6	*?		*?	*?		It is yet one of the best in localities where the season is long enough to ripen it. Good two years out of three at the south.
7						Very early, vigorous and productive, but its poor quality condemns it.
8						Is seldom good or even passable till ripened by frost. Fruit best on high, warm, gravelly soils.
9	**	**	**	**	**	Here, as elsewhere, this is the "grape for the million," since it can take care of itself.
10	*?	*?	**	*?		Seedling from Concord, by E. W. Bull. Far from satisfactory.
11	**	**	**	**	**	Slow grower. Fully as productive as Concord when well established. Fruit sometimes falls from dropping of the leaves.
12	*	*	*	*		Vigorous, healthy, promising as a variety for amateurs.
13	*?	*?	*	*		Rather foxy, with a thick, tough skin. One of the best keepers. A thin bearer on strong soils. Better on dry, warm soils.
14	*?	*?	*?	*?		Very large in both bunch and berry—market.
15	*	*	*	*		Promises well for both dessert and market.
16	*?	*?	*?	*?		A good dessert grape. May in some localities do for market. It seems to lack constitution.
17			*?	*?		Rather late for even southern Michigan.
18		*?		*?		Still prominent as one of the hardiest and most productive for early market; but very liable to drop its berries. Generally discarded.
19	*	*	*	*	*	Vigorous, hardy. Of fine quality. Valuable for amateurs.
20		*?	*?	*?		Another of the Massachusetts hybrids, of fair quality.
21		*?	*?	*?		Generally esteemed as the finest of our natives. The vine seems to lack constitution, and is not generally successful.
22			*?	*?		An old favorite. Still popular where it is sure to ripen. Is not generally successful.
23		*?	*?	*?		Valued for hardiness, vigor and productiveness. A good wine grape.
24	*?	*?	*?	*?	*	Hardy and vigorous. Ripens with Concord.
25		*?	*?	*?		Vine hardy, productive. Not satisfactory in some localities.
26	†	†	*?	*?		Promising early dessert grape.
27	*	*	*	*	*	Seedling of Concord, and as hardy and healthy; but not as vigorous and productive. Quality superior.
28						Valuable in locations where it will ripen. Ripens with Isabella.
29	*	*	*	**	*	A vigorous and productive vine. But little grown in this State. Worthy.
30	*?	*?	*?	*?	*?	Much sought for on account of its color. Very sweet but too foxy.
31	*	*	*	*	*?	Moderately vigorous and productive; like most of the hybrids, liable to mildew.
32	*	*	*	*	*	Vigorous and prolific. Much like Wilder in quality and season.
33	†	†	†	†	†	Worthy of trial.
34	*?	*?	*?	*?		A good dessert grape. May prove profitable.
35	*	**	*	*	**	Vigorous grower. Excellent; especially for the north.
36	*?	*?	*?	*?	*?	Much like Delaware, but less sprightly in flavor.
37	**	**	**	**	*	A promising white, market grape. Very vigorous, healthy and productive.
38	*	*	*	*	*	Hardy, beautiful. Rather late.
39	*?	*?	*?	*?		Promising here, but requires further trial.
40	*	**	**	**	*	The largest, most attractive and popular of the Rogers hybrids. Vigorous, productive. Bunches often imperfect. Mildews.
41	*?	*?	*?	*?	*	Hardy and vigorous. Ripening with Hartford and similar in quality.
42	*	*	*	*	*	Hardy, productive. Promises superior excellence.
43	*	*	*	*	*?	Hardy. Ripens with Concord. Not of high quality.
44	*	*	*?	*?	*	A promising very early dessert variety.
45	*	*	*	*	*?	One of the finest and most popular of the Rogers hybrids. Will do for market.
46	**	**	**	**	**	The finest of the early white grapes. Green Mountain is identical with it.
47	*?	*?	*?	*?	*?	Hardy, vigorous. A market grape only.
48	*	**	**	**	**	A week earlier than Concord and better in quality. Very desirable.
49						Showy, but not desirable.

SECTION X.—PEACHES.

ABBREVIATIONS FOR THIS SECTION.

Form.		Color.			Flowers.	Glands.
c. compressed.	ov. oval.	b. bright.	p. purple.	l. large.	g. globose.	
d. depressed.	r. round.	c. crimson.	r. red.	s. small.	o. obscure.	
o. oblong.		d. dark.	w. white.		r. reniform.	
		g. green.	y. yellow.		s. serrate.	
		o. orange.				

Number.	Names.	Descriptions.									Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Flowers.	Glands.	Adhesion.	Season.	Origin.	Dessert.	Cooking.	Market.
1	Alberge	m	r	ypr	g	s	g	f	e Aug.	Fr.	6	---	8
2	Alexander	m	r	gwr	vg	l	g	cf	e July.	Ill.	7	---	9
3	Amsden	m	r	gwr	vg	l	g	cf	e July.	Mo.	7	---	9
4	Barnard	ml	r	ydr	vg	ro	g	f	b Sept.	Am.	7	7	9
5	Beer Smock	ml	ov	yr	vg	s	r	f	m Oct.	Am.	6	9	9
6	Chill	m	ov c	ydr	g	l	r	f	e Sept.	N. Y.	6	8	9
7	Conkling	me	rov	yr	vg	s	r	f	m Sept.	---	9	---	8
8	Coolidge	l	r	wc	vg	s	g	f	m Aug.	Mass.	9	---	7
9	Corner	l	o	yr	vg	s	g	---	e Sept.	Mich.	---	---	---
10	Crawford, Early	l	o	yr	vg	s	g	f	e Aug.	N. J.	9	10	9
11	Crawford, Late	vl	r	ydr	vg	s	g	f	e Sept.	N. J.	8	10	9
12	Crosby	m	r	ry	g	s	r	f	m Sept.	Mass.	8	8	9
13	Druid Hill	l	r	gwr	b	s	r	f	e Sept.	Md.	10	---	7
14	Dumont	l	r	d yr	g	s	g	r	m Sept.	Mich.	8	7	8
15	Early Michigan	e	l	wr	vg	s	rg	f	e Aug.	Mich.	2	8	10
16	Early Newington free	l	rc	ywr	b	s	g	f	e Aug.	Am.	10	---	7
17	Elberta	l	ro	ry	vg	s	g	r	b Sept.	Am.	8	8	9
18	Engle (Mammoth)	l	ro	yr	vg	s	g	f	m Sept.	Mich.	8	9	9
19	Foster	l	rd	dor	vg	s	g	f	e Aug.	Mass.	8	8	9
20	George the Fourth	m	r	yodr	b	s	go	f	e Aug.	N. Y.	10	---	5
21	Gold Drop	ml	rov	by	vg	l	r	f	e Sept.	Mich?	7	9	10
22	Grosse Mignonne	l	rd	gypr	b	l	g	f	e Aug.	Eur.	10	9	6
23	Hale	m	r	gwr	vg	l	g	fc	m Aug.	Ohio.	10	---	9
24	Heath Cling	l	ov	ywr b	vg	s	r	c	b Oct.	Md.	9	9	7
25	Jacques	l	rc	d yr	vg	s	r	f	m Sept.	Mass.	7	9	9
26	Kalamazoo	l	ro	by	vg	s	r	f	e Sept.	Mich.	8	9	10
27	Keyport	l	r	wc	vg	s	r	f	b Oct.	Am.	6	7	8
28	Lady Palmerston	ml	r	ydr	vg	s	r	f	e Sept.	Eng.	6	7	7
29	Large Early York	ml	r	wr	vg	s	g	f	b Sept.	Am.	8	8	8
30	Louise	m	rc	wpr	vg	s	r	f	b Aug.	Eng.	8	---	8
31	Lemon Cling	l	o	yr	vg	s	r	c	e Sept.	Am.	6	7	8
32	Lewis	l	ro	wr	vg	s	r	f	e Aug.	Mich.	8	8	9
33	Moore	l	rov	wr	vg	s	g	f	b m Sept.	Mass.	8	6	8
34	Morris White	m	ov	gwp	vg	s	r	f	e Sept.	Am.	7	10	8
35	Mountain Rose	l	rc	wr	vg	s	g	f	b Sept.	N. J.	9	8	8
36	Oldmixon Cling	l	rov	ywr	b	s	g	c	m Sept.	Am.	8	9	7
37	Oldmixon Free	l	rov	ywr	vg	s	g	f	m Sept.	Am.	8	8	9
38	Red Cheek	l	rov	ybr	g	s	g	f	m Sept.	Am.	7	---	8
39	Richmond	ml	rc	ydr	vg	s	g	f	b Sept.	N. Y.	8	9	9
40	Rivers	l	r	ypink	b	l	r	f	m Aug.	Eng.	9	9	8
41	St. John <i>Crane's Early.</i>	l	rc	yr	vg	s	r	f	b Sept.	Am.	8	---	9
42	Salway	l	rd	ycr	vg	s	r	f	b Oct.	Eng.	8	9	8
43	Smock Free	l	ov c	oydr	vg	s	r	f	Oct.	N. J.	6	9	9
44	Snow Orange	ml	r	bydr	vg	s	r	f	b Sept.	Mich.	6	7	9
45	Steadley	l	rov	wr	vg	s	r	f	b Oct.	Am.	9	9	---
46	Stump	vl	ro	wbr	vg	s	g	f	e Sept.	N. J.	8	8	8
47	Susquehanna	vl	r	yr	vg	s	r	f	m Sept.	Penn.	7	9	6
48	Switzerland	m	r	yr	vg	---	---	f	e July.	Ga.	---	---	---
49	Triumph	m	r	ywr	vg	s	g	f	m Sept.	---	8	7	9
50	Troth	m	r	wbr	vg	s	g	f	e Aug.	N. J.	5	---	7
51	Wager	m	ov	y	vg	s	g	f	b Sept.	N. Y.	8	9	8
52	Yellow Rareripec	l	ro	oyr	vg	s	g	f	b Sept.	Am.	8	8	8

SECTION X.—PEACHES.

Since the peach is generally used in its fresh state, or for canning, which is only a mode of preserving it in a nearly fresh condition, we have generally omitted to give values in the column headed "cooking." Throughout Central Michigan, except in favorable localities, occasional severe winters prove fatal to the fruit buds of the peach, and sometimes, even to the trees. These facts can not be properly expressed in the starring, and hence are disregarded.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lakeshore.	Northern lakeshore.	
1	*?	?	*?	*?	*?	This is one of the earliest of yellow-fleshed peaches, and only desirable for that reason.
2	*	*	*	*	*	A partial cling, much like its supposed parent, Hale, and two or three weeks earlier. Profitable for market.
3	*	*	*	*	*	Almost exactly like Alexander in tree, fruit, and season of ripening.
4	*	**	**	**	**	When thoroughly thinned, size is large; often overbears, becoming small.
5	*	*	*	*	*	Preferred to Smock by some growers.
6	*	*	*	*	*	Hardy; a good bearer and a profitable late variety on young trees. Lacks quality. Losing reputation.
7	†	†	†	†	†	Worthy of planting.
8	*	*	*	*	*	One of the best pale-fleshed, early market peaches.
9	†	†	†	*	†	Grown and valued for market in Allegan county.
10	**	**	**	**	*	Very popular with both market men and fruitgrowers. Much used for canning. Others often sell under this name. Bloom tender, hence uncertain.
11	*	**	**	*	*	Lacks productiveness on light soils, and on young trees. Many place it first for profit.
12	†	†	†	†	†	A hardy and promising market sort. High colored but only of medium size.
13	*	*	*	*	*	An excellent late pale-fleshed peach that should be better known.
14	*	*	*	*	*	Tree and buds hardy. Shipping qualities best.
15	**	**	**	**	**	Worthy of extensive planting.
16	*?	*?	*?	*?	*?	Sometimes clings slightly. A fine amateur peach. Fruit large and beautiful.
17	**	**	**	**	**	Well worthy of trial. Hardy, productive and brings the highest price.
18	*	*	*	*	*	Promising. Hardier than Crawford.
19	*	**	*	*	*	A good market peach, but almost identical in season with Early Crawford.
20	*?	*?	*?	*?	*?	One of the best for home use. Too tender and delicate for market.
21	**	**	**	**	**	Probably an unrecognized old variety. Largely grown for market.
22	*?	*?	*?	*?	*?	The true variety is one of the most delicious of peaches.
23	**	**	**	**	**	A fine peach and a vigorous tree. Sometimes rots before maturity. By many highly esteemed for market. A semi-cling.
24	----	----	*?	*?	----	One of the finest clings, but needs a long season in this latitude. Very profitable when it ripens fully.
25	*	**	**	**	*	Profitable, but not of high quality.
26	**	**	**	**	*	Highly praised by all who have fruited it. Brunson is much like it.
27	----	----	*?	*?	----	Does not mature perfectly in unfavorable seasons. Surer on light soils.
28	----	----	*?	*?	----	Originated by the late Thomas Rivers. Promising.
29	*	**	*	*	*	Has not become generally popular in Michigan.
30	*?	*?	*?	*?	*?	Ripens in advance of Hale or Beatrice. Very high quality. At Lawton said to sell well.
31	*?	*?	*?	*?	*?	The largest and best of the yellow-fleshed clings. Does not sell well.
32	**	**	**	**	**	An Allegan county seedling. A very valuable market peach.
33	----	----	*	*	----	A beautiful and promising peach. May be valuable for market if productive
34	*	*	*	*	*	valued for preserving and canning on account of its color.
35	*	*	**	**	**	A valuable market variety. Highly prized where fully proved.
36	*?	*?	*?	*?	*?	Where a cling is desired, this is one of the finest of its season.
37	*	*	**	**	**	A very old variety, which still holds a high position as a market peach.
38	*	*	*	*	*	An old sort. The parent of Crawford's Early and Late.
39	*	*	*	*	*	A new and valuable variety. A few days later than Early Crawford, and less acid.
40	*	*	*	*	*	An excellent very early sort; lacks color. Fruit large and beautiful. At Lawton very profitable.
41	*	**	**	**	*	Identical with Flaters St. John, Crane's Early and Yellow St. John.
42	----	----	*	*	----	Will only ripen at the south with certainty; fails in unfavorable seasons.
43	*	**	**	**	*	One of the latest profitable market peaches in Southern Michigan. Valuable
44	*	*	*	*?	*?	Similar to Barnard; bright in color, and slightly later. Must be thinned to insure good size.
45	----	----	*	*	----	Excellent for either dessert or canning.
46	*	*	*	*	*	A large and beautiful market peach of fair quality. Very profitable.
47	*	*	*	*	*	A promising market sort.
48	*?	*?	*?	*?	*?	A large, beautiful and fine, rather late peach. Lacks productiveness.
49	†	†	†	†	†	A seedling of Early Michigan and a promising early yellow variety.
50	*	*	*	*	*	An early and productive white fleshed peach of only medium quality.
51	*?	*?	*?	*?	*?	Said to be the most profitable variety in Mason county.
52	*	*	*	*	*	The genuine is a fine early peach.

SECTION XI.—PEARS.

ABBREVIATIONS FOR THIS SECTION.

Form.

a. acute.
d. depressede. elongated.
o. oblong.ob. obtuse.
obo. obovate.ov. oval or ovate.
p. pyriform.r. roundish.
t. turbinate.

Number.	Names.	Descriptions.					Use and value. Scale 1 to 10.			
		Size.	Form.	Color.	Quality.	Season.	Origin.	Dessert.	Cooking.	Market.
1	Angouleme, <i>Duchess</i>	v l	o obo	g y ru	vg	Oct.	Fr.	7	9	10
2	Anjou.....	l	ob p	g r u c b	vg	Nov.	Fr.	9	9	10
3	Bartlett.....	l	o ob p	y r u r	vrg	Sept.	Eng.	8	10	10
4	Bloodgood.....	m	t obo	y ru	vg	Aug.	N. Y.	9	6	4
5	Bosc.....	l	p	d y r r	b	Oct.	Bel.	9	8	9
6	Boussock.....	l	obo p	d y ru	vg	Sept. Oct.	Bel.	7	7	8
7	Brandywine.....	m	e ob p	y g r u r	vg	b Sept.	Penn.	7	7	5
8	Buffum.....	m	ob obo	d y r	vg	Sept.	R. I.	6	7	6
9	Clairgeau.....	l	p	y o c ru	g	Oct. Nov.	Fr.	6	7	9
10	Clapp Favorite.....	l	obo ob p	l c y	vg	Sept.	Mass.	8	8	9
11	Columbia.....	l	o obo	g y o	g	Nov. Jan.	N. Y.	7	8	6
12	Comice, <i>Doyenne du Comice</i>	l	r ob p	y c ru	b	Oct. Nov.	Fr.	9	7	7
13	Dana Hovey.....	s	obo ob p	g y ru	b	Nov. Jan.	Mass.	9	5	5
14	Dearborn.....	s	r p	l y	vg	Aug.	Mass.	7	5	3
15	Diel.....	l	obo ob p	y o r u b	vg	Sept. Dec.	Bel.	6	8	7
16	Easter Beurree.....	l	r obo ob	y g r u b	vg	Jan. Mar.	Eur.	6	8	3
17	Emile d' Heyst.....	l	o obo p	y o ru	b	Nov. Dec.	Bel.	10	8	8
18	Flemish Beauty.....	l	obo ob p	y r u r b	vg	Sept.	Bel.	7	7	8
19	Giffard.....	m	p	g y r	vg	e Aug.	Fr.	10	6	6
20	Glout Morceau.....	l	obo ob p	g y b	b	Dec.	Fr.	7	7	5
21	Guy Doyenne.....	m	o obo	l ru	b	Oct.	Eur.	9	8	8
22	Hardy.....	l	obo ob p	g r u b	vg	Sept. Oct.	-----	7	7	8
23	Howell.....	l	r p	l y ru	vg	Oct.	Conn.	8	7	8
24	Idaho.....	l	r ob obo	g y ru	vg	Oct.	Idaho.	8	8	-----
25	Josephine of Malines.....	m	r ob p	g y ru	vg	Jan. Feb.	Bel.	6	7	8
26	Kieffer.....	l	r ob p	y r	vg	Nov.	Am.	3	8	9
27	Lawrence.....	m	obo ob p	y ru	vg	Dec.	N. Y.	6	8	8
28	Louise Bonne (of Jersey).....	l	op	g b r	vg	Sept. Oct.	Fr.	7	9	8
29	Lucrative <i>Frandante d' Automne</i>	m	obo ob p	y g ru	b	Sept.	Fr.	10	8	8
30	Madeline.....	m	obo p	y g b	vg	July.	Fr.	8	8	7
31	Manning Elizabeth.....	s	obo ob p	l y r	vg	Aug. Sept.	Bel.	9	7	6
32	Mount Vernon.....	m l	r ob p	ru y b r	vg	Nov. Dec.	Mass.	8	8	6
33	Napoleon.....	l	ob p	y g	vg	Sept.	Bel.	5	6	6
34	Onondaga.....	l	obo ob p	y ru	vg	Oct. Nov.	Conn.	7	8	9
35	Osband (Summer).....	s	r ov ob op	y r ru	vg	Aug.	N. Y.	7	7	8
36	Paradise (of Autumn).....	l	o obo a p	y ru	vg	Sept. Oct.	Bel.	8	6	4
37	Pound.....	l	p	y g b	y	Dec. Mar.	Eur.?	1	8	7
38	Reeder.....	s m	r ob p	y ru	b	Nov.	N. Y.	9	8	5
39	Rostiezer.....	s	obo ob p	y g r b	b	Aug.	Eur.	9	5	6
40	Seckel.....	s	obo	y b r ru	b	Oct.	Penn.	10	-----	7
41	Sheldon.....	m	r ob obo	g y ru c	vg	Oct.	N. Y.	8	8	9
42	Souvenir du Congres.....	l	p r	y g	vg	Sept.	Fr.	7	8	9
43	Sterling.....	m	r ov p	y ru c	vg	Sept.	N. Y.	7	5	9
44	Stevens.....	l	r	y	vg	Sept.	N. Y.	9	6	6
45	Summer Doyenne <i>Doyenne d' Ete</i>	s	r obo p	y r	vg	July.	Bel.	9	5	8
46	Superfin.....	m	r p	y c ru	vg	Oct.	Fr.	7	8	8
47	Tyson.....	m s	a p	y ru c	b	Aug. Sept.	Penn.	9	6	7
48	Urbaniste.....	m l	obo	y ru	vg	Oct. Nov.	Fl.	9	7	6
49	Vermont Beauty.....	m	obo p	y r	vg	Sept.	Vt.	9	7	8
50	Viear.....	l	l p	y b	b	Nov. Jan.	Fr.	4	8	6
51	White Doyenne.....	m l	obo	y r	b	Oct.	Fr.	10	7	7
52	Wildor (<i>Early</i>).....	s	obo	y b r ru	vg	Sept.	Am.	9	7	-----
53	Winter Nellis.....	m	r obo	y g ru	b	Dec. Jan.	Fl.	9	7	7

SECTION XI.—PEARS.

ABBREVIATIONS FOR THIS SECTION.

Color.

b. brown.
c. crimson.

d. dark.
g. green.

l. light.
o. orange.

r. red.
ru. russet.

y. yellow.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	**	**	**	**	*	When neglected proves unproductive. Profitable under good treatment, and on dwarf stocks. At north loses quality.
2	**	**	**	**	*	One of the best late autumn pears, whether for market or home use.
3	**	**	**	**	**	The leading market sort. Too musky to suit some tastes.
4	*?	*?	*?	*?	*?	No garden should be without this. Fruit best when house ripened.
5	**	**	**	**	**	Fruit fair and even in size. Will bear to be planted for market.
6	**	**	**	**	**	Popular as a market pear. Also a good amateur fruit.
7	*?	*?	*?	*?	*?	But little disseminated. A good early amateur pear.
8	**	**	*	*	*	Popular on account of the health, vigor, and productiveness of the tree. Market.
9	*	*	*	**	*	Soon becomes dry and insipid, after ripening. A showy market pear.
10	**	**	**	*	*	A strong grower. Fine large fruit. Inclined to rot at the core. A good market pear if gathered early.
11	*?	*?	---	---	---	Liable to drop or be blown from the tree prematurely.
12	*?	*?	*?	*?	---	New; gives promise of value.
13	*?	*?	*?	*?	*?	One of the few winter pears of high quality.
14	---	---	---	---	---	Well known and esteemed, but too small to become very popular.
15	*?	*?	*?	*?	*?	Fruit apt to be astringent on young trees. Should be house-ripened.
16	---	---	---	---	---	In a warm exposure and favorable season, this will be found satisfactory. Better south.
17	*?	*?	*?	*?	*?	Little disseminated. A fruit of high quality.
18	*	**	*	*	*	Vigorous tree. Large, showy fruit, which decays soon at the center. Drops, and sometimes scabs or spots.
19	*?	*?	*?	*?	*?	Fruit requires to be gathered before maturity—decays rapidly.
20	---	---	---	---	---	On old trees, when well ripened, this is an excellent pear.
21	*?	*?	*?	*?	*?	Excellent for the amateur.
22	**	**	**	**	**	Not as well known as it should be.
23	**	**	**	**	**	Quite freely planted and generally esteemed.
24	†	†	†	†	†	Promising. Much like Sheldon.
25	*	*	*	*	*	Not as freely planted as it should be.
26	*	*	*	*	*	In this climate only valued for market and canning and that only at the south, but when well grown it is a very profitable variety.
27	*	*	*	*	*	Tree healthy and vigorous. Should be grown on dry, warm soils.
28	*	*	**	*	*	A good market pear. Should always be grown as a dwarf.
29	*	*	*	*	*	An excellent and profitable old variety.
30	*	*	*	*	---	The earliest pear of good quality. Sometimes slightly astringent.
31	*	*	*	*	*	One of the most desirable amateur pears of its season.
32	*	*	*	*	*	A promising late autumn and early winter pear. Bears young.
33	*	*	*	*	*	An early and abundant bearer. Lacks quality.
34	**	**	**	**	*	A good, constant bearer of large, showy fruit of fair quality in most seasons.
35	*	*	*	*	*	Tree vigorous, productive. Fruit sufficiently good for the market.
36	---	---	---	---	---	Fruit somewhat like Beurre Bosc, but more variable.
37	---	---	---	---	---	Chiefly valued for the kitchen. Trees, strong, healthy.
38	*?	*?	*?	*?	---	A new York seedling from Winter Nells.
39	*?	*?	*?	*?	*?	Tree vigorous and productive. Fruit excellent, but unattractive in appearance.
40	*	**	**	**	**	The standard of high quality among pears. Tree forms a beautiful pyramid. Profitable when buyers come to know it.
41	*	*	*	*	*	A hardy, productive tree; and a good fruit for general purposes; not attractive in appearance.
42	*	*	*	*	*	Very large and beautiful. Variable in size. Not of high quality.
43	*	*	*	*	*	Both tree and fruit well adapted for the market.
44	*?	*?	*?	*?	*?	An excellent and fine looking pear, but soon decays at the core.
45	**	**	**	**	**	The best and most satisfactory very early pear. Valued for early market.
46	*	*	*	*	*	A fine pear. Sometimes a little too acid. Productive.
47	*	*	*	*	*	A beautiful tree. Fruit grown to some extent for the market. A tardy bearer.
48	---	---	---	---	---	Too tardy a bearer. Is being abandoned; probably for this reason.
49	†	†	†	†	†	Quite productive; fruit handsome and of good quality.
50	*?	*?	*?	*?	*?	Tree vigorous and productive; its greatest recommendation for this climate.
51	---	---	---	---	---	This old favorite is seldom successful in this State as it scabs and cracks.
52	†	†	†	†	†	Much like Seckel but earlier.
53	*	*	*	*	*	The fruit if well grown and ripened, is scarcely inferior to the Seckel. The tree must not be allowed to overbear.

SECTION XII.—PLUMS.

In the grading and starrng of plums no reference is made to the prevalence of the curculio in the district; nor yet to the tendency of the variety to the premature rotting of the fruit or loss of foliage.

ABBREVIATIONS FOR THIS SECTION.

Form.

d. depressed. n. necked.	ob. oblate. ov. oval.	l. long. o. oblong.	obo. obovate. r. roundish.
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Number.	Names.	Descriptions.							Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Adhesion.	Season.	Origin.	Desert.	Cooking.	Market.
1	Abundance.....	m	r ov	r	g	f c	Aug.	Jap.	8	8	9
2	Bavay.....	l	r d	g y	g	f	Oct.	Bel.	9	9	9
3	Black Diamond.....	v l	o v	b	g	f	e Sept.	-----	8	10	10
4	Bleeker.....	m	r ov	y	v g	f c	e Aug.	N. Y.	8	7	8
5	Botan.....	m	r ov	y	g	f c	Aug.	Jap.	8	8	8
6	Bradshaw.....	l	ov obo n	r p	g	c f	e Aug.	Am.	7	10	10
7	Burbank.....	m	r	p	g	-----	Aug.	Cal.	-----	-----	-----
8	Canada Egg [local name].....	l	-----	-----	g	c	m Aug.	Ont.	7	7	8
9	Coe Golden Drop.....	l	ov n	y	v g	c	e Sept.	Eng.	8	8	9
10	Copper.....	m s	ov n	c b	g	f c	e Sept.	Eur.	4	8	9
11	Damson.....	s	ov	b p	g	c	Sept.	Am.	3	10	7
12	Duane Purple.....	v l	o ov	r p	g	f c	m Aug.	N. Y.	7	4	6
13	Felleberg, <i>Italian</i>	m	ov	b	g	f	b Oct.	Eur.	6	8	8
14	Field.....	l	r ov n	r p	g	c f	m Aug.	Am.	7	10	10
15	General Hand.....	v l	r ov	g	g	f	Sept.	Penn.?	6	7	7
16	German Prune.....	l	lov	b p	g	f	Sept.	Eur.	6	9	9
17	Gueli.....	l	lov	r p	g	f c	Sept.	N. Y.	6	10	10
18	Grand Duke.....	l	r ov	p	v g	f c	Sept.	Eur.	8	10	10
19	Green Gage.....	s	r	g y r	b	f	e Aug.	Eur.	10	8	5
20	Huling.....	v l	r ov	g y	g	f	e Aug.	Penn.	8	7	5
21	Imperial.....	-----	-----	g y	b	c	b Sept.	N. Y.	9	9	8
22	Jefferson.....	l	ov	y p r	b	f	b Sept.	N. Y.	10	9	9
23	Kingston.....	v l	ov	b	v g	f	Sept.	Eur.	8	10	10
24	Lawrence Favorite.....	l	r ob	y g	b	f	m Aug.	N. Y.	10	-----	-----
25	Lombard.....	m	r ov d	r p	g	c	b Sept.	N. Y.	6	10	9
26	McLaughlin.....	l	r ob d	y r	b	c	e Aug.	Me.	10	6	7
27	Miner.....	m	l r	p r	g	c	b Oct.	Penn.	6	6	4?
28	Orleans.....	m	r	r p	g	f	e Aug.	Eur.	-----	-----	-----
29	Peach.....	v l	r d	b r	g	f	b Aug.	Eur.	6	7	7
30	Pond, <i>Fonthill</i>	v l	ov n	y r	g	c	m Sept.	Eng.	6	7	10
31	Prince Englebert.....	l	ob ov	p br	v g	f	b Sept.	Bel.	8	8	10
32	Prince Yellow.....	m l	ov	y	v g	f	b Aug.	N. Y.	8	8	9
33	Quackenboss.....	l	r	p	g	f c	Sept.	N. Y.	6	7	9
34	Red Magnum Bonum.....	l	ov	r	g	f	b Sept.	Eur.	5	7	7
35	Shropshire Damson.....	s	ov	d p	g	f c	e Sept.	Eng.	4	10	8
36	Smith Orleans.....	l	ov	r p	v g	c	e Aug.	N. Y.	8	8	8
37	Stanton.....	m	r ov	d p	g	f c	e Sept.	Eur.	8	8	9
38	Washington.....	v l	r ov	g y c	v g	f	e Aug.	N. Y.	8	10	7
39	Wild Goose.....	m	r ov	p	g	c	e July.	Tenn.?	6	5	-----
40	Yellow Egg.....	v	ov	y	g	c	e Aug.	-----	6	8	7

SECTION XII.—PLUMS.

ABBREVIATIONS FOR THIS SECTION.

Color.

b. blue,
c. copper

br. brownish.
y. yellow.

p. purple.

r. red.
g. green.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*	*	*	**	*	Very productive. The hardiest of its class.
2	*	*	*	*	*	Nearly or quite as fine as Green Gage. Tree a better grower.
3	**	**	**	**	**	A large handsome late plum, productive and of good quality.
4	*	*	**	*	*	Hardy. A good regular bearer. Shoots downy.
5	*?	*?	*?	*?	*	Similar to A bundance except in color.
6	**	**	**	**	**	Grows and bears well. A superior market variety.
7	†	†	†	†	†	A promising Japanese variety.
8	†	*?	---	*?	*?	Probably an unrecognized old variety. Very hardy and productive in Mason county.
9	**	**	**	**	**	Beautiful. Excellent. Perhaps may not ripen with certainty at the extreme north.
10	*?	*?	*?	*?	*?	Valued for market and cooking.
11	*	*	**	**	*	A slow grower. Productive. Valued for preserves. Nearly free from rot.
12	*	*	*	*	*	Too soft and uneven in size for market.
13	*	*	*	*	*	Tree vigorous, spreading, branches smooth.
14	†	†	†	†	†	Promising, as it ripens ten days earlier than Bradshaw.
15	---	---	---	*?	*?	Does not succeed well in Mason county.
16	*	*	*	**	**	Valued for drying and preserving.
17	**	**	**	**	**	One of the most valuable of the new plums.
18	**	**	**	**	**	New. Wherever tested it has made an excellent showing.
19	*	*	*	*	*?	The standard of quality among plums. Tree a slow grower.
20	*?	*?	---	*?	*?	Tree very vigorous, upright, moderate bearer.
21	*	*	*	*	*	Productive, excellent; shoots dark, downy, vigorous.
22	*?	*?	*?	*?	*?	A slow grower, good bearer. Profitable at the north.
23	**	**	**	**	**	An early bearer. Very productive. Valuable.
24	*?	*?	*?	*?	*?	A seedling from Green Gage. Productive.
25	**	*	**	*	**	Tree vigorous, hardy and productive. The leading market variety. Tree not satisfactory at St. Joseph. Too much grown to be profitable.
26	*	*	*	*	*	Nearly or quite equal to Green Gage. Hardy, vigorous, productive.
27	*?	*?	*?	*?	*?	Comparatively unproductive if standing alone. Very hardy. One of the best of the Americana species.
28	*?	---	*?	*?	*?	Vigorous. Branches gray and very downy.
29	---	---	---	*?	*?	Tree upright, vigorous. A moderate bearer.
30	**	**	**	**	**	Productive, vigorous. Branches smooth, grayish. Dorr's Favorite of Oceana county is identical with this.
31	*	**	*	**	**	Tree a great bearer. Valuable for market.
32	*?	*?	*?	*?	*?	An old favorite. Hardy, productive.
33	**	**	*	*	**	A rapid, upright grower; productive.
34	*	*	*	*	**	The genuine has slender, smooth shoots.
35	*	**	*	**	**	Better than Damson for market.
36	*	*	*	*	*	One of the most vigorous; shoots glossy, reddish purple; very productive.
37	†	†	†	†	†	Worthy of trial as a late sort.
38	*	**	*	*	**	One of the largest and most beautiful, but inclined to rot on the tree. Free from rot at the north.
39	*?	*?	*?	*?	*?	An uncertain bearer at the north; probably from imperfect pollenization. A variety of the <i>chicasa</i> species.
40	*	*	*	*	**	A fine market variety, but rots in some seasons at the south, and as far north as Mason county.

SECTION XIII.—QUINCES.

ABBREVIATIONS FOR THIS SECTION.

Form.

ob. obtuse. p. pyriform. r. round.

Number.	Names.	Descriptions.						Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Origin.	Dessert.	Cooking.	Market.
1	Champion.....	v l	ob p	y	v g	Nov.	Am.	---	8	8
2	Meech.....	l	r ob p	y	v r	Oct. Nov.	N. J.	---	10	10
3	Orange, <i>Apple</i>	l	r p	y	v g	Oct. Nov.	Eur.	---	10	10
4	Rea.....	m	r ob p	y	g	Oct.	N. Y.	---	10	10

SECTION XIV.—RASPBERRIES.—RUBUS OCCIDENTALIS AND SUPPOSED HYBRIDS
ROOTING FROM THE TIPS OF THE BRANCHES.

ABBREVIATIONS FOR THIS SECTION.

Form.

c. conical. ob. obtuse. r. roundish.

Number.	Names.	Description.						Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Season.	Origin.	Dessert.	Cooking.	Market.
1	Carman.....	m	r	b	v g	m July.	Conn.	7	7	6
2	Caroline.....	m	r	o y	v r r	m July.	N. Y.	9	9	6
3	Columbian, (<i>Red</i>).....	v l	r	p r	v r r	e July.	N. Y.	8	10	10
4	Conrath.....	m l	r	b	v g	b July.	Mich.	8	9	9
5	Cromwell.....	m	r	b	v g	b July.	Conn.	8	7	8
6	Doolittle, <i>American Black</i>	s	r	b	v g	m July.	N. Y.	5	7	7
7	Earhart.....	m	r	b	v g	July, Oct.	Conn.	9	7	4
8	Gregg.....	v l	r	b	v r	m July.	Ind.	7	9	10
9	Hilborn.....	v l	r	b	v g	m July.	Ont.	9	9	10
10	Hopkins.....	m l	r	b	v g	m July.	Kan.	6	6	8
11	Johnston Sweet.....	m	r	b	v g	b July.	N. Y.	4	4	7
12	Kansas.....	m l	r	b	v g	b July.	Kan.	8	9	9
13	Mammoth Cluster, <i>McCormick</i>	m l	ob c	b	v g	July, Aug.	Am.	6	9	9
14	Muskingum (<i>Hybrid?</i>).....	l	r	p r	v g	m July.	Ohio.	8	9	8
15	Nemaha.....	l	r ob	b	v g	m July.	Neb.	5	5	9
16	Ohio.....	l	r	b	v g	m e July.	Ohio.	8	9	9
17	Older.....	m l	r	b	v g	m July.	Iowa.	8	9	9
18	Palmer.....	m	r	b	v g	b July.	Ohio.	8	9	9
19	Shaffer (<i>Hybrid?</i>).....	l	r	p r	v g	m e July.	N. Y.	8	10	8
20	Souhegan, <i>Tyler</i>	m	r	b	g	b m July.	N. H.	8	9	8

SECTION XIII.—QUINCES.

ABBREVIATIONS FOR THIS SECTION.

Color.
y. yellow.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*	*	*	*	*	An early and prolific bearer. Very downy. Very late. Said to be very productive and of superior quality. Well known and universally approved. Larger than the Orange and equally good. Tree thrifty.
2	**	**	**	**	---	
3	**	**	**	**	*	
4	*	*	*	*	*	

SECTION XIV.—RASPBERRIES.—RUBUS OCCIDENTALIS AND SUPPOSED HYBRIDS
ROOTING FROM THE TIPS OF THE BRANCHES.

ABBREVIATIONS FOR THIS SECTION.

Color.
b. black. p. purple. r. red. y. yellow.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	---	---	---	---	---	Of medium quality only.
2	*?	*?	*?	*?	*?	Supposed hybrid between <i>Idæus</i> and <i>Occidentalis</i> . A family berry.
3	**	**	**	**	**	Hardier, healthier and fruit firmer and of better quality than Shaffer.
4	*	**	**	*	*	One of the most promising of the new early sorts.
5	*	*	*	*	*	A new and promising early variety.
6	*	*	*	*	*	Desirable when great hardiness is required. A little better than Souhegan.
7	*?	*?	*?	*?	*?	Fruits on new canes till killed by frosts.
8	**	**	**	**	**	Larger than McCormick. Is now the leading Black Cap.
9	**	**	**	*	*	Nearly as large as Gregg; better in flavor, and clear black in color.
10	*	*	*	*	*	A very popular sort.
11	*?	*?	*?	*?	*?	Very seedy. For this reason profitable for drying.
12	*	*	**	**	*	One of the largest medium early black caps.
13	*	*	*	**	---	Plant very vigorous with stout thorns. Very productive. Formerly very popular.
14	*	*	*	*	*	Apparently an improvement upon Shaffer. Fruit firmer.
15	*	**	*	**	**	Much like Gregg, and claimed to be hardier.
16	*	*	*	*	*	A profitable market variety; good for drying. Very hardy.
17	*	*	*	*	*	A promising new variety.
18	**	**	**	**	**	The best early Black Cap.
19	*	**	*	*	*	Enormous grower and bearer. Fruits ripen in succession. Superior for canning.
20	*	*	*	*	*	A good, early, market Black Cap.

SECTION XV.—RASPBERRIES.—*RUBUS IDÆUS* AND *STRIGOSUS*, INCREASING BY SUCKERS OR SPROUTS.

ABBREVIATIONS FOR THIS SECTION.

Color.

b. bright. c. crimson. o. orange. p. purplish. r. red. s. scarlet.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*?	*?	*?	*?	*?	Its beauty, size, color and firmness are strongly in its favor.
2	---	---	---	---	---	An early red. Does not set well. Not fully hardy away from lake protection. Unproductive on southern lake shore.
3	*?	*?	*?	*?	*?	Not self-fertile. Must be planted with other varieties.
4	**	**	**	**	**	Very firm, productive and hardy. Has come to be the leading market variety of its class.
5	*	*	*	*	*	Like Cuthbert, except in the color of the fruit.
6	*	*	*	*	*	Hardy. Lacks vigor and productiveness.
7	**	**	**	**	**	Plants hardy and productive. Fruit large, firm and of good quality.
8	*	*	*	*	*	Fairly vigorous and productive. Is being extensively planted.
9	*?	*?	*?	*?	*?	Must have winter protection. Unequaled for amateur purposes; but very tender.
10	*?	*?	*?	*?	*?	Highly esteemed where fully tested. Canes not always healthy.
11	*?	*?	*?	*?	*?	Berries good, even size. Profitable, but its color is too dark.
12	*?	*?	*?	*?	*?	Very hardy, productive. Suckers profusely. Lacks firmness. Old but still valuable.

SECTION XVI.—STRAWBERRIES.

ABBREVIATIONS FOR THIS SECTION.

Sex of blossoms.

b. bi-sexual or perfect.
p. pistillate.

Texture.

f. firm.
m. medium.
s. soft.

Season.

The date (in June) of the ripening of the first perfect specimen is given in each case as the most convenient mode of indicating the relative season.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
1	*?	*?	*?	*?	*?	Hybrid of the late Chas. Arnold. A fairly productive early sort for home use.
2	*	*	**	**	*	Plant healthy and vigorous—Market.
3	*?	*?	*?	*?	*?	Does not always ripen well at the tip. Valuable no longer.
4	**	**	**	**	**	One of the best varieties for market.
5	*	*	*	*	*	Vigorous plant. Very prolific, but lacks quality and firmness. Foliage healthy.
6	*	*	*	*	*	Excellent as a berry for home use, or for near marketing.
7	**	**	**	**	**	One of the largest and most productive late sorts.
8	†	†	†	†	†	Promising for market.
9	*?	*?	*?	*?	*?	Bears profusely. Will not remain long on the list.

SECTION XVI.—STRAWBERRIES.—CONTINUED.

Number.	Names.	Descriptions.								Use and value. Scale 1 to 10.		
		Size.	Form.	Color.	Quality.	Sex.	Texture.	Season.	Origin.	Dessert.	Cooking.	Market.
10	Gandy.....	v l	obc	bc	v g	b	m	19 June.	N. J.	9	---	9
11	Gem (Nehring).....	v l	c	br	g	p	f	17 "	Ill.	8	---	9
12	Greenville.....	l	rc	bc	g	p	m	17 "	Ohio.	8	---	9
13	Haverland.....	l	oc	bc	v g	p	f	11 "	Ohio.	9	---	9
14	Jersey Queen.....	m	obc	c	g	p	m	15 "	N. J.	7	---	7
15	Jessie.....	v l	obc	bc	v g	b	f	17 "	Wis.	9	---	7
16	Manchester.....	l	cr	c	g	p	f	26 "	N. J.	8	---	8
17	Marshall.....	v l	oc c	bg	g	b	m	18 "	Mass.	8	---	7
18	Miner.....	l	rc	c	g	b	s	14 "	N. J.	8	7	7
19	Mt. Vernon.....	l	cr	bs	g	b	m	24 "	"	7	8	8
20	Mrs. Cleveland.....	l		bc		p		15 "	Ohio.	6	---	9
21	Parker Earle.....	m l	lc	c	v	b	f	15 "	Texas.	8	---	10
22	Pearl.....	m	oc	c	b	b	m	16 "	N. J.	9	---	9
23	Saunders.....	l	c	c	v g	b	f	12 "	Ont.	7	---	9
24	Sharpless, Ontario.....	v l	oc c	br	v g	b	m	14 "	Penn.	8	---	8
25	Shuckless.....											
26	Timbrell.....											
27	Triomphe (de Gand).....	l	rob c	br	b	b	f	12 "	Bel.	10	---	5
28	Vick.....	m	rc	c	v g	b	f	17 "	Mo.	8	---	7
29	Warfield No. 2.....	m	c	dr	v g	p	f	12 "	Ill.	9	---	10
30	Wilson.....	l	rc	dc	g	b	f	11 "	N. Y.	6	9	9

SUMMARY OF REJECTED VARIETIES.

LIST OF APPLES.

(The dates, 1893, etc., show the year the variety was dropped.)

Names.	Year.	Names.	Year.
American Beauty.....	1893	Drap d'or.....	1893
American Pippin.....	1893	Early Long Stem.....	1888
Anglo American.....	1893	Evening Party.....	1890
Aunt Hannah.....	1890	Flower (of Genesee).....	1893
Autumn Pearmain.....	1879	Fort Miami.....	1888
Autumn Sweet Swaar.....	1893	Foundling.....	1893
Bars.....	1890	Fourth of July.....	1893
Beauty of Kent.....	1893	Gabriel (adies Blush).....	1888
Belle et Bonne.....	1893	Garden (Comstock's).....	1893
Bently Sweet.....	1893	Green's Choice.....	1888
Better than Good.....	1883	Hall.....	1883
Bottle Greening.....	1893	Harvest Red Streak.....	1890
Burr Sweet.....	1893	Herefordshire.....	1893
Bush.....	1879	Hog Island Sweet.....	1893
Cabashea.....	1895	Holland Pippin.....	1893
Canada Remette.....	1895	Hollow Crown.....	1893
Chronical.....	1890	Horse.....	1893
Craig's August.....	1888	Housum's Red.....	1888
Cumberland Spice.....	1893	Hunt Russett.....	1893
Daniel.....	1890	Hulburt.....	1893
Detroit Black.....	1893	Indiana Favorite.....	1893
Detroit Red.....	1893		

SECTION XVI.—STRAWBERRIES.—CONTINUED.

Number.	Locality.					Remarks.
	East.	Center.	South.	Southern lake shore.	Northern lake shore.	
10	*	**	**	*	*	Desirable late market berry. Good dessert fruit.
11	*?	*?	*?	*?	*?	Plant exceedingly vigorous and productive. Fruit very large and showy.
12	†	†	†	†	†	Very promising for local market.
13	*	**	**	*	**	Plant vigorous. Proves valuable in many places. Stem weak. Fruit soft.
14	*?	*?	*?	*?	*?	Variable. Sometimes productive, but is little grown.
15	*?	*?	*?	*?	*?	Highly praised when produced, but not generally productive.
16	*?	*	*?	*?	*	Has been a leading market berry.
17	†	†	†	†	†	A highly praised new sort. Requires strong land and good care!
18	*?	*?	*?	*?	*?	Vigorous and productive in some sections.
19	*?	*?	*?	*?	*?	Very highly praised as a market variety by some growers. Quite late.
20	*	*	*	*	*	An Ohio seedling of fine promise.
21	**	**	**	**	**	Of good size and quality. Hardy. Very productive. Valuable if given high cultivation.
22	*?	*?	*?	*?	*?	A promising fruit of high quality. Subject to rust.
23	*	*	*	*	*	A promising market variety, originated by John Little of Ontario.
24	*	*	*	*	*	Is attracting much attention. Lacks firmness for distant marketing. does best in hills.
25	*?	*?	*?	*?	*?	Introduced with high encomiums, but of little value.
26	*?	*?	*?	*?	*?	Generally a failure.
27	*	*	*	*	*	Flavor rich, excellent. Must be grown in hills to warrant success for market.
28	*?	*?	*?	*?	*?	In plant and fruit much like Captain Jack.
29	**	**	**	**	**	A vigorous plant. Very productive. Best for market.
30	*	*	*	*	*	Colors early. Only good when fully ripe. Later pickings fail in size. Formerly the leading market berry with the mass of growers.

SUMMARY OF REJECTED VARIETIES.—CONTINUED.

APPLES.—Continued.

Names.	Year.	Names.	Year.
Jefferson County.....	1893	Progress.....	1888
Jewett Best.....	1893	Pumpkin Russet.....	1888
Jewett Red.....	1893	Quarrenden.....	1893
Kaighn.....	1893	Rebecca.....	1893
Klaproth.....	1893	Richardson.....	1893
Lacker.....	1888	River.....	1888
Lancaster Greening.....	1879	Rose Red (Autumn Red).....	1893
Ledge Sweet.....	1893	Scarlet Pearmain.....	1893
London.....	1893	Sine Qua Non.....	1893
Macomber.....	1893	Slingerland.....	1893
Marston.....	1893	Somerset (N. Y.).....	1888
May (Seek-no further).....	1893	Spiced Sweet.....	1890
McAfee.....	1893	Stillman.....	1893
Melt-in-the-mouth.....	1888	Striped Belleflower.....	1893
Milan.....	1895	Summer Pippin.....	1893
Newark Pippin.....	1888	Summer Rambo, Rambour.....	1895
Nick-a-jack.....	1893	Summer Rambo (Mich.).....	1893
Northern Sweet.....	1888	Summer Bellflower (N. Y.).....	1888
Orange Pippin.....	1893	Summer Greening.....	1888
Ortley (White Detroit).....	1893	Sweet Baldwin.....	1888
Pittsburgh.....	1893	Sweet and Sour.....	1890
Pound Royal (Winter).....	1893	Sweet Rambo.....	1893

SUMMARY OF REJECTED VARIETIES.—CONTINUED.

Names.	Year.	Names.	Year.
<i>APPLES.—Continued.</i>			
Sweet Vandevere.....	1893	Red Heart.....	1888
Sweet Winesap.....	1883	Red Jacket.....	1893
Table (Greening).....	1888	Rivers Amber.....	1883
Toole Indian.....	1893	Rumsey's Late Morello.....	1885
Twin.....	1888	Sparhawk.....	1893
Walpole.....	1893	Tradescant.....	1888
Washington Royal.....	1893	Transparent Guigne.....	1888
Water.....	1893	Tecumseh.....	1893
Wealthys Favorite.....	1888	White French.....	1888
Western Spy.....	1890	White Tartarian.....	1888
Wetherell Sweet.....	1893	Wilkinson.....	1888
White Doctor.....	1893		
White Juneating.....	1890	CURRANTS.	
White Spanish Reinette.....	1893	Anger's (Fertile de Anger).....	1893
Winter Pippin (Mich.).....	1893	Hative.....	1893
Winter Paradise.....	1893		
Winthrop Greening.....	1893	GRAPES.	
<i>APPLES—CRABS.</i>		Allen.....	1888
Briers Sweet.....	1888	Alvey.....	1888
Byers.....	1893	Anna.....	1888
Red Siberian.....	1893	Belvidere.....	1888
Soulard.....	1893	Black Hawk.....	1888
<i>APRICOTS.</i>		Canada (Arnold's 16).....	1893
Hemskirk.....	1893	Cornucopia (Arnold's 2).....	1888
Red Masculine.....	1893	Creveling.....	1893
St. Ambrose.....	1893	Croton.....	1888
Turkey.....	1893	Elvira.....	1893
<i>BLACKBERRIES.</i>		Essex (Rogers' 41).....	1893
Barnard.....	1893	Gaertner.....	1893
Brunton.....	1890	Israella.....	1893
Dorchester.....	1893	Kalamazoo.....	1893
Wachusett.....	1893	Mottled.....	1888
White Seedling.....	1881	Neff (Kenka).....	1888
<i>DEWBERRIES.</i>		Norton's Virginia.....	1888
Bartle.....	1893	Othello (Arnold's 1st).....	1888
Mammoth.....	1893	Perkins.....	1893
<i>CHERRIES.</i>		Peter Wylie.....	1888
Arch Duke.....	1893	Rebecca.....	1888
Buttner's Yellow.....	1888	Roger's 20.....	1888
Bauman May.....	1893	Senasqua.....	1888
Belle D'Orleans.....	1893	Taylor's Bullitt.....	1885
Brant.....	1893	To Kalon.....	1888
Burr.....	1893	Union Village.....	1888
Champagne.....	1893	York Madeira.....	1888
China Bigarreau.....	1888	Walter.....	1893
Delicate.....	1893		
Doctor.....	1893	NECTARINES.	
Donna Maria.....	1893	Red Roman.....	1893
Downton.....	1893	Stanwick.....	1893
Duchesse de Palluau.....	1885	Victoria.....	1893
Early Amber.....	1888		
Jeffry.....	1893	PEARS.	
Large White Bigarreau.....	1888	Ananas d' Eté.....	1893
Logan.....	1893	Brignais Des Nonnes.....	1893
Manning Mottled.....	1893	Dix.....	1893
Merveille de Septembre.....	1888	Dunmore.....	1879
Ohio.....	1893	Epine Dumas.....	1893
Oseola.....	1893	Gris D'Hiver Nouveau.....	1893
Plumstone.....	1893	Goubalt.....	1890
Pontiac.....	1893	Jalousie de Fontenay Vendée.....	1879
Powhattan.....	1893	Kirtland.....	1893
		Langelier.....	1893
		Le Conte.....	1893
		Oswego.....	1893
		St. Ghislain.....	1898
		Washington.....	1893
		Windsor.....	1893

SUMMARY OF REJECTED VARIETIES.—CONTINUED.

Names.	Year.	Names.	Year.
PLUMS.			
Admiral.....	1879	Oblong.....	1893
Columbia.....	1893	President.....	1893
Dorr's Favorite.....	1881	Pullen.....	1893
Imperial Blue.....	1893	Reeves late.....	1893
Kirke.....	1893	Ruding Late.....	1893
Monroe.....	1893	Silver Medal.....	1893
		Snow.....	1893
QUINCES.			
Angers.....	1893	Temple Late.....	1893
Portugal.....	1893	Thurber.....	1888
		Tippecanoe.....	1893
RED RASPBERRIES.			
Arnold's Red.....	1888	Van Zandt.....	1893
Bristol.....	1888	Variegated.....	1893
Clarke.....	1895	Windoos.....	1881
Delaware.....	1888	Wheeler Early.....	1893
Early Andrews.....	1883		
Fastolf (Naomi).....	1888	STRAWBERRIES.	
Franconia.....	1893	Afrique.....	1883
Herstine.....	1895	Agriculturalist.....	1888
Highland Hardy.....	1888	America.....	1893
Hornet.....	1888	Arnold's Pride.....	1893
Kirtland.....	1882	Atlantic.....	1893
Montclair.....	1883	Belmont.....	1895
Naomi.....	1895	Black Defiance.....	1893
Philadelphia.....	1895	Boston Pine.....	1885
Red Antwerp.....	1888	Boyden (Seth Boyden).....	1893
Saunders.....	1893	Bright Ida.....	1893
Superb.....	1888	Burgess.....	1885
Thwack.....	1883	Burr Oak.....	1883
Winant.....	1883	Burr's New Pine.....	1888
		Captain Jack.....	1895
BLACK CAP.		Caroline.....	1883
American White.....	1893	Centennial Favorite.....	1883
Beebe.....	1893	Champion.....	1893
Canada.....	1888	Chas. Downing.....	1895
Davison's Thornless.....	1888	Cheney.....	1893
Ellisdale.....	1888	Cinderella.....	1883
Florence.....	1893	Cornelia.....	1890
Ganargua.....	1885	Cowing.....	1893
Golden Thornless.....	1893	Crimson Cluster.....	1893
Lum's Everbearing.....	1883	Crimson Cone.....	1883
Miami.....	1893	Damaak Beauty.....	1883
New Rochelle.....	1893	Daniel Boone.....	1890
Norwood.....	1888	Dr. Warder.....	1883
Ontario.....	1893	Downer.....	1893
Purple Cane.....	1888	Duchess.....	1888
Seneca.....	1888	Duncan.....	1893
Wetherbee.....	1888	Early Canada.....	1893
		Early Hudson.....	1883
PEACHES.		Emperor.....	1883
Atlanta.....	1893	Essex Beauty.....	1883
Beatrice.....	1893	Excelsior.....	1885
Bergen.....	1893	Fillmore.....	1883
Briggs May.....	1893	Forest Rose.....	1885
Cole.....	1893	Fowler's Seedling.....	1883
Columbia.....	1893	French.....	1883
Coopers Mammoth.....	1883	Frontenac.....	1883
Delavan.....	1893	Gen. Sherman.....	1893
Downing.....	1893	Gipsev.....	1890
Early Admirable.....	1893	Glendale.....	1893
Early York.....	1893	Golden Defiance.....	1885
Haines.....	1893	Goldsmith.....	1890
Imperial.....	1893	Grace.....	1883
Large White Cling.....	1893	Great American.....	1888
Late Admirable.....	1893	Green Prolific.....	1888
Late Red Rareripe.....	1893	Hervey Davis.....	1888
Macon (Local).....	1893	Henderson.....	1893
Muscogee.....	1888	Hooker.....	1885
Nonpareil.....	1893	Hudson No. 10.....	1883
		Hovey.....	1888
		Ida.....	1883

SUMMARY OF REJECTED VARIETIES.—CONCLUDED.

STRAWBERRIES.—Continued.

Names.	Year.	Names.	Year.
Indiana.....	1893	Ohio.....	1893
Iowa Prolific.....	1883	Phelps (Old Iron Clad).....	1893
Jewell.....	1893	Photo (Martha).....	1888
Jucunda.....	1893	Pioneer.....	1888
Kentucky.....	1895	Pres. Lincoln.....	1883
Kirkwood.....	1885	Pres. Wilder.....	1883
Kissany.....	1883	Romeyn.....	1883
Large Ey. Scarlet.....	1883	Russell.....	1885
Lennig's White.....	1883	Russell's Advance.....	1890
Longfellow.....	1890	Scarlet Globe.....	1883
Longworths Prolific.....	1883	Seedling Eliza.....	1883
Luckhurst.....	1883	Seneca Chief.....	1885
Maggie.....	1893	Seneca Queen.....	1893
Major McMahon.....	1883	Springdale.....	1885
Marvin.....	1885	Shirts.....	1890
Matilda.....	1885	Star of the West.....	1883
May King.....	1893	Star.....	1883
Metcalf.....	1885	Sterling.....	1883
Miami.....	1893	Sucker State.....	1893
Michigan.....	1885	Summit.....	1893
Minnesota.....	1885	Victoria (Golden Queen).....	1888
Monarch of the West.....	1888	Warren.....	1890
Napoleon III.....	1883	Walden.....	1883
New Dominion.....	1893	Wilding Seedling.....	1883
New Jersey Scarlet.....	1888	Windsor Chief.....	1881
Nicanor.....	1890	Woodruff.....	1893

CONSTITUTION AND BY-LAWS.

ARTICLE I.—NAME, TERRITORY AND OBJECTS.

The name of the society shall be the Michigan State Horticultural Society, and its territory shall be the state of Michigan. Its objects shall be the development of an adequate appreciation of the peculiar adaptation of the soils and climate of the state to the pursuit of horticulture in all its branches; and the collection and dissemination of information bearing upon the theory and practice of the same, as well as upon the arts and sciences directly or indirectly associated therewith, or calculated to elevate or improve the practice thereof.

ARTICLE II.—OFFICERS AND MODE OF ELECTION.

The officers of the society shall be a president, a secretary, and a treasurer, together with an executive board of six members, aside from the president, secretary, and treasurer, who shall be *ex officio* members of the said board.

Said board shall designate one of its members as vice-president. The officers shall be elected by ballot.

The society may, at its discretion, elect an honorary president, whose term of office shall be for life, said office to be an honorary one, without duties, and established to express the sense of obligations which the society may feel to one of its members who may unselfishly give a lifetime of earnest effort to promote its interests, and to further the horticultural interests of this state.

ARTICLE III.—A QUORUM.

Four members of the executive board shall constitute a quorum for the transaction of business at any meeting of said board: *Provided*, That each of the members thereof shall have been notified, in the usual manner, of the time, place, and object of such meeting.

ARTICLE IV.—ANNUAL MEETING AND ELECTION OF OFFICERS.

The annual meeting of the society, for the election of officers specified in Article II, shall occur upon the first Wednesday of December in each year.

ARTICLE V.—TERMS OF OFFICE.

The officers specified in Article II shall hold their offices until the thirty-first day of December of the year for which they were elected, and thereafter until their successors shall have been elected, and shall have signified to the secretary their acceptance: *Provided*, That the terms of office of the six members of the executive board shall be so arranged that but two regular vacancies shall occur in each year.

ARTICLE VI.—ANNUAL AND LIFE MEMBERS.

Any person may become a member of the society for one year by paying to the treasurer the sum of one dollar; and the yearly term of all annual memberships shall expire on the thirty-first day of December of the year for which they were taken, but be regarded as continuous, except as may be provided by the by-laws. Any person may become a life member by the payment at any one time of the sum of ten dollars into the treasury of the society.

ARTICLE VII.—AMOUNT OR LIMIT OF PROPERTY.

The society may hold real and personal estate to an amount not exceeding twenty thousand dollars.

ARTICLE VIII.—BY-LAWS.

By-laws for the government of the society shall be framed, and when needful, amended by the executive board; but changes thereof may be at any time proposed by the society in general meeting.

ARTICLE IX.—AMENDMENTS.

This constitution may be amended at any regular meeting of the society by a vote, by ballot, of two-thirds of all the members present and voting: *Provided*, That notice of such proposed amendment, specifying its purport, shall have been given at the last previous regular meeting.

BY-LAWS OF THE MICHIGAN STATE HORTICULTURAL SOCIETY.

I.—THE PRESIDENT.

1st. The president shall be the executive officer of the society, and of the executive board; and it shall be his duty to see that the rules and regulations of the society, and of the executive board, are duly enforced and obeyed.

2d. He may, in his discretion, and in the lack of needful rules, during the recesses of the society and of the board, prescribe rules for the management of the interests or business of the society, such rules to continue in force till the next session of the executive board, and until, by its action, they shall have become no longer necessary.

3d. He shall act in conjunction with the secretary in the preparation of programmes or orders of business, for the sessions of the society; and in the devising of plans and processes for the maintenance of its interests.

4th. He shall have the best interests of the society at heart, and shall lead in forwarding any and all enterprises calculated to add to its permanency or to increase its usefulness, and establish it more firmly in the public confidence.

II.—VICE-PRESIDENT.

The vice-president shall perform the duties of the president in case of the absence or inability of that officer; and may be called upon by the president to assume the duties of the chair at any meeting of the society or executive board.

III.—THE SECRETARY.

1st. The secretary shall be the recording, corresponding, and accounting officer of the society, and he shall also be, jointly with the business committee, its financial and auditing officer.

2d. He shall incur no expenditure of a large or doubtful character except with the sanction of the executive board or of the business committee.

3d. He shall submit all bills or claims against the society to the business committee for approval, and indorsement to that effect, before drawing his order upon the treasurer for the payment of the same.

4th. He shall attend all meetings of the society, and of the executive board, and shall keep a faithful record of their proceedings.

5th. He shall sign all certificates of membership, and all diplomas and certificates of merit awarded by the society.

6th. He shall have charge of the society's books and papers, excepting only such as, by the advice or direction of the executive board, shall be placed in charge of the librarian, and he shall be responsible to the board for the safe keeping of the property placed in his charge.

7th. He shall be the custodian of the seal of the society, and shall have authority to affix the same to documents when needful.

8th. He shall seek by all suitable means to secure the fullest announcement of the meetings of the society in this state, as well as in adjacent states, when such shall be found desirable.

9th. He shall, so far as practicable, cause the transactions of the society, together with such valuable or interesting papers as shall be read at its sessions, to be properly published, and thus placed within reach of the state.

10th. It shall also be his duty, yearly, to prepare for publication the annual report of the society, together with such other matter as he shall deem proper—he being aided in the selection of such matter by an advisory committee of the executive board.

IV.—THE TREASURER.

1st. All the funds of the society shall be paid into the hands of the treasurer.

2d. He shall disburse the moneys of the society that shall come into his hands only upon the order of the secretary, countersigned by the president.

3d. He shall keep the moneys received by the society for life memberships as a distinct fund, and shall invest the same under the advice and direction of the executive board, applying only the interest accruing thereon to the purposes of the general fund.

4th. Immediately upon assuming his office, and before entering upon its duties, he shall execute to the society an official bond with sufficient sureties, conditioned for the safe keeping and disbursement of the moneys of the society, and for the proper discharge of the further duties of his office, in such sum as shall be specified by the executive board. Such bond shall receive the approval of the president and shall be deposited with the secretary.

5th. He shall, at the close of each year, report to the executive board the amount of money that shall have come into his hands during the year, the sources from which it has been derived, and the disposition made of the same.

V.—THE LIBRARIAN.

1st. The librarian shall have the custody of the library of the society. He shall be appointed by the executive board, and may be displaced at its pleasure.

2d. He shall act jointly with the secretary in the care and arrangement of the same, and in the reception, custody, and disposal of the volumes of the transactions annually supplied to the society by the state.

3d. He shall have the custody of the rooms assigned to the society at the state capitol, together with such books and other property as the society or the board shall direct to be deposited therein.

4th. He shall report annually, at the close of the year, to the executive board the amount and condition of the property in his hands.

VI.—THE EXECUTIVE BOARD.

1st. The executive board shall enact all rules and regulations for the management of the affairs of the society, determine the salaries of its officers, and assume the control and management of its exhibitions.

2d. It shall have power to displace any officer of the society for neglect of duty or abuse of position, and to fill all vacancies by appointment, to continue till the next annual election.

3d. The board shall hold four regular sessions during the year, to occur at the times and places for the regular meetings of the society.

4th. Other meetings may be called by the secretary under the advice or direction of the president, or of a majority of its members, at such times and places as may be deemed most convenient; but in all such cases each member must be notified of the time, place, and object of such meeting.

5th. It shall be the duty of the board to carefully guard the general interests of the society, to watch over its finances, and to provide for its necessities as they shall arise.

6th. All important measures shall be submitted to this board, but they may by the board be resubmitted to the society with recommendations.

7th. The board shall, at the annual meeting, submit through the secretary, in connection with the reports of officers, such further report upon the condition, interests, and prospects of the society as it shall judge necessary or expedient.

8th. Two members of the executive board are to be elected each year, to hold the office for three years, but if any such member shall absent himself from two or more consecutive meetings of the society and of the board, without reason satisfactory to the board, the said board may, in its discretion, consider the office vacant, and proceed to fill such vacancy by appointment, to continue to the next annual election.

VII.—THE BUSINESS COMMITTEE.

1st. It shall be the duty of the executive board, annually, upon entering upon the duties of the new year, to appoint from their own number three members who shall constitute a business committee for the year.

2d. All accounts or claims against the society, when presented to the secretary for payment, shall, before payment, receive the sanction and indorsement of the business committee.

3d. Such claims shall be submitted to this committee and approved in duplicate, one copy to remain with the secretary as his warrant for the payment of the same, and the other to be transmitted by him to the president, along with his order upon the treasurer, as his warrant for countersigning the same.

4th. It shall be the duty of the business committee, upon application of the secretary, during the recess of the executive board, to advise with him as to the expediency of making any contemplated but questionable expenditure for which occasion may arise during such recess.

VIII.—STANDING COMMITTEES.

1st. There shall be a standing committee on revision of the catalogue, to be composed of one member from each of the five districts into which the state is, for this purpose divided, with one member chosen from the state at large, who shall be the chairman of the committee.

2d. Each member of said committee (except the chairman) is empowered and expected to choose a sub-committee for his district, of which he shall be chairman.

3d. It shall be the duty of each sub-committee to collect and report, each year, to the general chairman, such facts respecting fruit culture in the district as shall promise to be of value in the revision of the catalogue.

4th. There shall be a standing committee on new fruits, to consist of a chairman, with as many associates as such chairman shall find it desirable to appoint.

5th. Such other standing committees may from time to time be appointed by the executive board as, in its discretion, it shall deem desirable or necessary.

6th. All standing committees are expected to report at the annual meeting in December, any information of value to the society or its members that may have come to their knowledge during the year, as well as any scientific theories, deductions, or facts that, in their opinion, may be useful in advancing the objects for which the society is laboring.

IX.—LIFE MEMBERSHIP FUND.

1st. All moneys coming into the treasury of the society in payment for life memberships shall constitute a perpetual fund, to be known as the life membership fund.

2d. The principal of this fund shall be invested by the treasurer under the advice and direction of the executive board.

3d. All interest accruing upon any portion of said fund shall constitute and become part of the fund of the society devoted to the payment of its ordinary expenses.

X.—MEETINGS OF THE SOCIETY.

1st. The society shall hold its first regular meeting for the year during the month of January or February for the inauguration of the officers chosen at the annual meeting held the previous December, as provided in article IV of the constitution, and also to arrange its plan of operations for the year.

2d. Its second regular meeting shall be held in the month of June at such date as shall best accommodate an exhibit of the early summer fruits.

3d. Its third regular meeting shall be at its annual exhibit of autumn and winter fruits, in the month of September or October.

4th. Its fourth regular meeting shall occur in connection with its annual election of officers, in December, as provided in article IV of the constitution.

5th. The times and places for the occurrence of these regular meetings (excepting only the *time* of the annual meeting), shall be determined by the executive board.

6th. Other meetings may be called by the secretary, under the advice or direction of the members of the executive board, at times and places by them deemed expedient.

7th. In case of the calling of a special meeting for the election of officers of the society, in consequence of any failure to elect at the annual meeting, as provided in section IV of the constitution, all persons entitled as members to vote at such annual meeting shall be considered as retaining such membership for such purpose until such election, and until such officers so elected shall have been inducted into office.

XI.—RULES FOR DISCUSSIONS, ETC.

1st. The deliberations and discussions of the society shall be conducted in accordance with ordinary parliamentary usages.

XII.—AUXILIARY SOCIETIES.

1st. The society shall, in all reasonable and proper ways, encourage the formation of local horticultural or pomological societies auxiliary to this society in all such counties or other municipalities of this state as shall afford a reasonable prospect that they will be able to effectually maintain the same.

2d. It shall be the policy of this society in supervising the organization of such local societies to secure an identity of constitutional provisions throughout, and in so doing to insure harmony among them; but at the same time it will not discourage the including by them of special or local objects in cases in which such shall be found desirable, so long as the introduction of the requisite provisions therefor into the constitution and by-laws of the auxiliary society shall not be deemed likely to interfere with the harmonious workings of the whole.

3d. Any person who shall become a member of an auxiliary society for one year, and comply with its regulation as to fee, shall thereby become an auxiliary member of this society also for the same time, and entitled to all the rights and benefits of full membership, except that he or she shall not have the right to vote at the annual election of officers or upon questions of the expenditure of money.

4th. On receipt by the secretary, from the secretary of such an auxiliary society, of a list of officers and members of that society, he shall file the same; and upon issuance of the Annual Report shall supply such auxiliary society with a sufficient number of volumes to provide one for each of its members. He shall also transmit the names of such officers and members, with their postoffice addresses to the secretary of any and all experiment stations and societies willing to supply bulletins and reports and to the national department of agriculture for the same purpose; and the secretary shall issue to such auxiliary society a certificate of membership for the year.

5th. Reports of auxiliary societies shall be made to the secretary of this society on or before the fifteenth day of January of each year, and shall include the officers for the ensuing year and a statement of the proceedings of such society during the past year, which shall be incorporated into the Annual Report of the preceding year.

XIII.—AMENDMENTS, ADDITIONS, SUSPENSIONS.

1st. Amendments or additions to these by-laws may be made by a majority vote of the executive board, at any meeting; but if objections shall be made the same shall "lie upon the table" till the next regular meeting of the board.

2d. These by-laws, or any one or more of them, may be suspended for the time, by order of a majority of all the members of the society present and voting.

3d. A proposition in the general meeting of the society for an amendment or addition to these by-laws shall be referred to the executive board for consideration and decision; but the society may submit therewith its advice or request.

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