TWENTY-SECOND ANNUAL REPORT

OF THE

SECRETARY

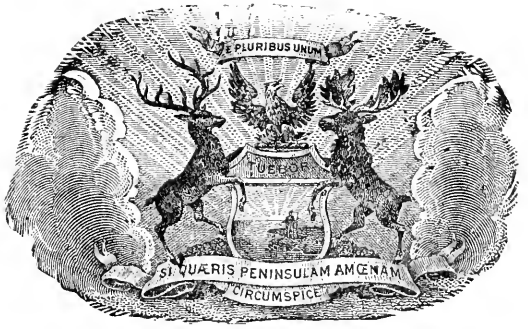
OF THE

STATE HORTICULTURAL SOCIETY

OF

MICHIGAN

1892



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1893

REPORT OF THE SECRETARY

OF THE

MICHIGAN STATE HORTICULTURAL SOCIETY.

ALLEGAN, MICHIGAN,
December 31, 1892.

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 1892, with supplementary papers.

Respectfully yours,

EDWY C. REID,

Secretary of the Michigan State Horticultural Society.

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OFFICERS

OF THE

STATE HORTICULTURAL SOCIETY FOR 1893.

PRESIDENT—T. T. LYON, South Haven.
VICE-PRESIDENT—CHAS. J. MONROE, South Haven.
SECRETARY—EDWY C. REID, Allegan.
TREASURER—S. M. PEARSALL, Grand Rapids.
LIBRARIAN—ROBERT L. HEWITT, Lansing.

EXECUTIVE BOARD.

R. MORRILL, Benton Harbor, 1 year.
C. J. MONROE, South Haven, 1 year.
CHAS. A. SESSIONS, Mears, 2 years.
CHAS. W. GARFIELD, Grand Rapids, 2 years.
L. R. TAFT, Agricultural College, 3 years.
L. W. WATKINS, Manchester, 3 years.

STANDING COMMITTEES.

ON FRUIT CATALOGUE, T. T. LYON, South Haven, Chairman; 1st district, L. B. RICE, Port Huron; 2d district, E. H. SCOTT, Ann Arbor; 3d district, D. G. EDMISTON, Adrian; 4th district, W. A. BROWN, Benton Harbor; 5th district, GEO. C. McCLATCHIE, Ludington.

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

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

ON ENTOMOLOGY—ALBERT J. COOK, Chairman.

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

ON LANDSCAPE GARDENING—JAMES SATTERLEE, Chairman.

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

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

THE NEW YELLOWS LAW.

AN ACT to prevent the spread of the contagious diseases known as yellows and black knot among peach, plum, cherry, prune, almond, apricot and nectarine trees, or the fruit thereof, by providing measures for the eradication of the same, and to repeal act number one hundred and fifty-eight of the public acts of eighteen hundred and ninety-one, entitled "An act to prevent the spread of yellows, a contagious disease among peach, almond, apricot, and nectarine trees, and to provide measures for the eradication of the same, and to repeal act thirty-two of the session laws of eighteen hundred and seventy-nine," approved April four, eighteen hundred seventy-nine.

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 or nectarine tree infected with the contagious diseases known as yellows or black knot, or to offer for sale or shipment, or to sell, or to ship any of the fruit thereof, except the fruit of the plum and cherry 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, city or village 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 or village 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, village or city as commissioners, who shall hold office during the pleasure of said board, village or city council, and such order of appointment and of revocation shall be entered at large upon the township, village or city records: *Provided*, That the commissioners now appointed and in office shall continue in said office until their successors are appointed and qualified.

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, village 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, village 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 or black knot, or other contagious diseases 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 owners 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 ten days, Sundays excepted, from the date of the service of the notice; and in case of trees known as nursery stock, or 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. 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 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, village or city; and for the purpose of such removal and destruction, the said commissioners, their agents and workmen shall have the right and power to enter upon any and all premises within their township, village or city.

SEC. 6. 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, 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 only, and not to trees affected with yellows.

SEC. 7. 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, village or city council, all of which costs, charges, expenses and disbursements may be recovered by the township, village or city from the owner of said diseased fruit or nursery stock or from the owner of the premises on which said diseased trees stood, in action of assumpsit.

SEC. 8. All of act number one hundred and fifty-eight, of the public acts of eighteen hundred and ninety-one be and the same is hereby repealed.

This act is ordered to take immediate effect.

Approved May 25, 1893.

CONSTITUTION

OF THE

MICHIGAN STATE HORTICULTURAL SOCIETY.

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.

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 during the time between Dec. 25 and 31 of each year, according to call of president and secretary, and the election shall be held during the second session of such meeting.

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 therefor 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 excutive 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 re-submitted 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, effectively, to maintain the same.

2d. It shall be the policy of this society in supervising the organization of such local auxiliaries 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 may become a full member of an auxiliary society, for one year, by paying into its treasury the sum of one dollar; and a compliance with the provisions of clause fifth of these by-laws shall constitute him also a member of this society, for the same term.

4th. The wife, and the resident, single or unmarried daughters of any full member, may also become members of such auxiliary society upon the payment of fifty cents each: *Provided*, That in such case such entire family shall become entitled to a single copy, only, of the current volume of the transactions of this society.

5th. On receipt of the names of such members, with the required fees, the secretary shall immediately transmit their names and postoffice addresses, together with half the membership fee of each, to the secretary of this society, who shall record the same and pay the money into the treasury for the benefit of the general fund.

6th. It shall be the duty of the secretary, on receipt of such remittance, with list of members, to supply such auxiliary society with a certificate of membership in this society for one year, together with a copy of the current volume of transactions for each full member so remitted for.

7th. The proceedings of such auxiliary society shall, at the close of the year, be forwarded, in succinct form, to the secretary of this society, to be by him incorporated into the annual volume of transactions, accompanied by a list of its members for the year.

8th. The auxiliary societies shall, as far as practicable, be made the medium for the distribution of the annual volumes of the transactions of the society, the nuclei for its meetings, and the means of creating interest therein, as well as the means of collecting such facts or other information or material as shall, from time to time, become needful or desirable in the conducting of its various operations.

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.

4th. All amendments of the constitution and by-laws of auxiliary societies shall, before they shall take effect, be submitted to the executive board of this society, by whom their approval or rejection shall be considered upon the principle provided in section XII, clause 2, and the determination of said executive board shall be final and binding upon the auxiliary society.

PROCEEDINGS OF THE WINTER MEETING,

HELD IN PORT HURON, MICHIGAN, FEBRUARY 17-19, 1892.

When it was decided to hold the winter meeting of the State Horticultural society at Port Huron, Feb. 17 to 19, there were grave doubts whether at such a time a good attendance could be obtained in a locality where there was presumed to be so little interest in fruitgrowing. But assurance was had from Mr. L. B. RICE that nothing would be left undone, in the way of local committee work, and the sequel proved how thoroughly he did his part; for, both in attendance and interest, the meeting was successful in great degree, and this despite the score or more of Canadian and Michigan fruitgrowers who were detained at home by the prevalent epidemic of grip, and who by letter expressed their regret for non-attendance.

The sessions were held in a very pleasant hall in the new White block, provided with all the comforts of good seats, light, and warmth. Mr. M. ULLENBRUCH, a florist of the city, beautifully decorated the hall with palms, blooming azaleas, dracenas, and other plants, and cut flowers of the rose, carnation, hyacinth, narcissus, and a number more. Pleasant quarters were provided at the Huron house, and every provision made for the comfort and enjoyment of the visitors. A memorable feature of the occasion was the excellent vocal music furnished by Miss GRETA RICE and Mrs. LENA JONES. The society has seldom been favored with anything of the kind of equal quality.

The first session, that of Wednesday evening, the 17th, was not largely attended, owing, perhaps, to a misunderstanding as to the programme, between the local committee and the secretary; and as the latter was not

present, Mr. L. D. WATKINS of Manchester, was chosen to temporarily take his place.

Waiving the programme, President LYON spoke at some length upon Michigan's exhibit at the World's Fair. A committee has been appointed to prepare the exhibit, and this has been divided into six sub-committees to secure the different classes of fruits, etc. For the present the committee will have to work without compensation, but the legislature will be called upon to settle with the committee later. It was all speculative, however. The speaker believed Michigan would be found in the lead at the Fair. Trees will be taken up and shipped to Chicago, where they will be set out in orchards near the Michigan building on the Exposition grounds. Whatever is taken from Michigan to the Fair should be first-class. The fruit must be gathered at the time of harvesting, to secure the best. In strawberries and other perishable fruits, the exhibits will be changed from time to time as may be necessary to keep the exhibit up to standard. All this means continuous work by the several committees. Circulars will be printed and supplied to horticulturists at a later date.

Mr. L. B. RICE was called upon for a speech. He said that this part of the state should be worked for the Fair, inasmuch as the season for fruits in this locality is later than in other parts of Michigan. The "Thumb" of Michigan can supply fruits, strawberries, etc., when fruit from other parts of the state has rotted. Mr. RICE thought that a great deal of work should be done in St. Clair and the upper counties on the east side of the state.

Mr. RICE asked, "Is it good policy to mulch an orchard, especially if the trees have begun to bear?"

President LYON stated that he never would mulch under ordinary circumstances. Where the ground is likely to freeze he might mulch, but not on general principles. The roots will come nearer to the surface if the ground is mulched.

Mr. R. MORRILL of Benton Harbor did not believe in mulching, unless it be with manure. The practice had not been profitable with him. In fact, he had lost several crops by mulching.

Mr. JOSEPH PORTER believed in mulching with a cultivator. Mulching for winter protection does not pay.

Dr. HARRIS gave an account of his observations, but did not commit himself either way as to mulching.

Mr. JOSEPH PORTER did not believe in off years in the fruit business. He thought the idea was all moonshine.

Mr. JOHN M. HOFFMAN thought Mr. Porter was altogether too fast. He never knew a tree which would bear good crops two years in succession.

Mr. L. B. RICE was of the opinion that trees experience off years.

Mr. R. MORRILL gave his views on setting out strawberry plants. He believed in selecting plants from young and growing beds, but never from an old bed. Select plants from hills after they have headed.

Mr. JOSEPH PORTER asked the president if he considered the coming season a good one for fruit.

President LYON replied, "We must never crow until we are out of the woods. Let us wait and let the trees speak for themselves."

Mr. L. B. RICE stated that the severe weather the past few days had injured fruit trees, causing many of them to crack.

The meeting then adjourned till 9:30 o'clock next morning.

Thursday Morning Session.

President LYON called to order, nearly fifty persons being present, a number which later was considerably increased. As so many of the essayists were detained at home by sickness, a rearrangement of the programme was made, the secretary meantime reading the letters from the absentees.

As had been originally arranged, Mr. L. B. RICE of Port Huron read the following paper upon

FRUITGROWING UPON THE WEST SHORE OF LAKE HURON.

By the west shore I would be understood to mean that portion of "the thumb" bordering upon the lake and extending from the St. Clair river around to Saginaw bay. Take a strip several miles wide and it would embrace a variety of soil. There would be clay land, hard and heavy, gravelly loam, sand ridges of the poorest kind, intermediate sand, generally cold and wet in the spring, and swamp muck.

In the early days these sand ridges produced great quantities of the finest wild berries, rivaling the cultivated in flavor and size.

Along the streams the wild plum and crab apple grew in great profusion, showing, even in a state of nature, that this was the natural home of the small fruits and the plum and apple.

The best land for orchards, in its natural condition (that is, without underdraining), is the gravelly loam ridge a few miles back from the lake and extending to the end of "the thumb." The heavy clay and the wet sand need underdraining before they will produce healthy orchards, and the sandy ridges have so far developed so many enemies that I do not now remember a good orchard on that kind of land.

SOME BESETMENTS.

The worst enemies that I have ever known, however, are poor fences and poor care, followed by depredations of cattle. The next was the cut worm

that would eat out the buds in the night and thus destroy the vitality of the trees. Orchards over this entire territory produce as fine apples, pears, and plums as can be found in any part of the country. Of cherries, only the Dukes and Morellos succeed. The Heart cherries last but a few years and then go. Of the thousands of trees brought into this vicinity, by agents who either did not know any better or did not care, not a dozen have succeeded: and just here let me say it is hard to estimate the loss to the country caused by the worthless trash that these agents have crowded upon the people. It would amount to thousands of dollars—yes, here in this city alone it amounts to hundreds of dollars every year.

In the early days of the settlement of the country, as in other new places, the peach seemed at home; but later the trees were killed, either by cold or neglect, till we were supposed to be outside the peach belt of the country. But more recently several energetic men have had more faith in the peach, and planted several hundred trees each, and they have had their reward in several fine crops of peaches that have made their orchards famous.

PEACHES ARE POSSIBLE.

Lands for peaches need to be thoroughly underdrained. The intermediate wet sand lands, so far, where deeply underdrained, have proved to be well adapted to the growth of pears and plums, and particularly of small fruits. But this is not the point that I wish to establish—it will be admitted by all. It is the fact that peach trees may be grown on the sandy ridges along the lake shore, and that with success. I have brought here samples of the sand and gravel taken from these ridges, the one taken from the surface and the other from two feet below. You will see that this is a very poor-looking soil, with a still poorer bottom; and had we gone down two feet further we would have found clean gravel and sand.

Now, here I wish to show you limbs taken from three peach trees which I helped to plant before the war, either in the spring of 1858 or '59. The ground where these trees stand, in all seven or eight in number, has been open to commons the past twelve years, subject to the depredation of cattle and hogs and men; and yet there they stand, loaded with fruit buds, and ready to do their part in supplying the world with fruit, notwithstanding they have stood in these drifting sands for thirty-four years, and have borne many fine crops of peaches. Here, again, I have a branch taken from the only survivor of an orchard of apples and peaches set twenty-two years ago. The rest were destroyed by cattle and this one broken down. The present tree came from the natural root below the bud. The only care and trimming it has ever had was done by the cattle, and yet it is a good-size tree and has had a number of crops, particularly in the last two years. The third sample is from an orchard of three trees which I set out last spring in this same sandy land, and where I shall set 2,000 more so fast as the ground can be prepared. It is of the Barnard variety and came from the shores of lake Michigan.

Now, I submit to this society the question, can we grow peaches on this sandy land?

As regards the climate, I have seen the thermometer stand at thirty-two degrees below zero, within the life of the first two samples of trees: and I will herewith show you the record of the lowest range of the thermometer since the establishment of a weather station in this city—that is, since

1874. You will see by this that in 1875 it touched twenty degrees, and in 1885 twenty-five degrees below; and that twice it has touched fifteen, twice gone to fourteen, and three times to thirteen below; while in the two winters preceding this, two above was the lowest range. When it touched twenty-five below (that is, in 1885), many young peach trees were killed, while others were not, as shown by the exhibit I have made. Why this was so, I can not tell. It is a subject worthy of the study of this society, to ascertain all of the conditions relating to these trees, and see if drainage, rich soil, improper covering of the ground with snow, especially exposed or protected location—any or all of these—exerted any peculiar effect that made them more susceptible to the cold. If so, what was that influence?

BAD PRACTICES ALL THROUGH.

Another and serious trouble with our people here is, that they do not dig out the borer as they should. Last fall I visited a number of orchards, large and small, and in every instance I found the peach trees infested with borers, and some of the trees nearly girdled by them. This cause alone will destroy the trees in a few years. The fact is that, as a community, we neglect our orchards to such a degree that the wonder is that we get so much and such fine fruit from them.

Again, when we get the fruit, not more than two thirds of it is saved from the orchards. The rest is eaten by stock, or frozen on the trees, or left to rot on the ground. Of the two thirds saved and gathered from the orchard, one half is lost by the poor care given it, or by the methods of marketing. A very large proportion of the small lots of apples are marketed in meal bags; and as the grocerymen refuse to buy them in that condition, they are peddled about the city at so much per bag.

THE MATTER RESTATED.

In brief, what we need is: (1) thoroughly and deeply drained ground for planting trees; (2) a proper selection of good, hardy varieties of marketable fruit; (3) these should be carefully set in well prepared soil and intelligently cultivated; (4) study all the improved methods of combatting the insect pests; (5) learn to pick the fruit carefully, selecting the best only and putting it into neat packages in an attractive style, and then you will not be obliged to drive about the streets seeking buyers, but buyers will seek you. When these conditions are followed, there will be no reason why we can not raise immense crops of apples, pears, plums, cherries, and peaches, and all of the hardy small fruits.

Now, a word more, about our outside market for perishable fruits. Our climatic influences are such that our fruits ripen after the great rush of other fruitgrowing sections has passed. We have at our door the finest line of fast-sailing steamers in the freight business that can be found in any part of the world. We can ship with equal facility to the centers of population to the south of us, as to the great northwest that lies outside the fruit-belt. This is the last point within the belt at which the lake Superior steamers stop and there is no other stopping place within sixty miles of us, so that we may virtually control this vast lake Superior market. With a large crop of pears, plums, or peaches, load down the Duluth boats, when they are passing up light, and have a good distributing agent at Duluth, so

that when the market is full there the fruit could be sent on to other points along the railways. I don't see why a market could not be developed for a great outlet for fruit.

COMMENTS.

President LYON: This region has certain advantages for fruitgrowing. It lies west of a great body of water; and when we at the west suffer from cold coming in from the northeast, growers here would be protected, and a crop at such times is of the greater value. Our Michigan fruit-belt extends so far north that varieties grown to the south of us are gone when ours are ready. On the western coast of the state, ability to grow fruit extends to the straits and perhaps beyond. An increasing interest in fruitgrowing exists even upon the southern shore of lake Superior.

Mr. A. G. GULLEY of Agricultural College: Markets here must be very good, and I have often wondered why fruitgrowing was not more engaged in here. Mr. RICE'S chart shows that the temperature of ten out of nineteen winters was very severe, so much so that peach-growing here would be quite hazardous. But much depends upon condition of the buds. As to sand, some of the best orchards in the western part of the state are on sandy ground. So I see no reason, except the temperature, why peaches may not be grown here.

Mr. RICE: It is warmer at the northern end of lake Michigan, than it is here at the southern end of lake Huron, because that water is warm and flows to the north, while Huron's water is cold and flows to the south.

Mr. S. D. WILLARD of Geneva, N. Y.: I was unaware that there was such a possibility for fruitgrowing here. The matter of care is the main trouble everywhere. Borers must by all means be kept out of the peach and quince.

Mr. R. MORRILL of Benton Harbor: Have you not found a better way than digging the borers?

Mr. WILLARD: No, only to get at them before they go in.

Mr. MORRILL: Some have tried whitewash in which was some sulphur and carbolic acid.

Mr. LYON: About South Haven we heap the earth up about the trunks, a few inches, the early part of June, covering the soft bark at the crowns where the insect deposits the eggs. If they are laid above, they either do not hatch or the grubs can not penetrate the bark. The earth is removed in August, so that the bark may harden and water not find a settling place about the trunks. Some wrap tarred paper around the trees.

Mr. GULLEY: It is the practice in some places to put Paris green into the whitewash.

Mr. LYON: The insect has a peculiar liking for low crotches, so it would be well to keep crotches (if they are permitted) 1½ feet above the surface, as the insect is not likely to search higher.

Mr. WILLARD: I have seen tarred paper used, but damage came in some cases from not removing it in time, the bark under it becoming tender and the tree winter-killing in some instances.

Mr. A. M. SMITH of St. Catherines, Ont.: We have had very little trouble with borers since we began earthing up.

Mr. I. H. BUTTERFIELD of Lapeer: Proximity to water here is not an advantage, as the cold air of spring, blown over the water, is more likely to do harm than the colder air of winter further inland. Therefore there is not much hope for peaches, but apples, pears, and plums do well. Huron county is engaging somewhat in fruitgrowing, but there are very few men who make it a business. It is mainly an accessory to general farming and is neglected, and so failure often results.

Mr. A. M. HOLLISTER of Monroe: I have for fifty years sent much nursery stock north of Saginaw, but the trouble is, there as here, people know more about pine trees than any other kind. They have just as good conditions as have the growers of this region, with better soil. Mr. HOLLISTER cited several examples of successful fruitgrowing in the region referred to.

Mr. MORRILL, referring to Mr. RICE'S remark about bad fences, said that any township that pleases may vote to restrain stock and do away with road fences entirely. It is so in Berrien county and the roads are kept clear of brush and trash, and cultivation extends up to the line or beyond it.

Continuing the session, President LYON read the following paper upon

THE TESTING AND INTRODUCTION OF NOVELTIES.

Previous observation and experience have convinced me that in such gatherings as ours, the interest is best aroused and maintained by such concise announcement of facts or principles as shall effectually beget free and general discussion. Assuming such to be the fact, I may perhaps be excused for presenting my views of the subject assigned, briefly, leaving its amplification to the chances of subsequent discussion.

Ample experience has long since established the fact that, of the mass of novelties originated or discovered, and offered the public as worthy of trial, scarcely even one out of one hundred succeed under the crucial test of general cultivation.

Not merely a favorable opinion, by even an expert to whom specimens may have been sent for an estimate of their value, nor yet a careful trial by fruiting them under his own eye, can be deemed to have determined the value of a novelty to the public at large. Nor yet will a more general trial of a year or two in fruit suffice to determine the ultimate or perma-

nent value of a variety for such purpose. The Concord grape came out at a juncture when the public mind was in condition for its acceptance, with the result that it was readily and promptly assigned the position which it has so long and so steadily held; while, on the other hand, its even more worthy descendant, the Worden, has for nearly or quite a quarter of a century failed to vindicate its right to the position which genuine merit would surely entitle it. In the case of the Delaware grape, notwithstanding its great beauty, productiveness, and (at the time) unequaled quality, a full quarter of a century had elapsed before it was able to take an assured position as a general favorite.

With only the old Hovey as a competitor, many years elapsed before the Wilson strawberry received the meed of general approval which it has so long and so persistently held.

The Shiawassee apple, a probable descendant of the old, well-known Fameuse, and every way its superior, has now been nearly a half century before the public and has not even yet been generally accorded the rank to which its real merits entitle it.

In earlier years there was no special effort to hasten the notoriety of novelties, but they were left mainly to win their way to popularity upon their individual merits. More recently, however, with the growth of the nursery and fruit-planting interests, the origination and introduction of novelties has assumed the dimensions and dignity of a commercial enterprise, and is far too commonly conducted with the inflated descriptions, exaggerations of picturing, and even the unscrupulous sharp practices, so common in operations of a so-called business character.

WHY MANY NOVELTIES FAIL.

Doubtless one reason why many of these novelties fail to meet the promises or assurances of originators may be found in the fact that the average cultivator operates on far too low a plane as compared with that of the originator or disseminator; and that, while the latter may by high culture have brought his plants up to a condition enabling them to resist disease or fungus, or to outgrow insect depredations, following which the processes of the average cultivators may be, and doubtless in far too many cases are, effective rather in exhausting such accumulated vigor, thus incapacitating them for developing their accustomed results, though it may reasonably be assured that, but too frequently, their true capacity may have been overestimated by a sanguine and partial originator.

It is but too true, as the rule, that few if any varieties are generally successful. While occasionally one, like the Wilson strawberry, the Bartlett pear, the Red Astrachan and Maiden Blush apples, are widely successful under varied conditions of soil and climate, others must be supplied with special conditions to insure success—a defect which only wide dissemination and more or less lengthened cultivation can fully develop.

A very common modern practice is for the introducer to supply nurserymen and dealers with plants, often grown by the originator, by him shipped to the introducer, going from him, perchance, to yet another nurseryman or dealer, and thence to the planter—thus, perhaps, subjecting the plants to two if not three repackings and shipments during a single season, an ordeal which, if not fatal, is at least far too trying for the ultimate good of the plants.

HELP FROM EXPERIMENT STATIONS.

Within the last two years, under the influence of a federal enactment with an accompanying appropriation, an extensive system of experiment stations has been brought into existence, with facilities for the thorough testing and characterizing of natives, in the way of both fruits and plants, such as can scarcely be reasonably anticipated from individual effort, since both the person in charge and the government are pledged to the efficient and careful conduct of the experiments, to guard against the pirating of varieties and to carry forward each trial to a finish, whether under the charge of one or a succession of agents, in one or a series of years.

These stations must, from the circumstances of the case, be unbiased in their conclusion; while it is a duty which they owe to the public, as well as to their own reputation, to keep well up with the novelties introduced and to be introduced, as well as with the most approved system of cultivation and management.

In order to provide for the widest possible dissemination of the results of their experiments, bulletins are provided, which are distributed free to all who apply.

With the means for an early and trustworthy determination of the real value of novelties as they appear, as well as of the various processes, both old and new, for the benefit of horticulture, as well as for the extermination of fungi, insects, and all the varied obstacles or enemies which the horticulturist must be expected to encounter, it would seem to be the dictate of the highest wisdom that the mass of the people should let novelties severely alone till, through the careful investigation of these horticultural laboratories, the chaff shall have been winnowed out and only the worthy left to invite the desired investment.

With this purpose realized, the mass of random experiments would find their occupation too unprofitable, and the field would be left clear for those who, from careful and scientific study of the principles involved, may be able to work more clearly and definitely to the desired end; or, by a fuller knowledge of the qualities necessary to a successful result, assure themselves of the propriety of putting their productions before the public.

PRIVATE EXPERIMENTS SHOULD ALSO BE MADE.

Mr. MORRILL: Is it not a fact that a new variety is now recognized and understood much quicker than it was some years ago? Is there not much more private experimentation?

Mr. LYON: Possibly; but such private work may not be disinterested, and be not carefully made. Those in charge of experiment stations should keep in advance and test new varieties before they have been generally distributed. Private tests may be made under peculiarly favorable circumstances, and the varieties tested be successful nowhere else. Therefore, tests by experiment stations are more generally to be relied upon.

Mr. RICE: There is need of more sub-stations in this state, such as

that Mr. LYON conducts at South Haven, to save the people's money from waste.

Mr. S. D. WILLARD of Geneva, N. Y., commended Mr. LYON'S ideas of experiment station tests; the stations are grand things, and their number should be increased. "If I were about to start in fruitgrowing, I would go to Mr. LYON and find out what is successful at his station, and then test that on my own ground. I can not grow prunes, though successful with plums; yet, five miles away, at the experiment station, they are highly successful with prunes."

Mr. MORRILL agreed with this. "Each must test for himself. Not that the experiment station does not do excellent work, but that one can not rely absolutely upon any tests beyond one's own farm. I experiment for myself upon almost every new sort that's offered."

Mr. RICE: Most of us can not do that.

Mr. MORRILL: Twenty-five dollars will be enough to test a great many varieties.

Mr. LYON: Mr. WILLARD spoke of the failure of the Great American strawberry. It was originated by Mr. DURAND of New Jersey, who had many others, but not one of them all is now grown, and for the reason that no grower equals the thorough, intensive culture under which these varieties were produced. The experiment stations aim to test by average modes and conditions of culture. They are the best media between the originator and the grower.

Mr. MORRILL: I tried the Great American and failed; but tried the Parker Earle and succeeded, and made money by it. Five hundred dollars would not buy my present stock of the Parker Earle.

Mr. PORTER of Port Huron advised caution in trying new varieties, except by testing a few by the same cultivation given standard kinds.

Mr. BUTTERFIELD of Lapeer (a member of the state board of agriculture): My impression is that if as favorable terms could be provided as were made at South Haven (gift of land to the state), a horticultural substation might be established in the eastern part of Michigan.

Mr. A. M. SMITH of St. Catherines, Ont.: We make tests of varieties by sending them to our members (Fruitgrowers' association of Ontario), and having them experiment and report.

Secretary REID followed with the subjoined paper by Mr. WM. FERGUSON of Detroit, superintendent of Belle Isle park, upon

SOME HARDY SHRUBS, ROSES, AND PERENNIALS.

I am requested to present a paper on hardy flowering plants, describing twelve hardy roses, as many flowering shrubs, and as many perennials, the object being to awaken a new interest in their cultivation in the society.

There are so many descriptive catalogues spread over the country nowadays, that it strikes me I would be wasting my shot to do that, except, as I may refer to varieties in what I shall undertake to say.

It is important, in undertaking the cultivation of anything, to have the best varieties, as it costs as much to care for a poor one as a good one; but the knowledge of how to get the best results is of first importance.

I will suppose that those present love flowers, and perhaps some have not undertaken, for some reason or other, the cultivation of them to any extent, but would like to do so.

Now, I will suppose Mr. or Mrs. Blank has a nice, commodious residence, or perhaps a small cottage—at any rate, plenty of room in some part of the lot, perhaps at one side against the fence, or it may be in the middle of a grass plat, although I would prefer to keep a nice grass plat free from shrubs, etc., as it is always pleasing to see a plat of grass when well kept. However, wherever it is located, there ought to be at least one foot (more is better) of good surface soil enriched with a liberal dressing of good, old, rotten manure, well mixed into the ground. Now, what shall we plant? Well, let us suppose again that here is the fence. It runs east and west. It is fifty feet long, and we can make the bed six feet wide. That will give room enough for four rows of plants, and we may have grape-vines on a trellis on the fence; or, if you do not want grapes, it may be honeysuckle, clematis, wisteria, etc., flowering vines; then, in first row, two feet from the fence, we will plant, say, two lilacs (Persian is best) one purple and one white; one syringa, say two varieties of spirea (S. prunifolia f. p. and S. Reevesii), two flowering almonds (white and pink); two wigelia (roseum and amabilis); one Forsythia (yellow flowering), two varieties of althea, one Prunus Pisardii. These may be planted from three to four feet apart, and between them, for the first two or three years, may be grown hollyhocks or dahlias.

Now, in the next row, we can place hardy roses—say one dozen—and between we can place varieties of perennial phlox, perennial larkspur (delphinum), peonies, or deutzia gracilis, etc. Now, suppose we make the next row of monthly roses—say one dozen varieties or less, but a dozen varieties may be selected that, with protection, will winter safely for several years. As to varieties I will name a few: Agripina (red), Adam (red), Bon Silene (pink), Duchess de Brabant (pink), Hermosa (pink), Souvenir de Malmaison (blush), Catherine Mermet (blush), Saffrano (sulphur), Devonensis (shaded pink), Douglas (dark red), Isabella Sprunt (canary yellow), Marie Guillot (white), etc. I enjoy fully the rich fragrance and glorious display of the hardy or June roses; but, like the beauty of a fair maid, they are not lasting, while a bed of monthly roses well cared for is good for the whole season.

The outside row may be of daisies, pansies, forget-me-nots, moss pinks, etc., which will complete the bed.

Another matter of importance is, where are you going to get your stock? And, what is of importance, how shall you treat it when you have? First, get it of the nearest reputable nurseryman or florist. The hardy shrubs should be pruned of at least one half of their wood, and hardy roses to within six inches of the ground. Herbaceous plants, being simply roots, need to be carefully planted. Thousands, and may be tens of thousands, of dollars are spent annually on such things, and because they are planted, very often, by merely taking up sod in the grass, and covering the root with some dirt, the result is disappointment and discouragement, as well as loss

It may be that in about two years these lilacs, syringas, etc., may be crowding each other, and you have some spot in the yard in which you could place them to advantage. To do so, dig a hole three or four feet in diameter and two feet deep, and have some good ground, as previously spoken of, to replace the poor ground. Then carefully dig up the plant you wish to move, saving all its roots, but again reducing the wood on the plant at least one third. In the case of a hardy rose, cut back the same as at first planting, as it is very rare that a rose can be lifted and retain any dirt with the roots.

These remarks have been made with reference to limited conditions, but the methods of getting and handling the stock, the preparation of ground, etc., are the important basis to success, and there is no limit to their application, whether at the cottager's home or the millionaire's palace.

The paper was greeted by warm applause, and Mr. WILLARD remarked that we make a mistake in not giving more care to those things that make home beautiful and pleasant. Educate the boy and girl to a love for flowers and for embellishment of home, both indoors and out, and they will not be very bad; and such adornment makes more valuable the property—so it has practical value in another sense. Several other members expressed warm commendation of floriculture and a desire to have more papers upon the subject at the society's meetings.

The chair announced committees as follows: On exhibits—Messrs. WILLARD, MORRILL and GULLEY. On resolutions—Messrs. SMITH, WATKINS and MONROE.

Thursday Afternoon Session.

Beginning the Thursday afternoon (Feb. 18) session of the State Horticultural society's meeting, remarks were made by Mr. S. D. WILLARD of Geneva, N. Y., delegate from the Western New York society. He congratulated Michigan horticulturists upon their advancement and the opportunities afforded them of soil, climate, and markets; and upon the intelligence they display in applying these to the successful prosecution of their work. He spoke of the interests New York and Michigan pomolo-

gists have in common, and the influence they wield in promotion of those interests. The agricultural classes in general, he contended, must continue to organize and make their power felt in behalf of the two paramount interests of this country, agriculture and horticulture.

Mr. A. M. SMITH of St. Catherines, delegate from the Ontario Fruitgrowers' association, expressed his pleasure at meeting, for the first time, with Michigan horticulturists. "It is my first visit, although I have often heard of your famous society and enthusiastic and valuable meetings." He extended greetings and best wishes of the Ontario society, and expressed a hope for better acquaintance in the future.

GRAFTING AND BUDDING.

Mr. A. G. GULLEY followed with the subjoined paper upon "Grafting and Budding."

It is not my intention to go into the history, nor yet into the theories, of the processes to be described; neither is this article written for the benefit of professional nurserymen, if any are present, but for that class of horticulturists who are usually well posted in the general care of trees and plants, but when the subject of grafting is broached they at once confess they know nothing about it; also for those who have not had an opportunity to see the operations performed, and could not get a clear idea of them from the descriptions found in horticultural works. Time and again have I known men who were well posted in all ordinary work pertaining to fruitgrowing, and never thought of asking help in any other work, who, if they had a few grafts or buds to set, had to look up some one to do it. This is the more surprising, as the operations are not difficult to perform, and are needed often by every practical horticulturist. For those especially have I prepared this paper. It will be limited to work adapted to hardy plants for this latitude. I shall try to make the work so plain that any one may easily perform it for himself, and after a little practice make the successful result as certain as if performed by a professional. Indeed, it can be said, when one understands the principles involved, he has only to practice to be a successful budder or grafter.

TWO FIRST PRINCIPLES.

As to the principles, there are two that must be remembered. First, so far as is known, perfect union can only take place between plants of the same natural order or family, botanically related, and only those that are clearly allied in those families at that. I have talked with men who had an idea there was no difficulty in putting a grape on a maple, if one understood grafting, and be surprised when told that it could not be done; then be still more astonished when informed that a pear would grow readily on the mountain ash. But the statement just made, that plants, to unite, must be closely allied, explains the different results. The rose family, which embraces all our valuable fruits except currants, gooseberries, grapes, and cranberries, can not by any means be united indiscriminately, as the raspberry and apple, or either with the cherry. We have cases were different

species of the same genus will not unite as readily as individuals of different genera, showing them to be closer related in internal structure if not in outward appearance. However, the general use of grafting and budding is to change varieties of the same species; and, except in ornamental propagation, the ordinary horticulturist will have very few cases where he will be called upon to unite different species.

The second principle is that the growing parts of the plant must be united. That is, as all new growth takes place at the surface of the wood, that portion of the stock and scion must come into contact at one or more points; and the more of such points of contact we can make, the more sure is our graft to grow.

THEIR PRACTICAL USES.

The principal uses of budding and grafting are: First, to change the variety of trees already grown and bearing to one more desirable. By using trees already grown we save several years of time. For this purpose, grafting is generally the operation performed. Second, to increase kinds that will not grow true from the seed, which embraces practically all tree fruits; or to grow those kinds that seed very little, as is the case with double-flowering trees. Third, to rapidly increase new varieties. In both the latter instances, both grafting and budding is used, but the latter to far the greater extent.

GENERAL DIRECTIONS.

It will be understood that the operations of grafting and budding are the same in result, only being performed at a different season and in a different way. In grafting, both stock and scion may be dormant, and in ordinary operations the scion is always so. In budding, the stock must be in a free, growing state, and the scion is usually so. Outside grafting is always done in the spring, at seasons varying with the plants. Apples and pears can be worked at any time after hard freezing until the trees are in full leaf. Cherries and plums usually take better worked very early before the sap starts. Peaches are never grafted in this latitude—always budded. Ornamental trees can be grafted just as the growth starts. Root-grafting, by which means apples are largely propagated, is done at any time during the winter, when convenient, in a warm room, and the grafts packed away till time of planting in the spring. Scions for grafting may be cut at any time during the winter, when not frozen. They must be made of wood of the past season's growth. Should the scions be taken from a tree which is old, or bore heavily, the new growth may be too short for scions. In that case they can be cut enough longer from the older wood to make the joint, leaving the new portion to grow.

After gathering the scions, pack them in damp moss or sawdust and put into a cool place till they are used. This is to keep them from drying—also from starting before needed. For winter root-grafting, the stocks or roots must also be taken up in the fall and packed where they will not dry nor freeze.

Budding is usually done in late summer, when the trees or stocks have about finished the season's growth, but before it has stopped, and at a time when well developed buds of the season's growth can be obtained.

Scions for budding are cut as needed, and the leaves taken off at once to prevent evaporation. If shipped any distance, they must be packed in damp moss, so as not to dry at all, nor yet heat, and used as soon as possible after being received.

PROCEDURE IN GRAFTING.

We will now consider the two operations separately. With our scions cut and the proper season arrived, we are ready to graft. There are but four modes of work with which the ordinary horticulturist need be familiar, and even one of these he will have very little occasion to use. Of the large number of other ways to set grafts, nearly all are simply modifications, to be used on special plants or occasions, with which the common grower has nothing to do. Those to be described and illustrated are whip or tongue, cleft, crown, and veneer grafting. One material which we shall need in all kinds of work, is grafting wax, and it is made as follows: take by weight one part of tallow, two parts beeswax, and four parts of rosin. Be sure about the proportions. Melt thoroughly together, then pour off into cold water; and as soon as cool enough to handle, pull it the same as you would molassess candy. When done it will have much the same appearance. To make the waxed string, simply put balls of fine darning cotton into the hot wax till they are soaked; and the same for waxed cloth, using any cotton cloth that will tear readily into strips. For whip-grating we need only, in addition to these materials, a sharp knife. Simply make a slanting cut across the ends of stock and scion, about an inch long; then, about one third of an inch from the thin end of the cut, and parallel to it, make a straight split into both, one third of an inch deep. Place the two cut surfaces together, end to end, pushing the tongue made by the cross-cut in each, into the slit of the other, being sure the bark joins on one side at least of the two pieces. Then cover the joints with wax or waxed cloth, air tight, and it is finished. If it is a root-graft, instead of using the wax bind a few times with waxed string to hold the pieces in place till planted. If well made, even this is not necessary. This kind of grafting may be used readily on any stocks of an inch or less in diameter, provided they do not have a pithy center. It is by far the easiest and most rapid method of grafts. It is so well adapted to the needs of the ordinary grower that every one should be familiar with it. It makes a perfect union and in a short time it is often impossible to tell where the joint was made.

Cleft-grafting is principally used on large trees, where it is desirable to change the variety. To do this the operator will need a strong knife or chisel, a small hand-saw, a sharp knife to prepare scions, a mallet, a small wedge, and wax. Saw off the limbs to be grafted, being very careful not to tear the bark. Then split the stock across the middle with the strong knife or chisel, opening it down about three inches. With the wedge, open the slit and insert the scions—one, or, if the stock is large, two, one at each end of the split. The scions are cut about five inches in length, or with at least three buds. These are made wedge-shape on the end to be inserted, thus being about one and a fourth inches long, one edge being thicker than the other. Cut the scion so as to have a bud just at the upper end of the wedge on the thickest edge. Place the scion in the split of the stock with the thick edge at the outside of the stock, being sure that the surfaces of the wood, not of the bark, of stock and scion are joined. Now remove the wedge in the end of the stock and the split will close up and hold the

scions firmly in place. Cover the end of the stock and the splits, also the upper ends of the scions, with wax, and the job is done.

The operation of side-grafting takes readily on all fruit trees except the peach, and is used by traveling grafters. The objections are that the ends of the stock often do not heal over completely, leaving a place where decay sets in that increases with the age of the tree. This is very likely to occur when the limbs operated upon are large. One very common error is to do this work too high in the tree. This is universal with traveling grafters, as they go up high to find plenty of thrifty limbs of suitable size to work, and that the grafts may grow more readily. As a result, the new head must be very high from the ground, and we have a very ungainly tree and are put to much more trouble to get the fruit. Instead, select small or medium-size limbs as near the ground as possible, in which to set the scions. If none suitable are to be found, go into the tree and cut it back heavily. A large number of suckers will start. Thin these out, leaving only enough to make a new head. Then, the next spring, set the scions on these. Whip or cleft graft as you think best. I prefer this method always when the tree is not in a very thrifty condition.

The third process, crown-grafting, can be used wherever cleft-grafting would be practiced, and can be used at roots or crotches where the stock would not split readily. It can only be done after the sap has started so the bark will separate from the tree. The stock is not split, but instead a one-sided wedge is made of the scion, with a shoulder at the upper end of the cut. The bark is then opened a little on the stock and the wedge end of the scion is pushed down between the bark and wood, letting the shoulder rest on the end of the stock. Two or even four scions can be set around the end of the stock if it is large. When grafting in this way, the scions must be tied in as well as waxed, otherwise, when they are growing, the wind may blow them out. It will be necessary, the first season, to look over the graft two or three times, and see that the bands do not become too tight. This style of grafting is to be preferred to cleft-grafting. There is no split in the stock where water may enter, and rot is prevented. By using several scions, the end heals over more readily. It is not so rapid a method, and the first needs a little more attention.

Veneer-grafting is of so little importance to the common propagator that but little time need be given to it. The only place where it is of value is in grafting small plants with large piths. Simply cut off the end of the stock and take a thin slice off the side, about an inch long. Then make a shouldered cut on the side of the scion, of the same length, taking care not to cut through the hard wood into the soft center. The two cuts are joined, letting the shoulder of the scion rest on the end of the stock. Tie in place and wax thoroughly if above ground. It is a slow process and the scions are very likely to become misplaced. No matter what mode is practiced, the work should be looked over occasionally the first season, to see that sprouts do not start on the stock and take all the strength. If tied in, the bands may have to be loosened once or twice during the season.

On cleft or crown grafts, the wax may crack and expose the end of the limb, so look them over. In top-grafting large trees I prefer to do the whole job at once, rather than take two or three years as is often recommended. Should any fail that are needed, be sure to replace them the next season. But if the tree is large, take two seasons after the grafting to remove the remainder of the old top. In many cases, where two scions

are set in, the same limb. and both grow, one should be removed after a year or two.

PROCESSES OF BUDDING.

Budding belongs more particularly to the nurseryman or propagator than to the fruitgrower, as it is a process adapted only to small stocks; but it is such a simple operation that there is no reason why the latter should not be able to do it when necessary. It is a cheaper and more rapid method of propagation than grafting. The only tools needed are two knives, one heavy for trimming the stocks and the other thin and very sharp for cutting and inserting the buds. Budding knives, also, usually have one end of the handle shaped to use in lifting the bark of the stock. Some material for tying the bud is needed. Common cotton yarn can be used for the purpose, but basswood bark or raffia is usually used. The latter is now furnished very cheaply by seedsmen. A pound is sufficient for 2,500 stocks. Budding consists of taking a bud with a piece of bark from the scion of the variety we wish to use and inserting it under the bark on the side of the stock in a T-shape cut, being careful to cut just through the bark. This is usually lifted a little so the bud will slip in easily and still fit closely. The cut is then tied down firmly with the band. As already stated, the stock must be in a thrifty, growing condition, so the bark will separate readily from the wood; but on the other hand, it must be so near the end of the season that the growth of the stock will not flood or overgrow the bud and kill it. In from ten to twenty days after the buds are set, the bands should be removed. This can be rapidly done on all ordinary stocks by running a sharp knife across the band on the side of the stock opposite the bud. It will then open with the growth of the stock and remove itself. The stocks will need no further attention during the fall except to see that they are situated so that no water shall stand on or around them during the winter. In the spring, just as the buds begin to grow, cut off the stock just above the bud. My rule is to cut just where I made the cross cut in budding. Do not, however, unless the plants are very valuable, cut it off some inches above, as is often advised, and then cut close later in the season. It is very hard work to take off the dry stub you will find at the second cutting, and the only object is to prevent the bud drying out from cutting too close the first time.

Sometimes, when a variety is new and it is desired to increase it rapidly, spring budding is resorted to, with dormant scions, the same as we use in grafting. In this way we have to use only one bud instead of three or four, as in a graft, on each stock. Of course it can only be done after growth starts. Thin as soon as the bud has grown in. The top of the stock is removed as before, and the bud starts to grow at once. This method is not often necessary. The object of removing the top of the stock is to throw the whole growth into the bud. There will probably a lot of suckers start up from the stock below the bud. These must be removed. This may have to be done two or three times during the season, until the bud shall become large enough to take the whole strength of the root.

The proper season for budding our fruit, is: plums, latter part of July; pears and cherries, first to middle of August; apples, any time in August, and peaches, middle of August to middle September. At the end of one or two seasons, according to kind and growth, the buds will make trees fit to

set in the orchard. As will be observed, the process of budding, as described, refers only to small stocks, and they are usually worked close to the ground. It may, however, be used to change the tops of small trees by budding into the limbs. It is difficult to make budding successful in the old bark, hence it is not used on trees of much size; but for propagating all kinds on small stocks is very successful. and if they are pithy or soft-wooded, it is the most desirable method.

Mr. WILLARD: I have used mutton tallow in making grafting wax, and found it better than beef tallow. I am now engaged in cutting off tops and removing brush from an orchard I am about to top-graft, so as to get that much done before the crowding of spring work. I will recut the limbs when I am ready to set the grafts.

Mr. MORRILL asked if there was not more danger with the cherry than with other fruits, in cutting out the ungrafted wood. Mr. WILLARD said there was not; but the ungrafted wood should not all be taken off the first year. It is all a matter of wise cutting. Mr. GULLEY agreed to this, saying, as to the cherry, no trouble would occur if not much wood was removed at a time.

Mr. MORRILL: I have lately been pruning my peach trees, and cut some limbs from one to one and a half inches in diameter, and have been told serious harm will ensue if cold weather follows.

Mr. WILLARD: If the cutting is merely for the purpose of heading in, I would not hesitate to do it at any time after the leaves fall.

After a duet, "Mother's Songs," by Mrs. JONES and Miss RICE, the following paper was read by Mr. N. A. BEECHER of Flushing, upon

EXPERIENCE IN ROOT AND TOP GRAFTING.

I came into the state of Michigan in the fall of 1857 and settled where I now reside, in Flushing, the next spring, for the purpose of securing a home. There was no orchard, and little to attract the occupants save the soil and a log cabin, in which my wife and I were made quite comfortable.

In the spring of 1859 I planted a few thousand root-grafts, mostly apple, and began the propagation of fruit trees, more to grow an orchard than to supply any outside demand.

The orchard grew in size, while the nursery slowly multiplied. I soon learned that certain varieties did not do well, but I clung to them as we do to our children, for they were my pets and I could not bear to give them up, but a few years' experience taught me something was wrong, and I was obliged to discard from the nursery the Roxbury Russet and Esopus Spitzenberg, not knowing that freezing was the trouble.

EXTREMES AND EFFECTS OF FROST.

In the winter of 1874-75, the thermometer touched 33 degrees below zero in Flint, Genesee county; at Kalamazoo, Feb. 9, 34 below; Grand

Rapids, 40 below; Beloit, Wis., 40 below; Sparta, Wis., 48 below, while at South Haven, Mich., it touched 16 below, for a few minutes; and, if my memory serves me right, there was only a light crop of peaches in the southwestern part of the state the next season.

The effects of King Frost were no longer a mystery. This frozen peninsula had rendered her verdict, and the dead and dying witnesses were found plentifully in the apple, pear, peach, and plum orchards all over Michigan. For the first time in my life I had learned that freezing was the trouble, and is what makes so many trees black-hearted, feeble, and sickly.

I was now able to trace the effect to the cause. My observation was aroused as never before. Since then I have been permitted to study many interesting lessons in this wide field of investigation, and shall now try to give you some of them.

TENDERNESS OF SEEDLINGS.

I have learned that many of our seedlings (apple stock) are tender, and, without doubt, the cause of many evils that crop out in fruit culture. This is likewise true of the sweet cherry on the Mazzard, and of the pear on the quince.

I find, also, that the tender varieties are more subject to the ravages of the borer and the armies of insects that prey upon our fruit trees, and that among this class we find the largest percentage of inferior and wormy fruit. If any one will take the pains to visit the orchards, as I have done, in this and adjoining counties, as to the health, hardiness, and quality of fruit borne, I think they will bear me out in this conclusion.

SELECT HARDY STOCKS.

In selecting the stocks and scions of the different species to be propagated, it is as necessary that we study the character of the two to be united, as to what is desired in the plant and fruit, as though we were about to engage in the propagation and perpetuation of the choicest breeds of horses, cattle, sheep, or swine.

Ground once gained by judicious selection, in this way, becomes fixed, and upon it we may enter with safety. By this process, this law of assimilation, combining health, strength, vigor, and hardiness, we are able to multiply and perpetuate the choicest selections of fruit.

If we will select such trees as the Lyscom, Talman Sweet, Northern Spy, Westfield Seek-no-further, and Golden Russet, of known merit as to hardiness and vigor, upon which to top-graft or regraft our tender varieties, such as Baldwin, Greening, King, and Red Canada, we shall make a great advancement in the right direction, for it is upon this point that success largely depends—perhaps more than upon any other.

This plan or system of "double-working" our tender varieties and feeble growers, on hardy stock, is like building upon the rock, assuring us not only of hardiness but of uniformity of growth and development (a very important point), at the same time increasing the longevity and fruitfulness of our orchards, and the quality of the fruit borne, a hundred fold.

MR. HATHAWAY'S PREDICTION.

I am happy to inform you that I am not alone in the pursuit of this subject. Mr. BENJAMIN HATHAWAY of Little Prairie Ronde, an old nurseryman of nearly fifty years' experience, a farmer, horticulturist, a forester, a gentleman of wide fame in the state, forsaw the impending disaster to the fruitgrowing interests of all the west, from this cause alone, and at the first meeting of the Northwestern Fruitgrowers' association, held in Chicago, gave the first note of warning and presented to the members of that meeting the facts of his experience. He then and there prophesied that "Before twenty years should go by, the unwisdom—not to say the criminal folly—of the almost universal method of root-grafts, would be made plain to the dullest comprehension." He went further, and said: "If there are any who are disposed to cavil, and say I put it too strong, let them come with me and go through a score or two of orchards in Cass county that I know all about. I will point them to trees, both of the same variety, one a root-graft the other a top-graft, the first of which has not borne one fourth the apples of the other since they were set out, thirty or forty years ago. And these are not isolated cases, but are the universal experience in all this region, where there has been a fair opportunity for comparison."

VALUE OF DOUBLE-WORKING.

I am proud to be able to quote the valuable experience of the above named gentleman, whom I have had the pleasure of meeting, to more fully substantiate some of the principles involved in this important question. especially of the double-working of our tender varieties and feeble growers on what I call a uniform standard stock, as the Lyscom, Talman Sweet, Northern Spy, etc., and never upon seedlings, even as a gift. Never upon seedlings, for they are not uniform in growth and development, some of them being dwarfish in their habit and as tender as a peach.

My experience in top-grafting the Red Canada on seedlings has not been satisfactory in the orchard or nursery—I think it is the least so of any variety. There is not a proper affinity or assimilation between stock and graft, consequently they are not uniform in growth, while a large percentage of them is worthless. This variety, root-grafted in the nursery, is very feeble, while not one tenth of them are merchantable. This is why all practical fruitgrowers recommend top-grafting the Red Canada under all circumstances, not so much to make it hardy as to make it strong and vigorous, for this variety is of itself quite hardy. Nurserymen, as a rule, will not grow it; and allow me to say, in all candor and courtesy, the individual who insists in ordering them root-grafted is not wise, and some have found it out to their sorrow.

This plan of double-working tender varieties and feeble growers on a hardy and vigorous stock, is the only method that holds out any promise of success to the future fruitgrowers of Michigan, even in the more favored parts of the state.

Some may urge that this system of top-grafting is unjust to nurserymen. It is not altogether so, for no one knows the facts better than they, and most of them know how to guard against them, and will do so, I am bold to say, if you as purchasers are willing to pay the extra expense and cost of propagation.

But is there not a safe and easy remedy outside of making the propagator this extra trouble? I think there is, and that lies in yourself. Purchase of the nursery some of the above named hardy, strong-growing trees; plant them out, and at the right time regraft them with those popular commercial varieties that are known to be tender and not to do well root-grafted.

ALL CENTERS IN THE MAN.

Here lies the strongest point in horticulture: the man. He is the main factor, the one that needs to rise above his avocation, else his business must suffer. He must be a close observer of facts and results, able to trace cause to effect and effect to cause—the master of his business. He must read as well as think, and that carefully, if he would select gold from the dross. Good brains are invaluable in any business. He must learn how to propagate, how to cultivate, and how to fertilize; how to pick and handle the fruit, and how to market the same. He must learn, likewise, how to combat the army of insects that prey upon the orchard and vine. A man that can not overcome obstacles that lie in his power, is like one who lies down in the shade and is forgotten. Take man out of horticulture, and it will return to where he first picked it up—to the wilds and jungles of nature.

Should any one desire help in this beautiful study, let me point him to the popular works of the Michigan State Horticultural society.

SOME OBSERVATIONS.

Mr. GULLEY asked about the age of stocks for top-grafting, and said he would as soon whip-graft in the nursery row, at two years of age (not sooner) as on transplanted trees two inches or more in diameter. A Golden Russet, root-grafted, is on a seedling. Why use the Russet?

Mr. BEECHER: I would use the Golden Russet, Spy, and Lyscom so, because they are hardy and the seedling is not.

Mr. WILLARD: The stock affects the root and transforms it, so that there is nothing left of the stock's original tenderness.

Mr. BEECHER: These double-worked trees are thoroughbreds. We have uniform stocks and so have uniform trees.

Mr. GULLEY advocated his plan of double-working for the same reasons. By use of the hardy stocks we get uniform roots and both roots and trees are hardy and strong.

Mr. MORRILL: Does it provide hardy tops also?

Mr. RICE said he asked the same question at a meeting lately in Ontario, and they said such was the case, one gentleman telling how Spy had been made hardy in Canada by grafting upon Talman Sweet stocks.

Mr. BEECHER cited some cases, near Saginaw, in which some Russian

stocks had made the Baldwin hardy, other Baldwin orchards, near by, having been killed by cold.

Mr. HOLLISTER of Monroe knew of the same instance, and said that Red Canada on the same stock proved hardy at the same time; and he told of similar success of this method with other varieties in Lapeer county—Red Canada and Stark on Oldenburg, and King and Peck's Pleasant on Talman Sweet and Spy. All made hardy, fine, uniform tops.

NO SUCH APPLE AS STEEL'S RED.

Replying to a question, Mr. LYON said there is no apple properly called Steel's Red and so recognized. The name is a synonym, an interloper. In New York it came to be applied to the Baldwin, because a man named Steel got Baldwin trees, not knowing what they were, and the fruit got his name. In Michigan, near Plymouth, a man got some grafts for Greening, but was told the red apples they bore were Steel's Red, and they were so disseminated, but were really Red Canada. So the name came to be applied, in two states, to two varieties. Orders sent to New York for Steel's Red trees will bring Baldwins. Do not propagate Red Canada by root-grafting, for it does not succeed so. Top-graft it always upon some hardy stock.

THE SEASON OF 1891 IN NEW YORK.

Under this heading, Mr. S. D. WILLARD of Geneva, N. Y., presented the following paper:

If in the few words I may say to you on this occasion, I should express sentiments not entirely in accord with your own, you will, I trust, be considerate and charitable, bearing in mind that we are residents of different states, with different surroundings (climate, soil, markets) and hence have different experiences.

We all have our varied experiences, but most of us are rather slow to communicate them to others. Nevertheless, what is more interesting than a good experience meeting, just such as fruitgrowers can have when all take a part and no one waits for another? I always enjoy such, and invariably have found that in meetings of this kind, where the gates are open wide and each one tells all he knows (and perhaps more) and then something he does not know, there is much that is useful and instructive to be gleaned and carried away to be added to my stock in trade. From my childhood days, fruitgrowing has had about it charms that I have been unable to see in any other department or profession of life.

The year just passed, to all fruitgrowers, I think, has been one rich in experience, if not in dollars and cents, and were all the craft consulted, from the north, south, east, and west, I imagine you would be informed that the year had been full of instructive lessons; and further, that the amount charged up to the debit side of educational expenses had been somewhat in excess of former years.

ALL MAKE MISTAKES.

Well, everybody makes mistakes. This is true in all professions. The lawyer, the doctor, the preacher, the editor, and even the politician, ambitious and sharp as he may be, as an aspirant for presidential honors, finds disappointments and discouragements to face, as a result of mistakes made that might have been avoided by judicious care and the application of well known principles and good common sense, just at the right time and in the right place.

No matter of surprise, then, that the fruitgrower, whose opportunities have been in a less extended scale, and whose field for observation has been circumscribed by the limits of his own county or state, should likewise find himself a victim of his own folly. We fruitgrowers are not unlike the rest of mankind, and in our experiences we fall into many errors that might be averted, but which in turn serve to relieve us of any burdensome surplus, financially. To consider some of these errors or mistakes is the object at this time, and the advising of such measures as may aid in avoiding them in the future.

Stubborn facts are what we are called upon to face when high prices for what we buy and low prices for what we sell are affording problems, the solution of which is taxing the financial genius of many a man to its utmost capacity.

Each year seems to demonstrate more fully than the preceding, wherein the mistakes are made, and therefore should the better fit us to avoid them in the future.

We have journals, societies, state aid, and government aid, and men of science, all ready to afford the required help and to teach us how to conduct our business with success. Let us utilize all these means at our command and become masters of the situation. Our state experiment stations are doing a grand work, but they should be wonderfully multiplied, until every good commercial fruitgrower should have a station of his own where he should test at least one of every variety of those fruits which he might wish to grow, and which, from such information as he might be able to derive, he would regard as adapted to his soil, climate, and wants. Were this course adopted, what an experience meeting we would have here at this time, and what an amount of intelligence and talent would be added to all horticultural meetings! Is it not safe to assume that it is a mistake that there is not more of this practical work done? Perhaps, however, you of this wide-awake state are fully abreast of the times and far in advance of us in the east in this regard.

BALDWIN APPLES FAILED.

The failure of the crop of Baldwin apples, which has now been so general for three consecutive seasons, has, we think, shown conclusively that this variety has been planted too largely, to the exclusion of other red apples, which, to say the least, should constitute a part of the orchard. The Hubbardston, Sutton's Beauty, McIntosh Red, Gilliflower, and Ben Davis all have given average crops during this time of Baldwin failure, and as they are productive and sell well in the markets, why should they be so neglected or overlooked? I have named Gilliflower and Ben Davis last, and yet the prices at which the fruit has been selling for years, being much higher than that of Baldwins and Greenings, would indicate that

they are worthy of more attention than they have generally received. Last week's quotations in New York were as follows:

Baldwin and Greenings.....$2 to $2.25 per bbl.
Gilliflowers.....$2.25 to $3 per bbl.
Ben Davis and Steel's Red.....$2.75 to $3.25.
Ben Davis at par with one of the best.

It is possible that the beautiful polish that follows the rub of the greasy coat-sleeve of the Italian may have its effect, but this is no exceptional quotation. It has been the rule for years, and probably no two apples can be produced so cheaply as Gilliflowers and Ben Davis; and yet we fail to grow them to the extent wanted, because not up to our standard of excellence.

Again, for years past there has been a scarcity of good fall varieties of apple which are adapted to the city fruit stands. The high prices that have prevailed for such apples fully illustrate the force attached to this statement. Stump apples, put up in peck baskets, have within three years sold at eighty cents per basket, while McIntosh Red (late fall and early winter) have repeatedly sold at $2 to $2.50 in half barrels. Has not the neglect to grow more good autumn apples been a great mistake?

DIVERSIFY YOUR PRODUCT.

The commercial orchardist, in my opinion, is quite apt to make all his ventures in one direction. By this I mean to go too exclusively into one kind of fruit. To illustrate, all apples or all peaches, and so on, when, in fact, common-sense and good judgment would dictate a more general line of such fruits as may be grown successfully upon his soil, and for which there may be good market, so that in the event of a failure of one there may be others from which may be sold sufficient to pay current expenses. The pear, plum, quince, currant, gooseberry, blackberry, etc., are all factors to be considered in this proposition. Said a party to me, two years since, who has a fifty-acre Baldwin orchard from which he has had only one full crop in five years, "Had it not been for that plantation of blackberries, I could not have paid my family expenses for the past two years." Such instances could be multiplied, and show the wisdom of the adoption of the plan proposed when feasible. We would say, then, adopt the system of mixed husbandry, where possible, and grow as great a variety as circumstances, of which you are the best judge, will premit, and you avoid one of the mistakes too often made.

Much might be said as to the value of good crops of small fruits, such as currants and gooseberries but our limited time will not permit. In general, when a good market, is accessible, they are very profitable, and prices as a rule, in western New York, have been well maintained.

In the state I have the honor to represent, it has been reported as a fact that seventy-five per cent. of all the dairy cows fail to pay their owners any profit. Think of it—seventy-five out of every one hundred cows stabled, fed, milked, and product marketed at a loss! My own slight experience in the cow business would incline me to the opinion that the statement is correct. The fact is, they give no cream. The milk is worthless except in the hands of the milkmen, who will buy only at very low prices so long as good hydrants are within easy access.

We say this is a sad commentary on the intelligence and business saga-

city of the dairymen; and yet, if you will ride from Maine to Michigan, I think you will come to the conclusion this is equally true of those engaged in fruit culture, and that fully three fourths of the fruit trees growing in the good fruit districts fail to pay the interest on the land they occupy. They may produce fruit, but oh! such fruit. There is no cream about it and it is simply forced upon the markets to compete with and break down the market value of good fruit in time of a surplus. "By their fruits shall ye know them," and that ye can not gather grapes from thorns, etc., is certainly true.

BE CAREFUL HOW AND WHAT YOU PLANT.

We should plant only trees from reliable families that produce fruit of the right sort, and if we have been so unfortunate as to have a stock of of others, graft them over to those wanted, at the earliest moment practicable.

In planting new orchards, study adaptability thoroughly, give them such excellent care and generous feed as will develop their surface in the least possible time consistent with a well-ripened growth. Much more may be done in this direction than is generally supposed, by judicious culture and the application of such wholesome plant food as may be at our command. How often we pass the roadsides and fence corners without once thinking that they often harbor much that is the best kind of plant food. Those old sods are rich in just those elements we would buy in a first-class commercial fertilizer. That muck swamp, which for centuries has taken the wash of the surrounding land, full of decaying wood and leaves, as an absorbent of the salts and gases of your manure heap is unequaled for that purpose and will hold them in readiness for the action of the little rootlets of your orchard trees that are ever ready to perform their allotted functions. Every one knows the value of wood ashes and fine ground bone—nothing is better to produce good, hard, ripened wood from which are developed fruit buds that are especially adapted to stand severe cold. The man who fails to make a good use of all these means at his command makes a mistake. Much might be said on the experience of underdraining, its effect on plant life, etc., but time will not permit. Let it suffice to say, no fruit tree can be healthy with roots submerged one half of the year, and artificial drainage should be provided when it is not natural.

GREAT DAMAGE BY BAD PRUNING.

Observation and experience have taught me that good, judicious pruning (or a lack of it) is a grave error into which a large number of otherwise good fruitgrowers have unwittingly fallen, and that the operation of pruning requires the application of much more good common-sense than is usually accorded the subject. Thousands of good trees are annually ruined by the unwise use of the saw and axe, all of which might have been prevented by beginning the second year from planting and following up annually, as might be required, to let in the necessary light and air, and in such a way that none of the vital forces are left to be expended in producing waste material which, sooner or later, must go to the brush heap. This subject, in a short paper of this kind, can only be touched in a general way. No iron-clad rule can be laid down which will hold good in all

cases or on different varieties—hence the difficulties surrounding the case. No book I have ever read affords the required information or covers the ground that will enable the novice to go forward intelligently in the performance of such work, hence the importance of a home experimental station, where all such work can be done and the results observed. At the age of fifteen years, following the outline of some reading on this subject, some experimental work was done in this line which afforded lessons never to be forgotten. They yet stand as monuments of the folly of the boy. It was a grand object lesson for me, but came near bringing death to the trees. The country is filled with unsightly objects that either have never been pruned at all, or, if so, have been neglected until the cutting away of large limbs here and there has left the tree only a fit subject for disease and premature death. Nothing need be said further on the subject, save the fact that different trees require different principles of pruning. To illustrate, standard pears need none and should have none, save cutting out interlocking limbs and suckers, while dwarf pears should have from one-half to two thirds the annual growth of young wood removed, if satisfactory results be attained; and so we might go through the whole list of different sorts, to do which would fill a book; and we will simply add, all trees and small fruits, to produce the best results, require annual attention —the removal of unnecessary wood and cutting back the previous year's growth, when required to give good fruit of the best quality.

My attention was called a few weeks since to two orchards of apple, planted some ten or twelve years ago on land of precisely the same quality and divided only by a highway. One has produced three crops, one of them being an average of two barrels to the tree. The other has never yet made a single barrel of apples. The one has been under annual cultivation, has been fed and pruned. The other has cared for itself, like thousands through the country.

We are living in a period of the nineteenth century when success demands interest, thought, word, and deed. Life is too short and time too important a factor in the affairs of the world, to accept of anything short of electric speed in the conduct of our business. Therefore, the importance of making no mistake that shall involve delay and prevent our being among those that get into the front ranks in this most honorable and elevating of all professions.

So much has been said or written on the very great importance attached to this question of picking, handling, and packing, which so often settles the question of selling at a profit or loss, that I am sure no reference needs be made to this subject.

A WORD ABOUT VARIETIES.

As the question of varieties is a matter of so much importance, and I have been especially asked to say something on this point, I will simply refer to those fruits in which I am especially interested, leaving the question of peaches to those who I assume ought to be far better posted than I am. The varieties of pear grown for market purposes here has, during the past twenty years, notwithstanding the large number of new sorts introduced, been greatly reduced, so that to-day Bartlett, Clapp, Howell, Angouleme, and Kieffer compose probably three fourths of all pears grown largely for market in western New York. As for cherries, we find Montmorenci, English Morello, Napoleon, and Windsor by far the most profit-

able and best adapted to all commercial purposes, considering hardiness, productiveness, and general market demands.

POINTS AS TO PLUMS.

The growing interest that has shown itself during the past twenty-five years in plum culture, has led to the introduction of many sorts of the European type, which in some regards have been a decided improvement upon many of the older varieties. The first consideration has been hardiness in wood and fruit-bud, and then productiveness, style, good handling qualities for market, and lastly quality. Most markets prefer high-colored fruit. The Bradshaw has long been a standard as a large, early ripening fruit, of fine style, but Schoharie county, New York, has given us the Field, of equal size and style; wood more hardy, and ripening ten days earlier. Maryland has given us the Prince of Wales, some two weeks later, which is also very hardy, exceedingly productive, and for style all that could be desired. England has also given us the Diamond, for mid-season, and the Grand Duke, Archduke, and Monarch for late ripening sorts, all of which, it would seem, will come to be regarded as great acquisitions to the commercial plum-grower; while to France we are indebted for the French Damson, in every respect the best of all the Damson family; and the Reine Claude de Bavay, the choicest of the Green Gage family, but rather too tender for many locations.

America has given us Peters' Yellow Gage, the best of all yellow plums, combining in an eminent degree all that is required in a first-class light-colored plum, to meet the wants of the most fastidious in taste; while from the same source come a host of others of value, whose period of ripening, however, is not in all instances exactly what we require. The introduction of a little foreign blood in the vegetable, as well as the animal, kingdom seems to be desirable in order to produce the best results.

While engaged in our experimental work, we may well investigate the new Japan plums, which certainly possess some characteristics that may be of great value to some sections of our country. Like the Japanese pears, they have a foliage unsurpassed in quantity and ruggedness which is carried through the season and would indicate a wood sufficiently hardy to fit them for the climate of New York or Michigan.

One very marked characteristic in all of these Japan plums, is their very strong and rugged foliage, which does not so far seem to be affected by any of the insect life or diseases that prey upon many of our choice European sorts, and sometimes weaken them to such an extent as to unfit them to withstand the severity of a hard winter following a heavy cropping.

Of these, there have been quite a large number of varieties introduced into this country, among which are several under the name Botan; and from information derived from the head of the department of agriculture at Washington, this appears to be the name of a family. One of this family has already been renamed Abundance.

In order to avoid confusion we have numbered the best two of this family as No. 6 and No. 26. The latter, No. 26, is of very good quality, productive, and markets well and ripens two to three weeks in advance of any plum we have. In 1891 it ripened July 18. Another, and so far as we can judge the best of all so far tested, is Burbank's Japan. This variety seems to combine hardiness, good quality, and good productiveness in an eminent degree, and may be styled a late ripening sort. In 1891 it

ripened from the 20th to 25th of September; and a single branch of eighteen inches matured forty-five specimens of perfect fruit. This sort seems especially hardy in the fruit bud. Several other varieties have been discarded for lack of qualities that would fit them for desirable market sorts. I should have stated that one, No. 6, is supposed to be the same as Abundance.

APRICOTS INCREASING IN POPULARITY.

The introduction of the so-called Russian apricots, which in themselves are probably of no value, may have served as a stimulus in the way of growing and testing other varieties of this fine fruit, so that today there is a growing interest in this fruit that has never before been seen; and several varieties have come to the surface that it would seem can be grown with success. One party had 1,000 bushels the past season. They are wanted not only on the fruit stands of the cities, but also by canning establishments. The manager of one of these, a few weeks since, informed me he packed 500 cases the past season and could easily have sold 5,000, affording a profit which I venture to say would satisfy any of us. Is not this fruit worth a trial on the east shore of lake Michigan? Varieties so far that have done well are Harris, Early Montgamet, and Oliver's Early Peach.

BY WAY OF CONCLUSION.

Notes have been prepared with reference to diseases and insect life, which the successful fruitgrower is called upon to combat every year—such as black-knot, yellows, apple-scab, and scores of a kindred nature—but all of this is a subject so vast as to form a topic alone for consideration. Therefore I leave it entirely, to be taken up in your discussion, as interest may indicate, simply suggesting that, if not done already, a law should at once be enacted by your legislature that will enable each town to clean out black-knot in the plum and cherry wherever found.

Avail yourselves of the necessary apparatus and chemicals, at a season of the year when you have time to give the business such consideration as it demands, and have all in readiness to make your fight early in 1892, against all enemies of whatever name and nature, and you will have no reason to regret mistakes which your less cautious neighbors will be likely to make.

THEY QUESTIONED HIM.

After concluding his paper, Mr. Willard spoke with great earnestness in warning against tolerating even the slightest appearance of black-knot, depicting its destructive ravages in Massachusetts and the Hudson river valley. Questioned as to other varieties of the plum, he said the Hudson River Purple Egg is one of the very best varieties we have. It originated in New York and is a long, purple plum of the prune type and is very productive. The only objection to the Lombard plum is that it ripens in midseason when prices are likely to be low. The same is the case with Shipper's Pride. "How much ground bone should be used to

the acre?" was asked. "O I don't know," said Mr. WILLARD; "all depends upon the quality and needs of the soil, so the amount that may be profitably used greatly varies. I have seen wonderful results from use of ground bone in Baldwin apple orchards. The French Damson is the best of all Damson plums, because of its good foliage. It is hardy and productive, but not an early bearer. Quackenboss is very late in coming into bearing, and is large and fine but gives small crops. No American plum does well in western New York, and I would not plant one, anyway —I like a good thing. Probably DOWNING is the best American gooseberry, but I prefer the new English sorts. I keep mildew off from them by use of the ammonia and copper solution. Liver of sulphur 'does up' mildew completely. Industry gooseberry is an excellent kind. I would not put the English gooseberries on gravel, but on cool, heavy soils. I did not mention the Anjou pear because, though of great excellence, it is not in demand in the markets. I like the Victoria currant and it is profitable. I have known it, under careful pruning, to pay $200 net per acre in Nova Scotia.

Thursday Evening Session.

The session of Thursday evening was given up to the social features of such occasions, and it was in all respects most enjoyable.

After a piano solo by one of the ladies who did so much, musically, to make all the sessions pleasant, Mayor MCILVANE of Port Huron delivered an admirable address, which was promised for publication but has not come to hand.

Mr. C. J. MONROE of South Haven followed, speaking of the pleasant social features of these occasions. He came not from Allegan county (alluding to an error of the chairman) but from within a mile of there. That vicinity has been greatly benefited by the State Horticultural society, which now meets here for the first time, though it is twenty-one years old and has held, usually, four meetings per year. If it stimulates an interest in fruitgrowing in Port Huron and vicinity, we who have come here will feel amply repaid for our visit.

Mr. S. D. WILLARD, vice-president of the Western New York Horticultural society, followed in one of his always felicitous speeches, first complimenting the beautiful display of flowers. At the meetings of this kind he has attended, he has seldom seen it equalled. As did Mr. MONROE also, he spoke in high terms of appreciation of the music. He dwelt at some

length upon the great advantages the present generation has over its predecessors in point of educational facilities and a thousand other provisions for their information, refinement, and comfort. Fruitgrowing, he said, is now a success largely because of scientific development; and he urged unity of action to secure legislative aid for advancement of agriculture and horticulture.

The next speaker was Mr. A. M. SMITH of St. Catherines, Ont., ex-president of the Ontario Fruitgrowers' association. Ontario, he said, has the largest horticultural society in America; and we believe that, while Michigan beats us in peaches, we may with truth claim to be the best region in the world for apples. Ontario used to be regarded as hopeless as a horticultural region, but now the greater portion of the province grows fruit. They made a successful show at the Columbian Exposition. For their inspiration and growth in pomology they owe much to the societies of Michigan and Western New York. Mr. SMITH extended an invitation to the fruitgrowers of both these societies to attend a great demonstration at Grimsby Park—a two days meeting in connection with a farmers' institute, to occur at some date in June.

Judge MITCHELL of Port Huron said he had been for many years interested in agriculture and horticulture and had kept in mind their advance in Michigan. The unoccupied lands spoken of by one speaker, are the key to our situation. Years ago, "the thumb" was out of reach of the improvement of the state, having no railways. We had only the pine and the lumberman; and when the lumberman leaves a region he is worse than fire and desolation. But gradually there were beginnings of agriculture, and later the people began to talk about fruit. Judge MITCHELL highly complimented Mr. L. B. RICE as the pioneer in horticulture in this region, and thanked him for bringing the State society to Port Huron. "These lands," he continued, "are producing the finest of apples, pears, and plums and small fruits; and there is considerable advantage here from the lakes, though the springs are late." He thanked the society for this visit, and expressed a hope that it would do something to help the really fine country further up the Huron shore.

Mr. R. MORRILL of Benton Harbor said the society was to be congratulated, not commended, for going to Port Huron, and he recited the many pleasant features of the meeting. "If we can not gain some information from you, we will have largely failed in the object of our coming. A man once said to me, 'You horticulturists have peculiar ideas; they are not business; you expose all your secrets.' So it is, and 'tis remarkable. Thoroughbred horticulturists are not clams—they do not shut themselves up when you approach them. They are not the wealthiest class of farmers,

but they enjoy themselves. But what do we here? Why, simply seek to add to the great competition which already exists." Mr. MORRILL than gave the financial statistics of shipment of horticultural products from Benton Harbor which were recently printed in these columns and generally in the state press.

After another musical selection, the session adjourned.

Friday Morning Session.

Opening the concluding session, the secretary read the appended letter from Mr. G. W. CLINE of Winona, Ontario, upon

CANADIAN PLUM CULTURE.

As it is impossible for me to meet with you, I send you on paper some of my experience in growing plums for the past twenty years. I have found that, for my section, the list of good plums is larger than that of any other of the cultivated fruits. I have grown and found good and profitable, over forty varieties, and have not fruited all varieties recommended yet. This list, as follows, has done extra well. In order of ripening it comprises Imperial Gage, Washington, Bradshaw, Niagara, Duane's Purple, Smith's Orleans, Myers' Seedling, Lombard, Victoria, Huling's Superb, Yellow Egg, Monroe Egg, Glass' Seedling, Columbia, Quackenboss, Pond's Seedling, Gen. Hand, Coe's Golden Drop, Reine Claude de Bavay, German Prune; but there are others, that I believe are just as good, that I have not had long enough to judge of them, such as Jefferson, Shipper's Pride, Gueii, Stanton, Field, Peters' Yellow Gage, Saunders, Hudson River Purple Egg, Red Egg, Green Gage, McLaughlin, Dunston Superb, Shropshire Damson, English Damson, Canada Orleans, Fellenberg, French Prune, Peach plum.

The first list I am always ready to plant, knowing them as extra good from my long experience with them; but the best advice I can give any planter is to look about among his brother growers and note the situation and the soil in which the different varieties are growing and doing extra well. I do not think it advisable for any planter to plant largely of any new varieties, as the chances are older established varieties are the best. How seldom does any of the new varieties of fruits that come out with a flourish of trumpets prove equal to the old! But by all means try a tree, or vine or two, and await results. You will make money by waiting, ninety-nine times out of one hundred, over rushing in and planting largely of new and untried sorts; but there is room for improvements in our fruits, and in time we will get some if not all of them.

I am not favorable to any of the plums of the wild sort, as Wild Goose, Moore's Artic, Weaver, DeSoto, and many more of that stamp, as they are worthless for this section, and I have but little faith in the Japanese plums so much talked of and advertised. Still, we must try those we

think the best and judge for ourselves; but try them lightly, as I feel assured you will find none of them equal to our old well-tried varieties.

As to cultivation, I find that you can hardly give too much of it after trees once commence bearing. Before that, if soil is very rich, too much cultivation may cause a too thrifty growth; and if the growth is very long, it should be cut back, early in spring, about one-half, or your trees will become misshapen. For fertilizers, some soils may be rich enough in all the parts that go to form fruit. Then, again, there may be plenty of nitrogen but lack of phosphoric acid, or potash, or it may lack all these, and that is often the reason people who have fruit trees do not get any fruit. Where such is the case, I advise applying, in June, ashes to some trees for potash; dissolved bone to others for phosphoric acid; to others, a complete fertilizer composed of all these. You will then find out what is needed and which has done the best, but you will not receive any apparent benefit that season, as these fertilizers often require to be applied a season in advance to give full benefit, where trees do not blossom; but where trees blossom and fail to set fruit, early in the spring may answer —as soon as snow is off and enough frost out to allow the fertilizer to soak into the soil. These are points in manures that I have tried to my satisfaction. But try them for yourselves, as soils differ so very much and locations, climate, and all go to require changes from any formula for growing fruit.

There may be some here who do not want to plant a large variety of plums, or a large quantity of trees. For those I will here give a small list of some among the best, in order of ripening: Washington, Bradshaw, Lombard, Yellow Egg, Glass' Seedling, Coe's Golden Drop, Bavay.

Black-knot was very bad with me for several years, but I commenced using commercial fertilizer on my orchard every spring, early, and cutting the knots twice each year, always burning the knots. I always cut in July and August first; then, as soon as leaves fall, cut those I missed before. My orchard is very nearly clear of knots at present, and trees very healthy and bearing large crops. But they would not, if I did not destroy the curculio, which have always been bad with me. For several years I jarred the trees and caught the insects on a sheet. This was very hard work, and when spraying with Paris green came to my notice, some eight or ten years ago, I bought a Lockport pump and went at it, and found it good—so good that I have sprayed every year since, my pears, plums, and apples for insect pests, and would no more think of trying to grow good fruit without it than I would of flying without I was built that way. I use scant three ounces of Paris green to forty gallons of water, kept well stirred.

Mr. WILLARD pronounced this a practical paper by a successful man, having in it points worth remembering. He cautioned plum-growers to exercise great care in use of arsenites, as the leaves of the plum are exceedingly sensitive; and he had had losses from use of too strong mixtures. Spraying for curculio had not met growers' expectations in New York, and they were obliged to continue use of sheets. An implement is made in Geneva, N. Y., for this purpose, being a sheet mounted on wheels in nice shape. He had not been successful in efforts to stop rot. He advised thinning plum crops, first by cutting back and afterward by removing surplus fruit.

Mr. GULLEY said the copper solutions have been used with great success in restraining rot of the plum and peach, and all other kinds of fungous diseases of leaf and fruit. Mr. WILLARD expressed great faith in them.

ONIONS ON MUCK SOIL

was the subject of the next paper, read by the secretary, in the absence of its author, Mr. W. H. PARMELEE of Hilliards, Allegan county. It was as follows:

By request of your secretary, I send you a brief sketch of my experince in onion-raising upon muck land. I should be much pleased to be with you in person and share in your discussions; but, circumstances not favoring, I must content myself with writing, hoping by this means to be of some benefit to others, while I hope to be profited by your deliberations, in due time, by reading them in print.

EVOLUTION OF AN ONION FIELD.

To begin with, I am writing no fancy sketch, neither am I giving the opinion of others solely, for I have been right there myself, crawling for miles on hand and knee, weeding-knife in hand, using hoe and spade with greater freedom than I can use the pen. The swamps of Michigan differ much in their make-up. We have had no experience in reclaiming cranberry marshes or swamps of a springy nature. Ours was simply a dish of about five acres in extent, in which water would stand quite deep in a wet time, but in a very dry fall would disappear entirely. Thirty-seven years ago it was covered with a dense growth of tall pine, bordered with black ash, with alders interspersed. Twenty-five or thirty years ago, a fire ran through it, felling the timber in every conceivable direction, and there for a number of years it lay, about thirty roads from my house, a perfect eyesore to gaze at. It was the rendezvous of frogs which gave us many an evening serenade in full chorus; while the wily rattlesnake, as if on picket duty, lay in ambush on its outskirts. The spring rains would fill it with water, from one to three feet deep, and there it would lie and stagnate in the hot summer's sun, and thus it became a fruiful source of malaria in the neighborhood.

To remove this stench from our nostrils was the work undertaken—with no reference, however, to the onion business at the time we undertook the job. That was an afterthought. We had to go about ninety rods to find a good outlet, from three to five feet deep through dryer land. We first tried open ditches, ran the water out, cleared the timber off, and commenced cropping it; but the ditches soon filled, and we lost the use of the land. It became a skating-rink for the boys in winter, and they could paddle their canoes over it in the spring. Though baffled we were not defeated in our plans; but went at it again, made a careful survey, found we had sufficient fall to give a line of tile through the ninety-rods outlet a grade of one inch in four rods, and bring it two feet under ground in the swamp.

HOW THE TILE WERE LAID.

We purchased the tile, using six-inch for outlet, branching around in the swamp with three-inch. We placed a large barrel in a suitable place

in the swamp, and from near the bottom of this the outlet started. The small branch lines ran into it three inches above exit. Room for sediment was left at the bottom of barrel. The small tile ran on a light grade to the outskirts. A box was placed over the barrel and all covered. Our grade was very light from beginning to end. We therefore worked with great caution, lest at any time we fall below our regular grade and thus leave room for sediment to settle and choke the tile, diminishing its capacity. A cord was kept stretched tight overhead, parallel with bottom grade, and from this we measured down in grading and placing the tile. It was our first effort at tile laying; yet, guided by the information we gathered from books and papers, we made a complete success.

About eight years ago the job was completed and the tile seem to be working today as nicely as ever, apparently good for scores of years to come. We have since dug an open ditch on one side, cutting off a part of the water flowing from high lands above, so that the tile may be able to exhaust the water in case of very heavy rains, before killing of tender vegetation can ensue. From first to last the draining has cost us $300. The clearing, I do not know how much, but a good many hard days' work, I can assure you. But has it paid? We think so. A scar has been removed from the landscape, and that pays well; a fruitful source of disease has been removed from the neighborhood, and that pays still better; and, should you chance to drive by it next June, you can feast your eyes upon one of the finest truck gardens you ever saw, dry and mellow and completed, filled up with long, straight rows of onions, carrots, mangolds, or some other "truck." The first two years after tiling, we cropped it with corn. Then, the land being well subdued, we tried roots of various kinds.

UPS AND DOWNS OF THE BUSINESS.

For the last six years, in the heart of this garden bed where the muck is deepest, we have raised a patch of onions varying in size from one to two and a quarter acres. The first year we had one and five eighths acres, raised 911 bushels, and sold them at fifty cents per bushel. In 1888 we raised 900 bushels, kept the most of them till spring, and then drew them to the field and plowed them under. While we were harvesting them, a gentleman driving past wanted some, as they looked very inviting, so we placed a few in his buggy, for which he paid us fifteen cents, which was all we received for the entire crop, the market being completely glutted. Of course we were disappointed, but we do not carry all our eggs in one basket, so we managed to stand the loss. We follow general farming, onion-raising being brought in as a sort of knitting-work to fill up the spare moments. The crop of 1890 we were more fortunate with, as there was a light crop in the country and they brought good prices. Taking one year with another, fifty cents may be considered a fair average price, and four hundred bushels a good yield per acre. Your crop will often fall below this, through insect depredation, dry weather at the time of bottoming, or failure of seed to germinate; while it is by no means impossible to grow six hundred bushels to the acre when everything is favorable. We sow the seed about the middle of April. Four pounds to the acre is the rule, but three pounds are plenty if seed is good and evenly sown. It is better to do some thinning than to have too many vacant spaces. We prefer to have varieties that ripen early, as it is better to have them harvested before wet, cold weather sets in. Early Red Globe, Yellow Danver, Early South-

port Red Globe, are all good varieties and do well with us. The Red Wethersfield is a strong grower and good keeper, but a little later.

METHODS OF PLANTING.

All plowing upon muck should be done in the fall, that frost may act upon it. But after ground has once been thoroughly fitted, we prefer not to plow at all, as the labor of weeding is increased thereby. We harrow thoroughly, then smooth it with a plank "rubber." We next draw a line straight across the field and run the drill by this the first time across; afterward the drill does its own marking. We use the Planet Junior drill. We make rows 14 inches apart, and eight onions to the foot we consider about right in the row. Still, if a little thicker they will bunch, rise out of the ground, and make fair onions if the ground is rich enough. We should guard against having them so thick as to cause them to spindle up and lop over before time to bottom. It is a very tedious job to harvest a crop of small onions, as they all have to be handled one by one in topping. As soon as we can see the rows well, we run a Planet Junior cultivator astride the row, and a skillful hand will run very close to the onions, and on light muck can do a nice job in a short time. We run the cultivator many times over the ground through the growing season, and especially after every rain, to break up the slightest crust that may form. A mellow surface acts as a mulch and helps to preserve the moisture beneath it. But the cultivator will not do all the work. We must get down on our knees, knife in hand, and clean out the rows.

Thinning should be done when the ground is quite moist, and as soon as the plant is tough enough to draw without breaking. We never expect to get rid of weeds entirely; but, by being very careful about letting any go to seed, we can make the weeding much lighter. The last season we estimated the hand weeding at about one quarter of what it had been in other years. In onion-raising on muck we must take time by the forelock, for weeds grow very fast and the pulling of large weeds from a row of onions in a soil so loose is a bad job, especially if the ground is dry.

HARVESTING AND STORING.

We aim to grow varieties that will ripen the fore part of September, so that they can be harvested when the days are bright and sunny, as they seem to harden up and keep better. In pulling we throw six rows into one, let them lie a few days in the sun to cure. Then they are ready to top. They should be pulled soon after the tops soften and fall over, for, should there come a rain, they are likely to throw out new roots and make a second growth which impairs their keeping qualities. A dry, sunny day should be selected for drawing and storing, using the middle of the day, when the shucks will rattle like paper. They will keep much better by so doing.

If we intend keeping in the winter they should be placed in a frost-proof building that can be well ventilated. We place them on racks about ten inches deep, building one above another, using common lath supported by two-inch plank for bottom. In this way we can dry them out, should they gather dampness. Do not let them freeze, but keep them at a low temperature. We try to avoid, as much as possible, chan-

ges of temperature, by opening and closing the ventilators, guided by the thermometer, which we closely watch within and without.

Onions do well year after year on the same ground. but we must use fertilizers, for the richest muck will, after a time, need them. We are giving ours a heavy dressing of manure this winter. It is very important, I find, to have our muck well drained, so we can work it early in the the spring; and, if too wet, the onions will run more to scullions, or be soft and spongy and, of course, poor keepers. Still, if too dry when bottoming, the crop will be very much diminished.

We hope to regulate, to some extent, the moisture in our muck by placing a cut off in the outlet, which can be easily done by sinking a cistern in the hard land, plastering it with cement, and running the tile through it, and there fixing a gate that can be opened and closed at will.

I need not continue this subject further, but cheerfully submit it for further discussion; and, if this short chapter from my experience shall lead the way to the redemption and utilization of any other stagnant pond, now marring the beauty of our noble state, I shall feel amply repaid.

FRUITGROWING ON LIGHT SOILS

was treated in the accompanying paper by Mr. ROLAND MORRILL of Benton Harbor:

This topic may refer to a great variety of soils, ranging from an extemely rich, sandy loam to the barren sand plains which are generally considered worthless and no doubt have no value today but may have in the future. The soil referred to can not mean any soil which contains much clay, clay loam, or having a clay subsoil; at least I shall not consider such soils as coming within the limits of my topic, and will treat only of such soils as are composed of sand or sandy loam resting on a sand or gravel subsoil. I would state also that my experience and observation have been confined mainly to soils that grew heavy, hard-wooded timber, such as beech, maple, and oak, and what I say may not be applicable to pine lands in all cases.

One of the first things to determine, if you are planting in such soils, is whether you wish to plant for market or for home use only. If for the latter purpose, you can plant anything that thrives at all in your vicinity, as a partial success is much better than to deprive your family of a full line of fruit; but if you are planting for market, the case is entirely different, as you must then come into competition with men who are favorably located, and you will not grow rich very fast from half crops or inferior fruit.

Among the small fruits which succeed well on good light soils, I will mention strawberries, grapes, raspberries, and gooseberries, about in the order named; at the same time, fair crops of blackberries and currants can be grown in good locations; and if it be pine land, I would place blackberries first in the list of the above fruits.

The different varieties of each fruit seem to have their likes and dislikes in soil, which makes it important that we make proper selection of varieties. Of this I shall speak further on. For general fruitgrowing, I am convinced that a rich, sandy loam, resting on subsoil containing a fair proportion of clay, is superior to all others, the next best being the same resting on compact gravel or sand, and the poorest is a poor sand resting

on loose sand or gravel; but even this can be made to produce fairly under proper treatment, which in a general way I should undertake to prepare as follows, taking just as many acres as I could apply to a fair dressing of manure very early in the spring. Then plow not more than five to six inches deep; then apply seventy-five to one hundred bushels of wood ashes, broadcast, and harrow in; then sow one peck of Mammoth clover seed, and roll or harrow in lightly. When the clover is nicely up, sow about 100 pounds of land plaster per acre; then, when the clover begins to show heads, which will be the latter part of July, put on a mower and cut the clover and weeds, letting it remain just where it falls. Next season let the clover grow as it pleases, and in the fall or the following spring plow under, and your ground is in prime condition for fruit or any other crop, but there is one thing that must be done to make this plan always a success. That is, the seed must be sown as early as the ground will work well; and another thing that must not be done, is sowing a crop of oats or other grain at the same time. Recollect, I am not speaking now of fertile lands, but of land that is naturally poor, or partially exhausted: and let me say that any land that will not respond to this treatment is not worth cultivating. Where ashes can be secured in abundance, two or three hundred bushels per acre will be much better than less, but clover is almost certain to catch and grow well on any sandy land which has a dressing of ashes.

In many instances, clay is found very convenient to tracts of sandy land. In such cases I have seen excellent results from a liberal application, lightly plowed under; and for setting pears, apples, plums, quinces, or roses, on very light soils, I consider it almost indispensable.

Now we will speak of the varieties of fruit that succeed on light soils, after urging upon you the importance of thorough preparation of the soil as detailed above. Commencing with the strawberry, we will name first the old varieties which still have value, giving a short description of each for the benefit of our friends who have not had experience, and I will mention their defects, which is something you rarely find in catalogues. Commencing with the old Wilson, I would say that it seems to have outlived its usefulness, except it is still useful as a fertilizer for early-blooming pistillate varieties, as it is almost universally attacked by rust at about the time of making the first picking. Crescent is still a great favorite, and is probably more extensively planted than all other kinds. It is one of the most reliable and productive known; it succeeds well on light soils, its principal defects being that it is rather soft for long shipments; it sets large quantities of fruit and fails to give it suitable size after the first two pickings; foliage is quite healthy, blossom semi-pistillate. Jessie is uniformly large, of high quality, has staminate blossoms, healthy foliage; is a cross between Sharpless and Cumberland, with the Sharpless defect of having tender bloom, easily injured by late frosts; but when planted on elevated land it is quite desirable. Haverland has pistillate bloom, is one of the hardiest, has healthy foliage, succeeds on light or heavy soils, its defect being long fruit stems, nearly horizontal, requiring mulching to protect fruit; is large, enormously productive, firm enough for ordinary marketing purposes; much superior to Crescent. Bubach—this grand berry has only one defect: the fruit is too soft for long shipment. It averages larger than any other, running twenty-five to fifty berries to the full quart, just as picked from the vines; foliage healthy; pistillate; resists drouth well. Warfield is the most popular berry now offered on Chicago market, place which it has won by some three or four years' trial. The fruit is

large, absolutely perfect in form, dark crimson in color, enormously productive, extremely firm, the only faults it has being rather short roots, which cause it to suffer from drouth sooner than some other varieties; and producing plants in excess, which must be kept down or the crop will be swamped by them; bloom, pistillate; foliage, healthy. Parker Earle, a new candidate for public favor, comes to us without a single defect being reported from the experiment stations or by private parties, a record no other variety can claim; makes enormous plants with very few runners; bloom, staminate, and so late as to miss all frosts; fruit large, uniform, good in color and quality, perfect in form, and the best shipper I ever saw. I sent a few crates to Chicago market in 1891 and they were promptly taken at fancy prices, and I could have sold thousands of plants as soon as they were introduced had I had them. It ripens from midseason to late. Michel's Early, while it has not filled all the claims made by the introducers, is still one of the most valuable I have, owing to its extreme earliness and the fact that it blooms early and resists frost perfectly, produces a fair crop of extra-early berries of same size as Crescent; foliage healthy, bloom staminate, and the best variety I know for setting with such pistillate varieties as Haverland, Bubach, and Warfield, as it remains so long in bloom.

RASPBERRIES.

In the blackcap varieties, the Palmer fills all the requirements for an early berry, ripens with the Souhegan and Tyler and is more productive; is also free from disease, a rank grower, with large, jet-black fruit, and ripens heavy pickings at first, which is very much in its favor. I see no defects after three years' fruiting. For a late crop I have found nothing better than Gregg, although it has some defects. It ripens late, produces immense crops of large fruit with a dusty bloom, ripens its entire crop in a very few days; but the cane is somewhat tender, showing bad effects of cold weather at about ten degrees below zero when the plant is in normal condition, but will come through and bear a partial crop at fifteen degrees below.

RED RASPBERRIES.

Turner is still the highest standard of hardiness and quality, ripens early, and is very productive, but is quite soft for shipment—requires careful handling. Cuthbert is a great favorite for late crops; is a rank, straggling grower, later and larger than Turner; color, crimson; darker than Turner, quite firm, a great market variety; but the cane is only moderately hardy. Brandywine is quite a favorite with some growers. The cane is a light grower, but produces wonderfully of large, bright-colored berries of great firmness and poor quality. Marlboro's foliage, owing to its foreign blood, sometimes fails during our hot summers; but where it succeeds it is a great money-maker, being earlier than Turner and larger and firmer than any other; quality, poor. Shaffer has some friends; is a strong grower, enormously productive of large, purplish, dirty-colored fruit of good quality, excellent for family use, but not adapted to the wants of a city market.

BLACKBERRIES.

The Snyder is a universal favorite on account of its hardiness and good quality, being very productive of medium-size berries, but suffers quickly

from drouth owing to its habit of rooting near the surface. Early Harvest is the earliest blackberry in cultivation; is of medium size, more productive than Snyder, of fair quality, an excellent shipper; not strictly hardy—kills at about fifteen degrees below zero, and does not succeed on poor, light soils. Early Wilson and Wilson Jr.—These varieties are so nearly identical that the difference is not worth mention: early, very productive of largest-size berries, when properly handled and pruned, but quite tender in plant, killing at eight to ten below zero. Lawton.—This is the old standard for late crop, and has no superior in its season; is somewhat subject to rust and not strictly hardy. Erie is similar in season and all other respects to the Lawton, and generally pronounced identical by our growers; but some of our most careful men pronounce it a different variety, though as yet it has not proved to be superior, so far as my knowledge or information goes. The Kittatinny and some other varieties have friends in certain localities, but have not proved generally successful.

GOOSEBERRIES.

The Downing possesses more good qualities for Michigan planters than all other tested varieties.

CURRANTS.

The Victoria is a prime favorite, as it blooms late, produces enormously of large berries with long bunches, resists drouth and borers better than any other, and holds its foliage late. The next best is the old Red Dutch. Fay's Prolific, I presume, has disappointed more people than any fruit introduced in the last twenty years. I have never yet seen a man who has made a success in growing this variety for market, although I have seen a few bushes do fairly well in sheltered locations or when protected from spring frosts. It is a general failure in Michigan. In black currants, Lee's Prolific and Black Naples are the best of the well-known sorts, but the Black Champion may prove superior; but don't waste any money on the Crandall—it is a worthless thing.

GRAPES.

In this fruit the Concord is the standard of productiveness and hardiness, and is a favorite with consumers at the same time. It is probable that no grape ripening later than Concord can ever be generally successful in Michigan, so we will use it as a standard for comparison. Worden is the only variety that is at all likely to displace the Concord on the market. It is a week or more earlier, is sweet as soon as it begins to color, and when ripe is of the very highest quality. Vine and foliage are strong and healthy; berry larger than Concord, bunch equally as large, and fully as productive; and, having so many good qualities, I consider it the best black grape for Michigan. Champion or Talman looks like Concord, is fully as healthy and productive; has a strong, healthy vine and foliage, and is often sold as Concord, but it is some three weeks earlier. In quality it is about as good as green persimmons—sour enough to make a pig squeal. Its mission seems to be to destroy the demand for such grapes as Worden and Concord, but the fact that good prices are realized for them is causing the setting of large acreages. Moore's Early is a very good early black

variety, ripening just ahead of the Worden, but not very productive. Still, it is a favorite in northern localities. Among the red varieties, the Delaware is still the best in localities where the foliage does not fail, with the Brighton holding second place. Both ripen as early as Concord. The Empire State and Niagara are the best white varieties I have yet seen, and ripen with Concord. But, in growing grapes for market, remember that the large city markets will use more carloads of good black grapes than they will cart loads of either red or white varieties; yet this might not be true of some small local markets.

TREE FRUITS.

Next we will consider the tree fruits adapted to this climate and to light soils. Probably first in their adaptability to both comes the cherry; and while I am familiar with its culture in a general way, I do not feel competent to discuss the merits of different varieties further than to say that they are partial to light soils. and I hope you will call up some experienced grower for information on varieties.

Next in its adaptability to light soils comes the peach; but as I infer that this climate is a trying one during the winter, I will speak only of the hardiest varieties with which I am familiar. It is quite well known that our earliest varieties, while generally considered a poor excuse for peaches, are at the same time among the hardiest in the bud: but being so poor in quality and so subject to the attacks of curculio, I will not name the earliest; and in naming the lowest degree of cold each variety will stand, it must be remembered that it only has reference to buds that are in normal condition, and might be subject to greater variations, as the buds are affected by adverse or extremely favorable conditions. First in the list I will name the Early Rivers, which can be classed as a second early sort. This tree is safe for a crop at ten or twelve degrees below zero; fruit of good size, white, with slight shadings of pink: ripens usually about Aug. 10: fair quality; its defects are very tender flesh (bruises easily) and pit cracks badly. Lewis was first brought to notice by a report made at the meeting of the American society at Grand Rapids, when some gentleman from Allegan county reported that a neighbor had thirty trees, from which he picked 900 baskets, and sold them for $900, or at the rate of some $3,300 per acre. This was following the disastrous February of '84 or '85, when the thermometer went down to twenty or thirty below zero, killing many orchards and all other varieties of peach in the vicinity in which these trees stood; and I believe they have never been killed entirely since. This is of course a good record, and the variety ripens early—in fact, is the earliest white freestone peach of fair quality; is of good size, wonderfully productive of beautiful peaches, ripening at a good time, and will succeed where any variety can. A variety called Early Michigan has been decided to be identical. Early Barnard is a reliable old variety and is first-class in every respect; has deep yellow flesh and skin, with dark-red cheek; of excellent quality; generally overbears, and must be well thinned to get best results. It stands twelve degrees below zero without material injury. Snow's Orange is practically a late Barnard, differing only in being larger and about ten days later. Red-Cheek (Melacaton) is the parent of the Crawford, and I very much prefer it today, as it proves to be much hardier and more productive although not as large. Elberta comes to us with the unqualified praise of every man who has fruited it or seen it. Some of the

leading authorities pronounce it the only perfect peach, and all agree on its extreme hardiness, productiveness, and large size. If it does as well in Michigan as elsewhere, it will prove an acquisition. Hill's Chili has been the standard of hardiness for many years, and all hardy varieties are compared with this; but, like many old varieties, this one is rapidly falling from grace, and while it never was adapted to very light soils it is very rare that a crop of really good fruit is seen on any soil. It suffers very quickly from drouth and is subject to the black fungi, sometimes called mildew. While I am not familiar with the Wager peach I am satisfied that it is an excellent yellow variety, very hardy and productive; but in Allegan county a peach called Bronson is disputing ground with it. Gold Drop, wherever tried, is a favorite, owing to its hardiness, productiveness, and good qualities. Under normal conditions, there is no doubt that it will stand a temperature of fifteen to twenty degrees below zero and produce a crop; but unless it is properly thinned it will be small. The Smock is probably the latest peach it is safe to set in this state. It is a very hardy, large, late peach, bears young, and is in every way satisfactory. Much more might be said about these varieties, and numerous other good ones not mentioned here; but from those given a good hardy list can be made which will produce fruit anywhere it is possible to grow peaches, and to extend the list might be tedious.

In the matter of plums, I am as inexperienced as in cherries, and hope to hear from some of our large plum-growers regarding soils, varieties, etc.

In pears I would name the following varieties as being grown successfully on good light soils: Clapp's Favorite, Bartlett, Sheldon, and Seckel. There may be others, but these have done best according to my observation; but it is very doubtful if any pear is a very great success on very light soil. Still, I have in mind a few young pear orchards on light soil, all in one neighborhood, where the owners prepared for setting by digging holes about three feet across and three feet deep, then putting in five or six bushels of clay mixed with the top soil, and setting the trees on that; and nothing could be finer than those trees, now just commencing to bear. Another orchard of 100 trees was prepared in the same manner, on poor sand, but the holes were partly filled with green sod spaded off the surface of an old pasture. These were four years set last spring, and twelve to sixteen feet high, and most of them bore some choice fruit last year. I am convinced that where clay is obtainable, pears and apples can be grown very successfully by this method; but of course they can not be as long-lived as they would be where the soil is just right naturally.

The varieties of apple which succeed best on light soil in my locality seem to be Red Astrachan, Maiden Blush, Oldenburg, Spy, and Baldwin, all well-known old varieties. Additions might be made to this list, but our people do not find apples as profitable on such soils as some other crops, and are digging out many orchards in order to use the land for other purposes. Still, in any locality where it is desirable to grow them, I am satisfied they can be grown successfully by the exercise of a little good judgment in preparing soil, selection of varieties, method of culture, fertilizing, etc.

In conclusion, permit me to say that any man who has a family and an acre of land, if he fails to grow an ample supply, is neglecting his duty to them; and any farmer in this state who does not grow enough fruit for his family needs reforming—and many of them might find a snug little income

from the product of an acre or two of land that now scarcely shows any profit.

An invitation from the Ann Arbor society, for the holding of the next annual meeting of the State society in Ann Arbor, was presented and referred to the executive board.

The committee on exhibits and on resolutions made the following reports, which were adopted:

REPORT OF COMMITTEE ON EXHIBITS.

Your committee beg to report some very fine samples of Princess Louise apples, exhibited by A. M. SMITH of St. Catherines, Ontario. This very beautiful early winter apple, by reason of its attractive style and exquisite quality, would seem destined to become one of our standard apples. It has already been tested sufficiently in Canada to establish the fact that it is well adapted to that section, and will justify efforts to grow it in other parts of our country. It certainly is just such an apple as is wanted for retail purposes on our city fruit stands, and would, without doubt, sell at high prices.

We also take great pleasure in calling attention to the excellent exhibit of palms, azaleas, and cut flowers, consisting of some magnificent specimens of roses and carnations, made by the Port Huron florist, M. ULLENBRUCH, and we suggest that any florist who will turn out such a beautiful display of his choicest productions is entitled to the sincere thanks of this society.

The Field Force Pump Co. of Lockport, N. Y., exhibit one of their five-gallon knapsack sprayers, which is a great improvement over the pattern made in 1891, and would seem to be entirely adapted to meet the wants of those in search of such a machine for spraying small fruits and such vegetables as require it. We would advise its trial.

S. D. WILLARD,
R. MORRILL,
A. G. GULLEY.

REPORT OF COMMITTEE ON RESOLUTIONS.

It has been a long-standing custom of this society to express, by resolutions, its thankfulness for the many good things usually received, and courtesies shown its members at the places of meeting.

Finding abundant reasons for continuing the pleasant practice, the members of the Michigan State Horticultural Society return thanks to Mr. L. B. RICE for the energy and enthusiasm he has shown in organizing the St. Clair Horticultural society, as an auxiliary to the State society, and in making such liberal inducements for the parent society to enjoy the hospitalities of this its youngest offspring. We congratulate Mr. RICE upon the large number he has interested to join, and we hope the discussions of this meeting will increase its usefulness, and that it will continue to grow in numbers and influence. Therefore, we resolve as follows:

That the paper of Mr. L. B. RICE, in relation to fruitgrowing on the western shore of lake Huron, is one which should command the attention of fruitgrowers, particularly in that portion of the state, and should awaken them to a knowledge of the fact that there are immense undeveloped resources of wealth at their command, and inspire them with a determination to work them out and to unite with the horticulturists in the western and central parts of the state in making Michigan, what it is bound to be, the banner fruitgrowing state of the American union.

Thanks are extended to the press of the city for its full reports of the proceedings, thereby enlarging the audience that may secure benefit from its discussions;

To the St. Clair Horticultural society for procuring this pleasant and commodious room in which to hold our sessions;

To Mr. M. ULLENBRUCH, the city florist, for his display of flowers and plants which are always so pleasing to the eye and gratifying in their sweet perfumes;

To Mrs. LENA JONES and Miss GRETA RICE of this city and Miss MATIE JONES of Detroit, for the music furnished, which greatly added to the pleasure of our sessions, gave variety, and enlivened by the harmonious notes of voice and instrument;

To visiting brother horticulturists from other states, and especially those from over the border, with whom we trust there will always exist a cordial feeling of mutual interest and reciprocity;

To the hotels that so generously reduced their rates while increasing our comfort by thoughtful attentions shown us;

To the mayor and many other citizens of Port Huron and vicinity, who have given us such a hearty welcome and extended numerous courtesies which we shall carry to our several homes as pleasant memories of this meeting.

Mr. A. M. SMITH described the Ontario system of farmers' institutes. Seventy-eight are held each year, and each receives $25 per year for expenses from the government, which also supplies the speakers, one sent to each of nine districts, who do very much to make the institutes successful and valuable.

Mr. BARNES of New York remarked upon the practice of horticulturists in "giving away secrets," concluding that "when a man is in a reputable business he is not ashamed of it nor to tell of it."

After congratulatory remarks by several gentlemen, the society, in the best of good feeling, adjourned *sine die*.

PROCEEDINGS OF THE TWENTY-THIRD ANNUAL MEETING.

HELD AT ANN ARBOR, DEC. 26–28, 1892.

One of the pleasantest of the annual meetings of this society was the twenty-third, held at Ann Arbor, Dec. 26–28. The attendance was at all times good and sometimes large, filling the spacious court room, and there was a quite unusual number present from about the state as well as from other states. Nearly all these took part in the discussions and added much to their interest and value. Specially enjoyable was the evening programme provided by members of the university faculty. There was, the bad season considered, a remarkably fine collection of apples, pears, quinces, and grapes, besides canned and dried fruits, jellies, wax models of fruit and vegetables, and berry and other fruit boxes and crates, the whole ornamented by numbers of potted plants.

The local committee were highly attentive to the wants of visitors, making their stay pleasant and memorable in every way.

The meeting was called to order Monday evening, Dec. 26, by President LYON, but Vice-President GARFIELD filled the chair at all the sessions; and prayer was offered by the Rev. Dr. BRADSHAW.

Mayor DOTY of Ann Arbor made the address of welcome, largely devoting his remarks to hits at the city's political affairs, which scarcely were sufficiently well understood to be appreciated. Mr. GARFIELD made suitable response.

The Banjo and Guitar club of Ann Arbor, a large company of young business men, delighted the audience with some of their unique and nicely rendered music, both at this and other times; and the keen pleasure they afforded was manifested in an encore and a vote of thanks.

President LYON read, as follows, his annual message:

To the members and friends of the Michigan State Horticultural Society:

At the last general meeting of the society, at Port Huron, it was proposed to change the date of the annual meeting to the week intervening between Christmas and New Year's day; but, by an oversight, the proposition to do so was omitted. The object sought was two-fold: (1), to bring our annual meeting to occur on a different week from those of several adjacent states; (2) and to enable our members to avail themselves of the reduced railroad rates offered by most roads at that season.

Conference with various members of the society indicated a very general approval of the proposed change; and, to enable the society to perfect the change on this occasion, a meeting of the society was called at Grand Rapids, on the occasion of the holding of their annual fairs, at which meeting the proposition was submitted and unanimously adopted.

To complete such change the constitution requires that the proposition be submitted and adopted at the next regular meeting. To this end the Secretary will doubtless submit at this meeting the draft of a constitutional amendment, needful for the purpose.

Since the constitution already provides that officers shall hold over until their successors shall be elected, it was deemed proper to defer the annual meeting to the proposed date, thus lengthening the year 1892 by a month.

THE STATE COLUMBIAN COMMISSION.

To persons conversant with the needs of horticulture, it can not be regarded as otherwise than unfortunate that, in the make-up of the State Columbian commission, there appears to be no person possessing a known and recognized acquaintance or sympathy with horticulture. This circumstance is the more to be regretted in a state which, like Michigan, has heretofore won enviable prominence for its horticultural possibilities, as well as for its actual development of this class of interests.

Recognizing such deficiency, and realizing that the State Horticultural society included in its membership, and those in sympathy with it, a very large proportion of our best horticultural experts, early efforts were put forth to induce the placing of this class of interests in charge of this society, at least to such extent as should enlist the hearty coöperation of its members and the active employment of the facilities at its command.

HORTICULTURE IGNORED.

To indicate how thoroughly these efforts were ignored, it is only necessary to analyze the composition of the committee to whom was committed the task of bringing together material for such a pomological exhibit as was expected to thoroughly maintain, and even more than maintain, the well earned reputation of the state, at the approaching Columbian Exposition—a task which its more or less discordant composition has, to a considerable extent, rendered nugatory; while the treatment meted out to it, from the date of its organization, has, to a greater or less extent, served to paralyze its operations.

Under existing conditions, so far as I have learned, very little has been done upon that portion of the state horticultural exhibit required to be in place at the opening on May 1, 1893. I have been able to put up twenty-five or thirty cans of peaches, pears, quinces, and grapes; but this portion

of the work has gone into other hands under circumstances which I deem not courteous to myself as chairman, nor creditable to the commission.

WHAT HAS BEEN DONE.

Mr. MONROE has supplied boxes for several bearing peach trees, which have been placed in my hands through the summer, and are now apparently in good condition to go upon the Exposition grounds next spring. The same is understood to be true of a collection of small fruit plants, cared for by a gentleman at South Haven. How much, if anything, has been done in this way, elsewhere, I have so far been unable to learn.

I have learned of a collection of long-keeping apples by Mr. HOUK of Ludington, intended for the opening exhibition; but of its extent I am not informed. In response to my inquiry the chairman of the committee on long-keeping fruits writes that, having no assurance of remuneration for either labor or expenditure, he has done nothing.

WHAT MAY BE DONE NEXT SEASON.

It is now quite too late to undertake an exhibit of fruit out of season; but, considering the apparent danger of an inadequate exhibit from other sources, it seems proper to consider the propriety of an effort, by the society, to make a display of fruits, each in its season, as a means of saving its own reputation and, by possibility, that of the state.

To enable us to act wisely in a matter involving so much of effort, care, and responsibility, I take occassion to state that I was recently called to Chicago, by Chief J. M. SAMUELS of the World's Fair department of horticulture, for the purpose of aiding to mature the rules and lists of that department, which are now in a state of forwardness.

While I was yet there, the committee on awards, who have the control of these matters, announced the following:

1. Awards are to be made by expert, single judges.
2. The decisions of each judge must be approved by the group of judges.
3. No comparisons of exhibts will be permitted, but each shall be judged strictly upon its merits, and the couditions upon which the award is based must be clearly stated.
4. The award, in each case, is a bronze medal, accompanied by a certificate specifying the grounds of the award.
5. The medals will be furnished by the United States, and parties may have their medals of gold or silver by paying for the same.
6. Judges will be compensated for their services and will be expected to devote their entire time.
7. In the case of the more perishable fruits, examinations will occur on Tuesday of each week, though doubtless occasion may arise for examinations on other days.
8. Provision will be made to insure correct nomenclature.
9. New varieties will be judged under the rules of the American Pomological society, which provide that, for a given locality, they must possess some valuable quality, or combination of qualities, in a higher degree than any other known variety of the same class and season.

The table space assigned to Michigan is upon two tables, side by side, away from the wall, at the south end of the southwest curtain. The total length is seventy-five feet, tables each six and one half feet wide.

This is for the summer display. Later, when the mass of long-keepers comes in, the space can be expanded indefinitely.

Upright cases may be built up from the centre of each table, for our

modeled fruits, and wires may be stretched above the tables, also, on which grapes or other similar exhibits may be suspended. All exhibits should be tastefully arranged, subject to the approval of the proper authorities.

Upon motion of Mr. E. H. SCOTT, the president's address was referred to a committee of three, appointed by the chair, Messrs. EVART H. SCOTT of Ann Arbor, R. M. KELLOGG of Ionia, and B. G. BUELL of Ann Arbor.

Mr. R. M. KELLOGG of Ionia read the following paper upon

"ECONOMY IN FRUITGROWING."

The word economy, as generally accepted, is suggestive of self-denial and privation, scant clothing, cheerless home, neglected family, and of miserly undertakings. It may be said with truth that a man's property is but the aggregate of his self-denials; for surely, no income is so great in this grasping, get-something-for-nothing age, but it can be readily disposed of as fast as it accumulates, and yet it is true that a very large part of our richest men have always been very liberal, not only with their families, but public-spirited, entering enthusiastically into all patriotic undertakings and public improvements. Their effort is not so much how to save a dollar as to make every dollar earn another dollar. Money that can not be made to contribute to this end has no value to them.

True economy, then, consists in marshaling every force that shall contribute to the success of the undertaking.

The successful general commanding an army first acquaints himself not only with his own army, its numerical strength, discipline, arms, and accoutrements, but learns every possible detail concerning the enemy he has to contend with. He makes himself familiar with the general topography of the country over which he is to operate, every road, hill, ravine, spring of water, creek, or river—every angle, or anything that will obstruct or protect his foe, is constantly in his mind's eye. He must calculate with the greatest accuracy the marching time of his troops, from one point to another, that perfect conjunctions may be made, and that the greatest economy of men, time, and materials shall always be secured. The great question that burdens his mind is, not what the cost of the maneuvers will be, but will the victory be commensurate with the loss sustained in securing it? His glory is in his achievements, not in what he has not done. So the delight of every man should be in what he has done to advance the cause of his chosen profession. The pride of the horticulturist is in his magnificent crops and superior methods of obtaining and disposing of them.

To gain a recognition among men, to create, invent, or bring into use some new method or device which shall contribute to the happiness of mankind, is a laudable ambition. Thus it is the men who invented mowers, the Planet Jr. cultivator, with their adjustable devices, the Morgan spading harrow, enabling the tiller to do his work with the greatest speed and thoroughness, have conferred a benefit upon every fruitgrower in the land. The greatest economizer is one who acquires the information that enables him to accomplish the most with the least possible exertion, and herein lies the value of these and kindred organizations, which through

their discussions throw a flood of information all over the land, solving the knotty problems, and when such papers as the Allegan Gazette and Michigan Farmer gather the cream of the whole, print and spread it before the people in such an entertaining way, no fruitgrower practices economy who saves his dollar and loses all these good things for a whole year.

If I were to formulate a method for a man to remain poor all his life, I should advise him to economize at every point, work very hard, early and late, utilizing every moment at hard, unceasing labor with his hands, but never to stop to think or read the thoughts of others. Our great men have always made themselves great as thinkers.

I once knew a man who never commenced his work till an hour or so after, and always quit before, his neighbors. He found time to go to all public meetings, always had time to do a neighborly kindness, and means to relieve distress wherever he found it, and yet he was always in advance with his work. His secret is revealed in three words: economy of time. His work was well planned. He never moved till he knew precisely what he wanted to do. No more was undertaken than could be done at the right time and in the right way. His deliberations enabled him to act with a clear mind and a correct idea of what he wanted to accomplish, and no mistakes were made to be corrected at expense. The best results were always obtained.

WHAT MUST BE DONE?

Fruitgrowing involves much painstaking and labor, and the man who saves a day's work in the preparation of his soil, and thereby loses three days in the after cultivation, is not practicing economy.

We must learn to make the rows straight, to use tools that will do all the hoeing with the horse, and to set plants and trees that possess the greatest fruiting power. There are few fruitgrowers who have given this subject proper attention. They waste their time on that which, in the nature of things, can give no returns. They should lay their horticultural books aside and attend the fat-stock show and give attention to the methods of breeding and improving animals.

I would no more set a plant of whose history and pedigree I knew nothing, than I would use a scrub animal if I were breeding stock. If we study the analogy of plant and animal life we shall find the lines run parallel and very close together. The law that governs in reproduction in the one obtains with equal force in the other.

When a plant fails to respond to liberal and generous care, there is something wrong and we must use the same remedy that we would with an inferior animal—send it to the shambles or the brush pile. I firmly believe our haphazard methods of propagating are responsible for the want of liberal success with half our growers. With them a plant is a plant, a variety is a variety. They either forgot, or never knew, that all plants and trees propagated by budding, grafts, cuttings, or layers are only the separate buds of the one original plant, and that when one of these buds becomes seminally exhausted through the process of seed production, that for a long time at least it will throw its energies into foliage and not fruit. It will take time to recuperate.

STUDY YOUR PLANTS.

The Warfield strawberry has taken the highest rank as a market berry, and yet you hear of its failure with many growers. Its great value being

recognized led it to be desseminated from beds which had borne an enormous and exhaustive crop. With ordinary treatment, its fruiting vigor will never be restored. No matter how many runners are made, they take with them the weakness of the parent plant.

I have found it very profitable to spend much time in the study of the character of my plants, their adaptability to the different soils, of which I have a great variety. We must learn to economize by throwing away, by culling out, this inferior stock. We can not succeed with a sort not adapted to our soil and location, and just what is best for us can only be learned by experimenting, and practicing the law of the survival of the fittest. Of course, we all understand the safest way is for beginners to confine themselves to those sorts which succeed over a wide area of country, but it is econony to do a good deal of testing. If strong fruiting vigor is to be maintained, we must have a separate propagating bed and stock it with buds and cuttings taken from ideal plants, so that weak and sickly plants shall not be permitted to multiply, but discard them as fast as they appear, and that without regard to the cause that made them so.

NOT A WASTE TO THIN FRUIT.

People seem to regard the thinning of fruit a great waste. They do not get the correct idea of it. It means more quarts and bushels each year, and an increase in fruiting power of the plant, as well as higher quality and better remuneration. Markets are glutted with poor fruit only. If we have an enormous crop of small berries one year we shall have a succession of eight crops to follow, but we may have an equal number of quarts of very large berries year after year. The reason of this is that the exhaustive process lies in perfecting the seeds. The pulp or fruit is only the receptacle for the seeds to grow in, and is not exhaustive. A small berry contains as many, and nearly as large, seeds as the large berry. All florists understand that, if the flowers are not picked from perpetual bloomers, as soon as seeds begin to form they will cease to get new flowers. The same is true of cucumbers, if a number of fruits are allowed to go to seed. The raspberry, blackberry, and grape should always be gone over after the fruit is set, and all limbs or branches should be either pruned or thinned till they contain only such an amount of fruit as can be brought to the greatest perfection and perfect its wood for the coming year, especially if the wood is to be used for propagating purposes.

I have not the slightest doubt that herein lies the secret of the decline of our apple, pear, and peach orchards.

A breeding animal, under the care of its owner, is carefully guarded in this respect; but the plant or tree is allowed full play of all its energies in this direction, until complete exhaustion ensues. My experiments confirm all my preconceived theories on this subject, that the greatest of all waste comes from this source, and that it must be corrected at once if the value of our favorite varieties is to be preserved.

HAVE NO LOST MOTION.

There is another thing that should claim more of the attention of fruit-growers, and that is economy of motion; we make too many motions to accomplish a given piece of work. When I enlisted in the army I was put into camp and drilled for months. I was taught to load and fire a

gun, mount and dismount my horse, and do everything with the fewest motions. Every movement was carefully prescribed and was gone over again and again, so that, under the intense excitement of the battlefield, everything should be done with celerity and in order. In setting plants I do not allow my help to work at random, making a dozen moves where one will suffice. I first adopt a method and then drill them until they can do it accurately, and then we are ready for the field. When a machinist lays down his tools they are placed where he can get them with the least possible trouble. A printer's case is so arranged that he can reach and distribute the type by moving his hand the shortest possible distance. A careful examination of the methods employed on the farm will show that loss of motion in having tools in the wrong place, the wrong kind of tools, and a lack of knowledge in their proper use, is one of the greatest losses in farm economy. We must not expend a large amount of labor on a piece of land not sufficiently supplied with plant food; and, having once properly fertilized, we must not lose the crop for want of cultivation. We know plants in general will not thrive with wet feet, and in these days of cheap tile and improved methods of putting them into the ground, we do not economize by setting plants in cold, wet soil.

Study the causes that produce the effect, and work with a well-defined purpose. Find out precisely what tools will do each particular kind of work best, and keep them in the best possible condition. Learn the principle of true economy.

The great study of the world is how to get on with less, curtail our enjoyments, toil early, toil on, pinch! pinch! Give loud lamentations to the fact that the world produces so much. Our politicians and economists teach us to discontinue the use of this and that, until our factories shall become idle and our fields barren. The great question should be, how can I consume the products of your labor, that you may consume and enjoy that which I produce? Consume all you can. The world stands ready to supply it. Life is short, and God intended we should enjoy the whole of it; that we should have an abundance of the luscious fruits and beautiful flowers. The cry of over-production is a sham, and people are fast finding it out. Notwithstanding the universal cry of economy and retrenchment, we are making progress. There are more of the luxuries of life among common people than ever before, and he who shouts "go slow" does not belong to the last decade of the nineteenth century.

Mr. W. E. Bird of Ann Arbor asked what is Mr. Kellogg's method for pickers handling berry boxes in the field.

Mr. Kellogg: I have baskets or frames made of lath, holding four boxes. These are returned to the shed, and the pickers must return all boxes taken. I begin picking when the dew is nearly off, and continue till near noon. Pickers are from ten to twenty years of age, and mostly girls. I pay by the quart—1¼c for strawberries and blackberries, 1¾c for raspberries, with an additional ¼c per quart to all pickers who remain through the season. One person brings all fruit to the packing shed, so the pickers save time, and there is less tramping over the rows.

The chair announced the following committees:

On Fruits and Models—NELSON BOGUE of Batavia, N. Y.; D. G. EDMISTON of Adrian; R. M. KELLOGG of Ionia.

On Plants and Flowers—CHAS. W. GARFIELD of Grand Rapids, Mrs. STANLEY POTTER of South Haven, Miss SARAH FLETCHER of Ann Arbor.

On resolutions—Prof. L. R. TAFT, Agricultural College; R. MORRILL, Benton Harbor; J. N. STEARNS, Kalamazoo.

Tuesday Morning Session.

Upon assembling, Tuesday morning, the society was called to order by Vice-President GARFIELD. who introduced President ANGELL of Michigan university.

Dr. ANGELL had been placed on the programme for an address in the evening, but was obliged to appear now, or not at all, because of a meeting of college professors and teachers. He extended an invitation to the society to visit the university, although it might not be found a very interesting place during vacation. He had once said, at a meeting of the society in Grand Rapids, that he had a right to be there because he had increased his peach crop 100 per cent. that year. It was one peach the year before and two peaches that season; but he was now obliged to say it perished utterly the next year. Horticulture was a matter of great interest to him. He stood last year upon the field of Waterloo and had been deeply interested in following the movements of the armies which there contended, but doubted now if he was more excited and interested than he was in his summer's contest with the insect pests in his garden. He had seldom found a very coarse man interested in horticulture. Such an one may grow a crop of apples for the market, but, as a rule, the man who largely engages in horticulture is of a refined nature. Horticulture seems as much an art as sculpture or painting. Mr. ANGELL spoke highly of the value to the state of the work of the society, and remarked that the people of the southern part of Michigan must more and more engage in horticulture as transportation facilities and consumption increase. No society is more deserving of aid and support, because it is promoting an industry that must increasingly supplant wheat-raising. He thanked the society for going to Ann Arbor to foster an already strong local interest. It had seemed to him that the time is coming when the common schools must do something in the way of imparting elementary knowledge of plant life—not as a daily task, perhaps, but by one or two hours' instruction each week by a competent lecturer. The difficulty would be to secure teachers really competent. The Germans do this successfully because they insist upon

having thoroughly trained teachers. We have our Agricultural college, which is doing a great work in this line and doing it well, but we have no help for the vast mass of common-school students. But this is bound to come some time. The people will demand teachers who will instruct the boys and girls in the affairs of their everyday life, not from big books but by plain talk.

Vice-President GARFIELD responded, commending especially the ideas advanced by Dr. ANGELL concerning horticultural instruction in the schools.

SECRETARY'S ANNUAL REPORT.

How Michigan horticulturists feel when they have secured a full crop of fruit, or even when they have one of good general average, it has not been my fortune to know since becoming secretary of this society. The past four years have been years of failure and disaster, not to the fruits alone, but to the trees and plants as well, no season showing nearly a full crop of more than one or two kinds of fruit and they not the most important. What the results of the past year were, and what are the present conditions, will be shown here by a series of reports which I have planned, embracing the principal fruit centers of the state. It will be far from an encouraging state of affairs which they will depict; and yet no one seems to be discouraged nor to lose faith in Michigan as a horticultural region second to none in the land for variety and excellence of product and margin of profit to the fruitgrower.

The same admirable spirit of perseverance has been manifested by the members of this society in its welfare and advancement, and the year closes with the society in better condition in several respects.

At our meeting one year ago it was voted to adopt the auxiliary system of membership of local societies in the state society, and your secretary was charged with its re-establishment. In connection with this was the plan of coöperation with the pomological division of the department of agriculture. This was arranged readily, the department agreeing to recognize this society as its representative in Michigan, supplying its bulletins and other publications to all our members. However, there seems to have been a dearth of publications since that time, for all I have received is a small sack of back-number pamphlets. These were distributed, and probably the near future will yield an increased supply and one of more value as to timeliness.

The most notable accession of the year, to our auxiliary list, was the association of Michigan manufacturers of fruit goods, who at their January meeting unanimously voted to join us as an auxiliary. New horticultural societies have been formed in Port Huron, Ionia, and Sanilac Center, during the year, and there will doubtless presently be one at Tawas City. Interest in fruitgrowing is rapidly increasing along the Huron shore, and surprising accounts of success with the apple, pear, plum, and small fruits are given. All district and county horticultural societies in the state, save two, recognize the auxiliary relation to the state society, and seem to be heartily interested in its success. Much more could be done in creating new societies and strengthening old ones were the state society

in possession of means with which to compensate some one for the considerable time and labor requisite to this end.

The society is in solvent financial condition, the result more of keeping expenses down than of increasing the revenue. The receipts of the year were:

Annual memberships	$26 00
Auxiliary societies	96 72
Interest on bonds and mortgages	133 33
	$256 05
Balance on hand Dec. 3, 1891	190 98
Making a total of	$447 03
The expenditures have been	387 93
Net balance at date	$59 10

The expenditures may be classified as follows:

Voted secretary as salary for 1891	$100 00
Treasurer's postage	18
Expenses connected with Annual Report	8 50
Library	12 50
Printing	23 50
Expenses of secretary's office	46 87
Expenses of quarterly meetings	193 63
Miscellaneous items	2 75
	$387 93

I have expected to receive a smart scolding for not having here volumes of the Annual Report for 1891, and perhaps merit what I have anticipated. I can only say for myself that though my hours of labor extend far beyond sunset each day, I still can not always keep abreast of the work which in many forms comes to my hands. I began work upon the Report last January when confined to my home by illness, and had I been sick longer the volume would have been ready sooner. But once more in my office, demands of my private affairs were inexorable.

The Report has grown in size until quite 600 pages are printed and the printers are getting into type as fast as they can the voluminous general index of the preceding eleven volumes, which will make fifty to sixty pages in small type. This portion of the book alone has consumed all the spare time of three months. Although the Report will be so large, still, I do not know of any part I would have omitted had I foreseen its great size; and I have some matter reserved for the Report of 1892 which I prepared for '91. The state printers assured me in September that they would do their part of the work in time, but the big index seems to have been too much for them. However, the volumes will be ready in two or three weeks, when I hope your righteous displeasure may be somewhat mollified by the book's extent and value, though it would ill-become me to presume much upon the latter. EDWY C. REID.

A report was also made by the treasurer, corresponding to the above, as to receipts and disbursements, but as it has been somehow misplaced from the secretary's files it will be printed later.

The reports were referred to a committee, Messrs. D. G. EDMISTON, L. B. RICE, and THOMAS JACKSON.

REPORTS UPON THE STATUS OF MICHIGAN HORTICULTURE.

Then followed a series of reports upon the present status and future prospects of fruitgrowing in several of the prominent or promising pomological regions of the state.

IN NORTHWESTERN MICHIGAN.

The season just past has been one of the most peculiar and trying ones that Michigan fruitgrowers have ever experienced. Nature seemed to have reversed the regular order of business to that extent that our most experienced pomologists have been baffled and have involuntarily found themselves exclaiming, "What next?" The season has been very favorable to the development of fungus growths, so much so that those heretofore hardly noticeable have done incalculable damage. All kinds of fruits have been affected, but the apple and plum have suffered most.

Such seasons cause the intelligent, thoughtful fruitgrower to pause, look about him, and see if he can see a why and a wherefore for all this.

Now, it appears very plain to my mind that nature, in her efforts to equalize (in other words to keep the supply and demand alike), summons to her aid some of her silent forces, thereby checking the tendency to over-production. We can see the wisdom of this course in causing us to study more carefully the requirements necessary, and the adaptability of different sections of our country to meet the wants of the people.

If all sections of the country were alike adapted to the growth of the tender fruits and vegetables, there would be alternations of feasts and famines.

When new insect pests or new fungus growths appear, seemingly to harass and injure the fruitgrower, our scientific men very soon come to their relief with an effective remedy, and nature must take a new tack.

When the record of 1892 is written it will show a greater and more marked deviation in nature, so far as the fruit interests are concerned, than ever before in any single year.

Now, we believe that this can in a great measure be avoided. By carefully looking over the statistics covering a period of say ten years, you will see that certain sections have almost annually produced good crops of certain fruits and vegetables. This law of nature has been very strikingly exemplified during the season just passed. The northern half of the lake shore region of the lower peninsula has produced a full crop of perfect apples, also of peaches, plums, and pears, wherever there were trees of bearing age.

The crops of the three last named fruits were very large in Oceana and Mason counties, thus showing that that is a section naturally adapted to the production of those fruits; and to such favored localities must we look for our supply of fruits in such trying seasons. To the fruitgrowers of that region the season of 1892 has been a very satisfactory one, and as lake Michigan will undoubtedly continue to exert the same influence in the future that she has in the past, we can see no cause for failure.

It must be understood, however, that all the known insect pests and fungus diseases are found there. So far as the insect pests are concerned, the live, thorough, practical horticulturist has no fear. The attacks of

fungi are not so severe, where the natural elements of both soil and climate abound to the extent they do there.

When our fruitgrowers learn that fungicides, to be effective, must be applied as a preventive, rather than a cure, I believe there will be nothing to fear in that direction.

In conclusion, to any one desiring to engage in fruitgrowing. I would say, look well to the natural elements of soil and climate.

C. A. SESSIONS.

IN LENAWEE COUNTY.

The present condition of fruitgrowing in Lenawee county is rather quiet.

In years when the insect crop is a failure and fungus diseases do not materialize, and when the sunshine and the showers come at proper intervals, and the fruit grows large and handsome without any labor, and prices are exceptionally good, then many of our people become quite enthusiastic horticulturists; but in years like the past two or three have been, when all these conditions are reversed, then these same men may be found running some other line of business, or possibly waiting for the good seasons to come again.

We have, however, a few faithful, hardworking horticulturists who are meeting every obstacle according to the best known methods, and are making a fair degree of success and advancement from year to year.

At blooming time last spring, the promise for a fine crop of fruit was perhaps never better; but June and July set these fair promises all aside. Our orchards looked as though a fire had run through them.

The excessive wet of the spring and early summer was followed by severe drouth, and the foliage on the apple and pear trees never seemed to recover. Consequently it is believed the trees are not now in the best condition for future usefulness.

In the northwestern part of our county, where peaches are grown to any considerable extent, the crop was a fair one the last year, and the trees are believed to be in fair condition for future crops. In many of the vineyards the grape crop was almost an entire failure, from mildew and black-rot and neglect, while in other vineyards, that were well cared for, the crop was fair, and the present condition of the vines is good.

So, taking all things into consideration, we believe the prospects of a reasonably good reward to the faithful, industrious fruitgrowers of Lenawee county are not wholly discouraging. D. G. EDMISTON.

IN WESTERN ALLEGAN COUNTY.

Fruit trees and plants of all kinds here in western Allegan county went through the winter of 1891 and 1892 in the best of condition, and the prospect for a full crop of all kinds of fruit was highly encouraging up to the first of May. About this time, or perhaps a little later, cold rains set in and continued for some time; and as most kinds of fruit trees were in full bloom, great damage was done.

The peach crop within one or two miles of lake Michigan has been almost an entire failure in many of the orchards, owing, it is thought, to the fogs that prevailed near the lake, together with excessive and continuous wet weather. Peach orchards that were located inland and away from the lake from three to six miles, produced full crops of fine fruit. The fogs

so prevalent near the lake shore did not extend inland far enough to affect these orchards.

The apple crop in this part of our county has been almost a total failure, not enough for home use. A great amount of injury has been done to the apple crop by rust or blight of the leaf, and as a result the prospect is not at all encouraging for a large crop the coming season.

Small fruits were injured very much by the extreme wet weather that prevailed early in the season. Strawberries were greatly damaged and did not produce to exceed one half a full crop. Yellows has prevailed to an alarming extent in our peach orchards, where the parties in charge have been negligent and have not complied with the requirements of the law.

In localities and orchards where the yellows law has been enforced, and all diseased trees have been promptly removed and destroyed, root and top, there is a perceptible decrease each year in the number of affected trees. Very many of our peach-growers have fallen into what has proven to be a very costly and objectionable practice, that of cutting down their diseased trees and then permitting the stumps and tops to remain in the orchard for an indefinite time. Experience has, I think, fully demonstrated the folly of this practice, as whole orchards have been lost where this custom has been followed for any considerable length of time.

After a number of years' experience as commissioner under the yellows law, I am fully convinced that the disease can be eradicated from an orchard or locality by prompt and thorough work in destroying all affected trees.

There will be about the usual number of peach trees planted the coming season. Small fruits of all kinds are receiving more attention from growers than in former years. Currants and gooseberries are being extensively planted.

Pear culture is commanding attention here on the lake shore, and extensive orchards are planting for commercial purposes.

Peach trees have made a good growth the past season and the wood and buds seem to be well matured and in condition to withstand a pretty low temperature if necessary; and, should the winter from this on prove at all favorable, western Allegan county can be relied upon for a supply of peaches the coming season.

Small fruits, as a general rule, have gone into the winter in fine condition, and the prospect at present is favorable for a crop of berries next summer.

D. W. WILEY.

ABOUT LAWTON AND PAW PAW.

In considering the condition of fruitgrowing near Lawton and Paw Paw, at the present time, it is plainly apparent to an observer that considerable change has taken place in the last fifteen years, in methods of cultivation and varieties of fruit grown. The acreage of berries of all kinds is very much less than it was a few years ago, and is plainly on the decline, these fruits giving away to grapes.

That the high lands near Lawton and Paw Paw were especially well adapted to the growing of choice grapes, became evident as soon as vines in these localities came into bearing, and in consequence grape culture has been extended and enlarged until it has become the leading branch of the fruit industry in this vicinity. The variety most largely grown is the

Concord, as it is well adapted to the demands of the general market and is the only variety that is called for in carloads as yet.

Worden and Moore's Early give good satisfaction and are being set quite largely to meet the need of an earlier ripening black grape. Niagara and Delaware are also grown in considerable quantities and are profitable where proper care is exercised in marketing. Some of the less prominent varieties are grown to a limited extent.

The vines are set eight or ten feet apart each way. The wider distance seems gaining in favor. Wire and posts are used for trellises. The use of stakes to support bearing vines is practically abandoned.

Two wires are used for making trellises, the upper one placed about five feet from the ground and the lower one about one half that distance. An excellent brace for the posts is a piece of strong galvanized wire with one end fastened to the post and the other end around a stone buried in the ground.

Of the insect enemies with which the grape-grower has to contend, the climbing cutworm occupies the front rank, and in some vineyards does great damage to the buds in spring time. The most effective check to his depredations are pieces of tin of suitable size and shape, placed around the base of the vine and also around the trellis posts. The grape-vine flea beetle, commonly called "steel beetle," also brings ruin to the young buds. These beetles are usually more numerous in vineyards adjoining woodlands or neglected fence rows. Hence the necessity of clean culture and clean surroundings. Rose bugs and thrips also remind the fruitgrower that eternal vigilance is the price of success.

Spraying with the Bordeaux mixture, as a preventive of grape rot, has been practiced by some of our grape-growers with good results.

Four tons per acre is considered a good crop, although much more than that is occasionally reported. An average crop for a term of years would be less than four tons per acre.

On account of the excessive rains in the early part of the season, the average yield per acre has been less than usual this season, but the large number of young vines bearing their first crop has made this year's yield the largest in the aggregate ever grown here. From five to eight carloads per day were shipped from Lawton during the grape harvest, the total shipments amounting to over seventeen hundred tons.

Climax baskets are the only packages used for shipping. The size holding eight pounds is mostly used for Concords, while Niagaras, Delawares, and other fancy varieties are generally put up in five-pound baskets.

The bulk of the crop is sent to Chicago commission houses, a few carloads being sold here on the track and orders from other towns being filled through the express company.

A fruitgrowers' shipping association was organized the past season to get the benefit of selling and shipping in car lots.

About one third of the crop was sold through the association. The price obtained for the eight-pound baskets of Concords here on the track varied from 16 to 20 cents.

The acreage of young vines not yet in full bearing is at least equal to the bearing vines, so we expect a large increase in the output of grapes from this vicinity in the future. The probability is that the number of grape roots set the coming spring will be less than usual.

In common with a large portion of our state, the apple crop was a total

failure the past season, caused, no doubt, by the excessive rains early in the season.

The same cause seemed to affect the peach crop quite seriously, although a few orchards, both at Lawton and Paw Paw, have borne fair crops. A large portion of our peach crop is sold at home, to buyers who come with teams, frequently from a distance of fifty miles or more. The great obstacle in the way of peach culture is yellows. The disease appeared here about fifteen years ago. Persistent determination in destroying infected trees, with the aid of the law, seems to keep the disease in check. The past season, however, yellows has seemed unusually virulent. To repair the damage done to our orchards by yellows it is necessary to set young trees each spring, and the usual number will probably be set.

At the present time our fruit buds of all kinds, except apples, seem to be in excellent condition for a crop the coming season.

N. ATWELL.

ABOUT ANN ARBOR.

Ann Arbor is a city of about 10,000 inhabitants, besides 3,000 non-resident students in its university and high school. It is situated on the Huron river at the intersection of the Toledo and Ann Arbor and the Michigan Central railways, being forty miles from Toledo and nearly the same distance from Detroit.

Ever since this part of the state was first settled, more than sixty years ago, the clay hills of Washtenaw county have been noted for the excellent quality and the uniformly good yields of wheat which they have produced, the county being for a long time the banner county of the state at the time when Michigan was the leading wheat-producing state in the Union. But changes have taken place in the agricultural conditions of the county. Wheat, though yielding good returns, unsurpassed in quality, is no longer its controlling product. Stock-raising has succeeded grain-growing with many farmers, while others have diversified their products in the direction of horticulture.

From the time of the earliest settlements the apple has been freely planted throughout the county, and it has proved so successful that at one time this became the leading county in the state in the production of apples. The area devoted to apple orchards in the county is now about 12,000 acres yielding a revenue in a favorable season of about $200,000, besides the value of the fruit consumed at home. Within the past ten years, however, almost no new orchards have been planted and many of the older orchards have become neglected and are falling into decay. A few growers give their orchards proper care and receive good returns, but as a whole the apple industry of the county appears to be on the decline and the yield probably does not now equal, either in quality or amount, that of some of the newer counties in the western part of the state. The cause of this decline is doubtless chiefly the increasing age of the orchards, together with the fact that many of them do not receive the care necessary to maintain their vigor and productiveness. Consequently, the yield has become more fluctuating, being more dependent upon the character of the seasons. The scab and codlin moth have also apparently become more destructive in recent years, and but few of our growers have yet made any adequate efforts to prevent their ravages.

About fifteen years ago the bluffs along the Huron river began to attract

attention for their adaptability to peach-growing. The moderating influence upon climate of large bodies of water had already led to the recognition of a "peach belt" along lake Michigan and the establishment of successful orchards in that part of the state; but the equally important principle of air drainage in its effect upon temperature was just at this time becoming widely recognized by fruitgrowers, largely, no doubt, through the publication of a discussion upon the subject which took place at a meeting of the State Pomological society at Grand Rapids in the winter of 1872. This discovery of the value of elevated situations for the production of the more tender fruits quickly led to the formation of a number of peach-growing centers in the interior of the state. Among these none has proved more successful than that at Ann Arbor, where the deep gorge of the Huron forms an admirable drainage channel for drawing the cold air away from the hills surrounding the city.

I am inclined thus to dwell upon the importance of elevation for the peach, from the fact that it has been somewhat overlooked here, under the impression that the peach planted anywhere at Ann Arbor was certain to succeed. Hence we have some orchards planted on land which lies so low that only in exceptionally favorable seasons is a full crop produced. The experience of the past season of 1892 has been highly instructive on this point, since upon the high elevations west of the city the crop was never more abundant, while as a whole, and particularly upon the lower hills east of the city, the peach crop was nearly a failure. The setting of peach orchards has fallen off somewhat within the last few years, and I know of but one plantation of any considerable size to be made in this vicinity the coming spring. The discovery of yellows in a number of our orchards last season has doubtless had some effect in checking the further planting of the peach until it is determined what shall be the result of the efforts now being made to exterminate or check the progress of this disease. The varieties of the peach most generally planted here are Early Crawford, Melocoton, and Smock. Hill's Chili, which has been highly recommended from this locality on account of its hardiness and productiveness, is being generally discarded, as it has not been found sufficiently vigorous to bring its fruit to full development except under high cultivation or in comparatively moist and fertile soils.

Small fruits do remarkably well here, though their cultivation has also fallen off of late, owing to the low prices which prevailed a few years ago when (in 1886) by vote of our horticultural society the cultivation of small fruits in this locality was declared to be no longer profitable. During the past two years, however, prices have advanced and there are signs of renewed activity in this direction.

The strawberry, which was formerly exported in considerable quantities, is now grown only for the home market. The varieties now chiefly cultivated are Crescent, Sharpless, Bubach and Warfield. Woodruff's No. 1, formerly extensively grown here, has proved to be wanting in vigor and subject to blight.

The Cuthbert is now the only red raspberry grown to any extent and gives universal satisfaction. Gregg is still the leading black-cap, though not so hardy as could be wished. A new early black-cap called Conrath is attracting some attention here. It is supposed to be a chance seedling of the Gregg and was found on the farm of Mr. C. H. Woodruff, the well-known originator of several new fruits, including the Woodruff strawberry and the White Ann Arbor and Woodruff Red grapes. The new raspberry

is now in the hands of the Conrath brothers of this place, who have ten acres of it in cultivation. It is from three days to a week earlier than the Gregg, and as it ripens its entire product within the space of a few days this enables the crop to be nearly marketed before the heaviest pickings of the Gregg come on. In size the Conrath nearly equals the Gregg; it is not quite so firm, being rather more juicy, and it is also more acid; it is much darker in color, being almost devoid of the white, mealy bloom so characteristic of the Gregg. It appears to be a good yielder and is pronounced by Professor Taft of the Agricultural college to be the best of any of the early black-caps he has had on trial.

Of blackberries the Snyder still takes the lead and no fault is found with it. The Taylor, which has done well with some of our growers, is, owing to its lateness, more likely to have its crop cut short by drought.

Grapes are successfully grown except when injured by black-rot and occasionally by frost. The moderate prices realized, however, and the proximity of large grape-growing districts elsewhere, have prevented extensive planting, so that almost none are produced for export, and the home market is largely supplied toward the close of the season from outside sources. The Concord is still the leading variety placed upon the market; though the Worden is generally preferred by those who have it, while the Niagara is becoming more popular every year.

Of vegetable-growing less can be said for the vicinity of Ann Arbor than fruitgrowing. The soil for the most part is somewhat unsuitable for vegetables, and the special advantages in the way of fruitgrowing have doubtless retained some in that industry who otherwise would have engaged in vegetable gardening. As a result, the city of Ann Arbor has never been fully supplied through the season with vegetables grown in its own immediate vicinity. Large quantities of vegetables are brought in by wagon every year by the market gardeners of Ypsilanti, who have the advantage of a better soil but who are not situated advantageously for general fruitgrowing. Detroit and Toledo furnish our grocers not only with early vegetables, but also frequently, in the hight of the season, with such common and easily grown products as squash, string beans, cabbage, sweet corn, and melons. There are no hot-houses here for the production of vegetables. It is a curious fact that the extensive importation of vegetables from other points, instead of awakening local growers to the demands of the home market and leading to increased efforts to supply it, seems to have the opposite effect of discouraging production in the face of outside supplies. As may be supposed, there is no canning nor pickle factory here for the utilization of surplus vegetables, although a flourishing pickle factory exists at Ypsilanti.

To the generally favorable character of the soil about Ann Arbor for the production of vegetables there are certain exceptions which deserve to be noted. Among these is a tract of reclaimed marsh some four miles south of the city which is owned and managed by Professor J. B. Steere of our state university. Here various kinds of vegetables as well as farm crops have been grown with marked success for a number of years. The soil consists of pure muck several feet in depth, which has been drained by open ditches, while recently irrigation has been provided for by some twenty artesian wells sunk at convenient points upon the farm. The leading crops the present season consisted of onions, potatoes, cauliflower, carrots, hay, Indian corn, and celery, all of which grew well and formed a marked contrast to the stunted and parched condition of many of the

crops upon the surrounding hills. The production of celery is a new enterprise here, having been first undertaken in a small way last year. These twenty acres were devoted to this crop by Professor Steere and the product was remarkably fine, commanding a ready sale, some of it being marketed as far east as Boston. There is hardly a doubt that celery-growing will now become an established industry on lands adapted to that crop in this vicinity.

In conclusion, I see no reason why horticulture should not continue to be profitable in this locality. The pioneer work is done. We have learned something of the business and of the best varieties for this locality. We now have satisfactory arrangements for marketing, with daily fruit cars when needed, to convenient markets. If low prices prevail, some of our growers have cold storage houses in which to hold their fruit, while a well-conducted evaporating factory stands ready to take any surplus which may exist.

A. A. CROZIER.

BENTON HARBOR AND VICINITY.

Mr. MORRILL: The spring opened with great promise of a big crop—too promisingly, for it betokened a large product and a lean pocket-book. But rain came in May and continued almost daily until the 8th of July. Our locality is almost purely a horticultural one, and such reverses are severely felt. There was fine bloom of the strawberry, but the rain caused the Crescent to fail and the Warfield also where there were not enough of the fertilizing varieties with it. Rain at time of ripening caused still more loss, yet shipments were from 5,000 to 8,000 cases daily. The raspberry crop was fair, the daily shipment being from 4,000 to 6,000 cases; and that of blackberries was good, being 6,000 to 8,000 cases daily. The melons were of good quality, the crop large, and prices low. Tomatoes yielded largely and prices were high—$500 per acre in some cases. Apple and pear trees are in bad condition, because of the attacks of fungi, save Astrachan, Hubbardston, Oldenburg, and Spy. I fear the young fruit, if any sets, will drop next season. Peaches were good on our best lands (the high ones) and sold well, bringing $2 or more per bushel in most cases. Many peach orchards on low lands are dead, but others are looking very well. Many of our people became discouraged early, and so their plantations are now in very bad shape. Through the banks, in 1891, fruit to the amount of $800,000 was paid for in Benton Harbor last season, while the payments by factories and those of other sorts made a total of one million dollars or more. The total for 1892 was large, but somewhat under these figures because of the failure of apples and pears.

IN "THE THUMB" AND EAST COAST.

Our secretary desired me to write about the status of fruitgrowing along the Huron shore and in northern Michigan in general. This would embrace a region which, within a very few years, has been the richest lumbering country for yellow pine in the world. Much of the wealth of Detroit and the lake cities of Erie was drawn from these forests. Less than forty years ago the only farming that was attempted was such as would contribute to the lumbering interests, even about Port Huron, while further north most of the land was owned by the government. The soil varied from a light sand (a cold, wet sand with quicksand bottom),

or gravel and clay mixed, to a heavy clay interspersed with muck swamps, all covered with the finest of heavy pine and hemlock; or, on the clay land, hardwood timber.

As the lumbering interests drew away toward the north, more attention was given to farming, and orchards were planted which seemed to thrive very well and to indicate that at least some portion of the country would be profitable for fruit. But it was soon demonstrated that the hardwood lands were best adapted to its growth, unless of a heavy clay nature; and, as most of them were of that character, there was little hope for very much fruit. The trees had an unhealthy appearance, the bark was covered with scale louse, peach trees were killed, by the cold winters, as was supposed, and the outlook was discouraging. The main supply of fruit for the city of Port Huron came from the well drained ridge of gravely land of the north part of Macomb county, which seemed to be the northern limit.

The climatic conditions of the east and west shores are as different as those of England and France. The waters of lake Michigan are fed by warmer streams and flow northward, while Huron's waters are largely fed from Superior and flow southward, and are always cold; and this is why its shores are so popular as a retreat from the summer's heat.

We have always looked with envy at our more fortunate neighbors on the other shore, with their orchards, vineyards, and gardens. For years it was my ambition to own a small piece of land in that favored locality, which I could plant to fruit-trees, and many were the day-dreams in which I indulged—never, however, destined to realize.

The soil of St. Clair county is diversified, as I said before, and a large portion of it is certainly poorly adapted to fruit culture. The cold quicksand seems to invite late frosts in the spring and early frosts in fall; but we find that these same cold soils, when deeply underdrained, make the very best that we have for fruits of all kinds, large and small, and for truck gardening. They seem to be especially adapted to the growth and productiveness of pears and plums, and of late large peach orchards have been planted on the drier ridges of sand or of gravel and clay loam.

One man, who is a "crank" on draining quicksand land (so considered by his neighbors, at least) putting his tile from six to eight feet deep, took seventy-five bushels of Lombard plums from twenty-four trees three and one half years from setting, and at the same time his trees made a good, long growth.

The cultivated varieties of cherry have not proved a success in St. Clair county, nor in any part of the district of which I shall speak. Only the natives have seemed to thrive and, at least half of the time, produce good crops. I have in my yard a few Empress Eugenie and Late Duke that have not failed to give us some fruit every year, even when the natives fail, and heavy crops nearly every year—at least two out of three.

We have been considered beyond the peach line, but some few trees have persisted in living and producing fruit for years, in spite of all of the vicissitudes of our climate. As we begin to understand the wants of the peach, and the most hardy varieties, we have planted orchards that have proved successful, so much so that a good many thousand peach trees were set last spring. Our chief want is a snow covering for winter. We have not had snow enough at Port Huron in three years to give us two weeks' sleighing all put together.

The apple crop was a complete failure throughout the county, and south

through Macomb county, the past year. Some varieties of pear have done well, as Clapp's Favorite, Sheldon, and Flemish Beauty, though the last named were very scabby with me. I have two trees of the Tyson that are both vigorous and strong and have given good crops of fruit, clear of scab, every year since they came into bearing. The greatest objection to the Tyson is a tendency to come into bearing very slowly. It is a good orchard tree if you can wait, and will pay well for the time lost when it does come.

With grapes, it is not every year that we can ripen the Concord. Of course, anything later would be of no use. We can never raise grapes to compete with those from the islands in lake Erie. If ours ripen at all, it is when theirs have been ripe so much longer that ours seem very sour.

A few specimens of quince are growing, yet buyers say that they have never known a peck of home-grown quinces to come in for sale.

Plums are grown but little, for market, but they do well and are fine. I know of but one or two men who have made any pretense of combating the curculio, and they use the sheet and have large crops. This year about one fourth of the trees through the county had good crops, but fifty per cent. of the fruit rotted just as it began to ripen. Last year was our year for a good, full crop of plums.

Strawberries were a full crop, but as none were shipped out of the country the market was very low—$1.40 to $1.75 per bushel. Black-cap raspberries were not more than one third of a crop, and brought $3.20 per bushel through the season. Red raspberries, about a half crop, and the market was not fully supplied at $4 per bushel.

Sanilac county lies on the shore fifteen miles from the lower end of lake Huron, with a shore line of nearly forty miles, its principal ports being Lexington, Port Sanilac, Richmondville, and Forestville. The land is high, rolling from the lake to Black river, and from there it is low and in many cases marshy. What I have said of St. Clair county fruits will apply to Sanilac county, except in the north part, were the apples were very good. From 15,000 to 20,000 barrels were shipped from this part of the country. Many new orchards of all kinds of fruit, but especially of peaches and some plums, were planted last spring. Lexington lies twenty-two miles north of Port Huron and seven miles north of the south line of Sanilac county, and it is on the same latitude as Rochester, N. Y. The north part of St. Clair county and the south part of Sanilac county are in the same latitude as western New York, yet I doubt if you will find a single good, healthy orchard, such as would be found there. Most of them show signs of neglect and disease; yet, in favorable seasons, we have a good many apples of very fine quality. It would be very foolish to think of planting apples anywhere in St. Clair county, for profit, except in very favorable places, or after the ground is well underdrained. Plums seem to do even better than apples, and pears seem to promise well if the scab and cracking can be checked; and on these same well-drained soils, the hardy varieties of peach promise well. Yet I should not recommend promiscuous planting of fruits of any kind, except the small fruits, with any prospect of making money. Only intelligent and thorough work will ever give us favorable results.

Huron county occupies the end of "the thumb," and might well be called the "thumb nail." It has a coast line of about sixty miles, bordering about equally on lake Huron and Saginaw bay. It is scarcely thirty years since the first settlers came with the great lumber firms that cut away the pine. Their earliest clearings were planted with fruit trees, which grew

finely and bade fair to be a great source of comfort to their owners; but the great fires of 1871 destroyed a larger part of the trees, and the people were left in bad shape. In the ten years of prosperity that followed, trees were replanted and many fine young orchards were started, when the fires of 1881 swept over the country again, and destroyed most of the young orchards and some of the older ones that escaped the fires of 1871. Now there are a few of the old orchards, some of those planted between '71 and '81, and many new young orchards, throughout the county. Every year large additions are made, of apples, pears, and plums, a few peaches, and some other kinds of fruit.

Plums have done remarkably well, and as a crop for profit have taken the lead until this year, when apple trees everywhere were loaded with fruit. Buyers came in from all parts, and Mr. WM. R. STAFFORD of Port Hope writes me that one buyer told him that his company bought and shipped, from points along the bay shore of Tuscola and Huron counties, forty thousand barrels of apples.

These counties seem to be better adapted to fruitgrowing than the country further south, probably on account of a dryer and gravelly soil, and more snow on the ground in winter. There is a section on the bay shore, about Sebewaing, partly in Tuscola and partly in Huron county, that is well adapted to grape culture, and many tons of grapes find their way into the Saginaw market yearly. Quinces are grown to some extent, and the small fruits thrive everywhere.

Thus far I think that very little scientific work has been done in the way of selection of varieties adapted to the locality, and in special care of trees. Agents have brought in and sold whatever they could induce people to buy, without reference to adaptability.

I have not heard of any one who has followed out any line of experiments in the way of combating insects or diseases, of either fruit or tree, and I hardly think that very many have given their orchards any special cultivation.

There is need that this society should extend its benign influence over all of this territory, and teach the people how to care for and preserve the productiveness of their orchards, and to select the best varieties for new plantations.

The future of fruitgrowing on the end of "the thumb" will undoubtedly be a bright one. I have never made a personal examination of the soil, but from what it has done under all of the adverse circumstances, it must be well adapted to the growth of most varieties. If I were to advise or give my opinion on fruits that would give the most profit, I should say plums. For quality and quantity of this fruit, I know of no locality where I would prefer to plant plums. Next I should plant pears. It would be a question whether apples or peaches should rank third in the list. So, if my soil was dry, and I intended to give good care, I should plant both. I would have my apple trees thirty-three feet apart each way, and peaches between, both ways, making three peach trees to one apple. I would, next in the list, plant cherries of the new and more hardy sorts—Montmorenci, Empress Eugenie, Late Duke, or something of that kind. I have never seen any black-knot among these varieties.

In arranging my grounds I should certainly prepare a place for quinces, and a few of the best varieties of crab-apple. These are very fine in this locality and would bring a good price in market when those from other places would not sell.

It would be of but little use to plant any but the earliest varieties of grape except in that locality near Sebewaing, mentioned heretofore.

I should plant any good variety of small fruit and expect success from it. I should expect best returns from those shipped by steamer to Detroit and Cleveland, as there would be no other fruit of that kind in the market so late in the season.

While this region may not equal the west shore, I think that all of the fruits named may be set, with good prospect for profit, in all of the towns of Tuscola and Huron, north of the Cass river and east of the Black river, down the Huron shore at least to the center of Sanilac county.

On the west side of Saginaw bay we are on the main part of the lower peninsula, so famous for its pine plains. These occupy the higher grounds along the line of the Michigan Central railway, and seem to be almost as worthless as the sands of Sahara. I know of nothing that can be made to grow on these lands, except blueberries or whortleberries as they are sometimes called. Between this ridge and the bay, for the first thirty miles, a large part of the land is said to be too low and wet. At Tawas we find hardwood lands interspersed with the plains, where all of the hardy fruits are reported as doing well. These ridges are found all the way along the shore between Tawas and Alpena, and back nearly to the line of the Michigan Central railway. There were good apples and plums through this region this year.

Back and to the north of Alpena are some good orchards of apples, pears, and plums. Fine fruit of these kinds was brought into the Alpena market. I have not been able to ascertain the varieties grown, but the samples of fruit were said to be fine and the flavor unexcelled. Small fruits, so far as I could learn, have been cultivated but little, owing to the abundance of the wild; but so far as they have been cultivated it has been with good success. At all of the ports from Tawas north, whortleberries are sold in great abundance, the ruling price being $1.25 per bushel. Wild cranberries are found in limited quantities, but I am informed that conditions favorable to their cultivation exist in many places through this region. That is. low ground with facilities for drainage and water that can be controlled for flooding. The future prospect may include this as one of the important industries of this section.

Follow with the coast line to the northwest of Alpena, seventy miles, and we pass through the north part of Alpena county, through Presque Isle county to Cheboygan. Much of the way we get occasional glimpses of the blue waters of lake Huron. All the way along we find places where young orchards have been planted and seem to be doing well; and about Cheboygan many fine apples and plums were grown this year. Among the fruits named I find Spy, Greenings, Baldwins, Pippins, and many others. At the Cheboygan county fair, this fall, the show of fruits of all kinds was said to have been very fine, and that of vegetables better than is usually seen at our fairs further south. Corn was excellent, pumpkins enormous; one squash weighed 300 pounds.

Cheboygan county is so near the point of the lower peninsula that it may partake of the mollifying influence of lake Michigan. Mr. John M. Cline lives in Cheboygan, owns an orchard over toward Traverse City, from which he took over 900 bushels of apples last fall. Wild fruits are plentiful in this county, especially whortleberries. Thousands of bushels of them find a market in Cheboygan, whence they are shipped to all points

down the lakes. My informant says that it was no uncommon thing to see eight or ten two-horse loads in line, coming in, and buyers were there from Buffalo, Cleveland, Detroit, and other places, during the season.

This may truthfully be called the fruit of the barren plains. Perhaps these berries may be improved by being protected or even cultivated on their natural soil, the pine plains.

Large quantities of wild blackberries were shipped from Cheboygan, and strawberries and raspberries were plentiful.

Cheboygan is 240 miles in a straight line north of this place. The winters are long and severe, but the ground is protected by the snow. From reports, it would seem that they raise fruits in Cheboygan which are tender in St. Clair county.

In conclusion, I would say that we have passed over a coast line of 300 miles from Port Huron, bordering on lake Huron and Saginaw bay. Along the whole of this distance, apples, pears, and plums are produced, of the finest quality. All kinds of small fruits may be cultivated with profit along the whole line. At least one third of the distance the cultivation of apples, plums, and pears may be called one of the leading industries. Over one half of the distance is favorable to the hardy varieties of the peach, to a certain extent, and truck-gardening may be followed at any point over the entire distance.

In Huron and north part of Sanilac, the quince succeeds well; unless there should be a change in climatic conditions, grapes will be profitable about Sebewaing on the Saginaw bay shore.

Cranberries may be cultivated northward from Bay City, where land is found to be favorable; and if any means may be devised for the cultivation of whortleberries, it may become an important industry on the worthless sand plains. I think this is a matter that should be experimented on, as it would bring into use a vast tract of land of no use even for pasturage.

AT SOUTH HAVEN.

Mr. MONROE: The general conditions about South Haven have been well covered by Mr. SESSIONS and Mr. WILEY, except as to the apple, and that has been well described by Mr. EDMISTON. As to the peach, the spring gave great assurance of a full, even an excessive, crop; but the long continued wet weather caused failure in the orchards we thought best of all—those nearest the lake. After good weather came, we thought we might get one third of a crop, say 100,000 fifth baskets; but this estimate was overrun by the shipments until 200,000 baskets were reached. This was in part due to the yield of new orchards. The township south of us furnished from 40,000 to 50,000 baskets, from young orchards of men who have been thorough and intelligent in their methods. This has caused renewed and great interest in setting new plantations which gives promise of reproduction there of the great crops sent from Fennville in former years. Some old growers have become discouraged from one cause or another, but on the whole there is quite as much interest in horticulture as ever. The trees, vines, and plants have all gone into the winter in excellent condition, except those of the careless cultivators. Apple trees, however, are not in a hopeful state because of their suffering by attacks of fungi upon the foliage.

It was decided to leave the nomination of officers to a committee, and for that purpose Messrs. L. D. WATKINS, L. J. POST, R. MORRILL, E. H. SCOTT, and D. WOODARD were appointed.

ADULTERATION OF FRUIT PRODUCTS.

Mr. A. TUCKER of Ann Arbor read the following paper:

It is doubtful whether there is any one cause so disastrously affecting honest producers and dealers as that of adulteration. First, a few words as to the character of adulterations, without any regard to their effect upon health. We will consider them as to their fraudulent character from a commercial standpoint.

CIDER VINEGAR VS. DISTILLED VINEGAR.

We will consider vinegar under two general classes, namely, distilled and fermented. Distilled vinegar is always water-white, being entirely devoid of coloring matter unless artificially added, while fermented vinegar is always more or less highly colored according to the product from which it is made. Distilled vinegar includes what is generally known as white wine vinegar, whisky vinegar, and that sometimes called corn vinegar, and all made from low wines, and in its natural state is the color of water. Cider vinegar has always and everywhere been regarded as the standard, not only more palatable but more healthful, and costing more than twice as much to produce as the distilled vinegar of equal strength. If these two classes of vinegar were both left in their natural color, both branded and sold true to their name, each standing or falling upon its merits, no injustice would be done to the manufacturer or dealer in either class of vinegar, and the consumer would get what he paid for. As it is now done, and has been since the repeal of the national revenue law in 1879, relating to the tax upon low wines manufactured and used for the making of vinegar, this distilled vinegar is artificially colored to resemble cider vinegar, and is branded "pure fruit" or "cider" vinegar, and the consumer, because of its color, and being branded pure cider or fruit vinegar, and very conscious that he has paid the price of cider vinegar, supposes he has what he paid for; or, if finding out the fraud that has been perpetrated on him, he goes to another grocer and asks for cider vinegar and is assured that the package is so branded, and was bought for cider vinegar. He tries it again, only to find he is cheated. But some manufacturer says the distilled vinegar is purer and every way superior to fermented cider vinegar. My only reply is, then why take so much trouble to counterfeit an inferior article? I fearlessly make the assertion that, for the last ten years ,in the fruit-producing state of Michigan, not more than one barrel in 500, sold through the trade, has been pure cider or fruit vinegar; but, out of every 500 sold, 499 were distilled vinegar, colored for no other purpose than to deceive. Who is injured by this fraud? Every man who grows fruit is robbed of his market for his cull fruit, which means, in an average year in Michigan, a loss to the fruitgrowers, in their cull fruit alone, of a good round million. Now, who is benefited? Some two or three manufacturers of distilled vinegar in the state, together with the dealers, who mutually share in the profits of this gigantic swindle. But, says some one, if the distilled vinegar is cheaper, and is not unwholesome, is it not to the interest of the poor

and laboring classes that this should be tolerated? There would be a plausibility about this if the consumer got his vinegar cheaper by reason of this commercial fraud. But he does not. He pays the price of cider vinegar, and it is for the purpose of obtaining this price that the distilled vinegar is thus artificially colored and branded, and the extra profits resulting therefrom are shared by the manufacturer, the jobber, and the retailer, and the poor consumer is the victim.

BUTTER FRAUDS.

What is true of vinegar is also true of butter. Some two or three many-times millionaire corporations of Chicago, by the manufacture of oleomargarine or butterine, have driven thousands of cows out of Michigan as well as other dairy states, thereby greatly crippling a very profitable farming industry, resulting in the deterioration of farming lands, forcing dairy farmers to produce other commodities with which the market is already surfeited. Hog products are also depressed by counterfeiting lard with cottonseed oil; and here, again, the farmers are the losers, to the full extent of the profit gained by a few large packing-houses.

OTHER ADULTERATIONS.

Buckwheat flour is compounded with poor, musty, low-grade wheat and corn. The hulls of buckwheat are used to adulterate ground black pepper. Coffee in the berry is modeled out of a paste composed of flour, beef liver, and chickory. Maple syrup is compounded with glucose. Jellies labeled "pure fruit" are made from glucose, acids, and gelatine, matters so filthy that no manufacturer of them would think of using them for himself or family. Fruit jams are made from pumpkins or squash for their base, fixed up with glucose and acids, flavored with fruit extracts, and seeds are supplied by using timothy or clover seed to suit the flavoring extract and the label on the package.

Who is benefited by all this array of adulterated goods, of which I have mentioned only an occasional one? Are the honest producers benefited, or are they injured? To ask the question is sufficient.

WHAT IS TO BE DONE?

What is the remedy? I answer, create the office of food commissioner in Michigan, with at least two assistants and a state chemist who shall analyze all products of food or drugs submitted to him by the food commissioner; and supply sufficient funds to enable this officer to do efficient work. Clothe the food commissioner with power to enter a man's place of business and inspect, and in extreme cases to seize, in case of harmful and unhealthful products; to prosecute offenders without unnecessary delay by postponements and adjournments and the like means, by which the ends of justice are so often defeated; and if laws and penalties as now upon the statute books of the state are not sufficiently explicit and strong to enable the food commissioner to stamp out this nefarious business, see to it that they are so amended and strengthened as to render them efficient. I have already made this paper much longer than I intended when I began.

It is the duty of the state to prohibit all unhealthful articles of food or drugs; to require all manufacturers and dealers in foods or drugs to make

and sell, and to brand their goods true to their name, and to prohibit the use of coloring matter or any other device when the evident object for which it is used is to deceive. I would let every man make and sell anything he saw fit, if not unhealthful, but compel every manufacturer and vender to brand and sell true to name, under heavy penalties, and so provide for the enforcement of all laws relating to adulterations that their execution shall be swift and sure.

If a citizen of Michigan wishes to eat oleomargarine or butterine, or prefers distilled vinegar to pure cider vinegar, he should have those goods as cheaply as competition in their manufacture and sale can produce them, and should not be compelled to pay the price that should be paid for the genuine goods. On the other hand, if a citizen of our state wants pure cider vinegar or pure butter, and pays the price for it, he should have it; and those manufacturers and venders who practice these commercial frauds should be made to feel the force of the law and public censure by a public exposure.

I have merely touched on the commercial side of this question. The more important side of it, as it relates to health, I leave for the doctors. There is still another very important side of this subject, namely, the effect on morals. Is it any wonder that important trusts are betrayed and men of high standing in society are found to be false, and are ingloriously falling, when the most common affairs of commercial business life are thoroughly permeated with fraud and dishonesty? "Sow the wind and reap the whirlwind."

Mr. TUCKER continued: Distilled vinegar is usually made from 80 per cent. of corn, 10 of rye, and 10 of barley. One bushel of the mixture costs thirty-five cents and makes forty gallons of vinegar. He did not care to prevent the manufacture of such vinegar, but desired to have it sold for what it really is. This society should try to have the legislature create the office of food commissioner, and the state society of manufacturers of fruit goods will do the same.

On motion of Mr. KELLOGG, the following committee on legislation was appointed: Messrs. R. M. KELLOGG of Ionia, L. B. RICE of Port Huron, and C. J. MONROE of South Haven.

Mr. MORRILL: Very few people have any idea of the extent to which food adulteration is carried on. I have seen no end of it in Chicago. No one is allowed to see the inside of Perine's canned fruit and jelly factory in Chicago—that is, the general public is excluded, and very few indeed, save the workmen employed, are permitted to know anything of the processes used. But a mail carrier who makes daily visits there, told me that the strawberry, raspberry, and blackberry jams made there contain not a single berry of any kind. Something is used to imitate the pulp, and timothy and clover seeds are used to counterfeit those of the strawberry and raspberry. Glucose, gelatine, and coloring matter make up the rest, and the whole goes forth as Perine's best pure fruit jam.

Mr. RICE: There is something wrong about evaporated fruits. The

apple crops have been short, yet the price of evaporated stock continues low. One cause may be the public's fear of zinc poisoning from use of galvanized wire trays. A committee should be had for investigation of the matter.

Mr. TUCKER: Apple drying used to be done almost wholly in New York. Short crops there, however, caused the dryers to move to Michigan, and the same cause has sent them on to Missouri and Arkansas, so that now the whole apple-growing region is engaged in drying, and the product is great, even when the crops are short in places or even on the whole. This over-production will be remedied to some extent if the manufacture of cider vinegar is encouraged. But hereafter the price of evaporated apples will not be more than five or six cents per pound, because prunes and other such dried fruits are so cheap. The high prices of other days will again be seen only in case of a general failure of the crop. There was some trouble about the use of galvanized wire trays, but that was all a "scare." A pure-food law would be easy of enforcement, compelling the sale of articles true to name.

A RESIGNATION WITHDRAWN.

President LYON notified the society that when Mr. GARFIELD went to Europe he resigned as a member of the executive board, but no action had been taken upon such resignation. He spoke decidedly against acceptance of it, as did also Messrs. WATKINS, PEARSALL, and RICE; and, Mr. GARFIELD not insisting, the resignation was considered withdrawn.

REPORT OF THE TREASURER.

The report of the treasurer, omitted from its due order in this report, was made as follows:

To the Board of the State Horticultural Society:

I have the honor to present to you my annual report.

In treasury December 3, 1891	$190 98
Annual memberships	26 00
Branch societies	24 00
Interest on bonds, mortgages, etc.	133 33
Received from E. C. Reid, sec'y	72 72
Total	$447 03

DISBURSEMENTS.

Paid checks aggregating	$387 93
Balance on hand	$59 10

Life members, 205, the fund secured as follows:

Birney Hoyt mortgages	$1,000 00
W. N. Cook mortgages	350 00
Lytell mortgages	300 00
Snell mortgages	300 00
U. S. bonds	100 00
Total	$2,050 00

Grand Rapids, Dec. 24, 1892.

S. M. PEARSALL, *Treasurer.*

Tuesday Afternoon Session.

Opening the afternoon session of Wednesday, Vice-President GARFIELD gave a brief description of the work in which he is engaged, the collection of a Michigan forestry exhibit for the World's Fair.

The secretary read a letter from Mr. A. J. KNISELY of Benton Harbor, concerning former action upon the question of Sunday opening of the World's Fair. At the Kalamazoo meeting, resolutions against opening were passed, and in them allusion was made to the example said to have been set by Edison the electrician in closing his exhibit on Sunday at the Paris exposition. Doubting if such had been the case, Mr. KNISELY wrote Mr. EDISON, inquiring about it, and was answered that the EDISON exhibit was not closed on Sunday, so far as Mr. EDISON knew, and if closed it certainly was not done by his order, as he believed in keeping such expositions open every day.

Mr. RICE remarked that he "did not believe the society wished to take the back track" on this question, and no action was taken.

ELECTION OF OFFICERS.

The report of the committee on nominations, as follows, was unanimously adopted:

President—T. T. LYON of South Haven.

Secretary—EDWY C. REID of Allegan.

Members of Executive Board—L. D. WATKINS of Manchester, Prof. L. R. TAFT of Agricultural College.

Later the board elected C. J. MONROE of South Haven vice-president.

Mr. S. D. WILLARD of Geneva, N. Y., read the following paper upon

POSSIBILITIES IN FRUITGROWING IN MICHIGAN.

Prevailing low prices for all farm products, including not only the cereals but cattle, sheep, swine, and horses, that have existed for some years past, have become a source of such anxiety to all land owners as to increase

the cry annually, "to what use shall we put our farms to make them profitable?"

This condition of affairs seems to be so universal throughout the eastern states, and westward to the prairie region, that we are practically upon common ground. hence we can with propriety reason together and unitedly act and aid each other in attempting a solution of a question of more vital interest to the land owner than has ever before engaged his attention.

In our characteristic liberality as a nation, our doors have been thrown wide open, emigration without limit has been invited to come in and possess the land, and we find, when too late to call a halt, that we have an over-production of almost everything required, for which our lands have been supposed to be adapted, and today we meet to consider the question, "What is to be done about it?"

RESULTS OF AGRICULTURAL EXPANSION.

This is no wide stretch of imagination, a stubborn fact. Our honorable secretary of agriculture tells us that we have passed the limits required to supply the world's want for bread, and that acreage must be reduced to afford living rates to the producer.

The presumption is that he is correct, and if so our system of agriculture must be changed to conform to existing conditions or we shall have occasion to regret our hestitation to act.

The country west of lake Michigan today has the lead in all farm products, no mistake. This acknowledgement may be distasteful to us, but the fact remains the same, and it is folly for us to ignore it.

A few weeks since, fourteen boatloads of barley were unloaded where I reside, produced in Dakota at an expense of sixteen cents per bushel (so said the producer) and freighted through at fourteen cents, making a total cost laid down at malt house of thirty cents. As this is far below the cost of producing the same grain in the state of New York, the question is, what is to be the future of the barley-grower with us? In like manner we might go through the whole list of grains, with any thing but a satisfactory showing as to the present and future probabilities in production, because of the sharp competition from the country west of us.

But if the lands west of your great lake can produce the grains and stock cheaper than you can, you may be assured they never can compete in the production of all those luscious fruits that can be grown with such marvelous success in your own state, and no one at all conversant with the difference of conditions in soil, climate, and all essentials for fruitgrowing, will for a moment question the truth of this statement.

Efforts without number, year after year, have been made, but the experiments have been failures and their supply must be sought from more congenial sections.

True it is that, now and then, limited areas of Illinois, Missouri, and Kansas give crops of the more hardy varieties of apple, but these only cultivate and intensify the taste for the choicer peaches, pears, plums, cherries, grapes, and other fruits which you are at liberty to supply and which you can grow at profits far in excess of what can be realized from any other purpose to which your land can be put.

FRUITGROWING HAS NOT GROWN SO FAST.

Here, then, is a basis on which to begin our speculations for our "future possibilities." In the economy of nature no one state in this great commonwealth has been so admirably adapted and provided with all of the essentials for growing such a diversity of fruit products, while at the same time enjoying the advantages to be derived from markets so easily and economically reached, the demand for which, twenty years hence, no living man of today can estimate.

Certain it is that the general fruitgrowing interests are not keeping pace with the increase of the people, who, as they become more highly educated and civilized, will consume in their living a much greater amount of fruit and less of those foods of a carbonaceous character.

Let us, then, as practical men, give our subject practical thought, and, if correct in our conclusions, proceed promptly to put into execution the result of our convictions.

We often fail to do this. We read, we talk, we think, but we fail to digest and put into practice. This is neither wisdom nor good sense.

Fruitgrowing has too often been regarded as a sort of sideshow of farming, and treated with a degree of neglect which would only insure failure when applied to any other crops. It has been regarded as a fit field of operation for him who, failing in everything else, might take this up as a last resort; but the successful fruitgrower of this latter part of the nineteenth century requires a combination of practical good sense, with intelligence in his profession, second to that possessed by no other man, no matter what may be his calling. It is a lack of required knowledge and attainments, more than anything else, to which may be ascribed discouragements and crop failures in fruitgrowing.

We want a more intimate acquaintance with all varieties of fruit adapted to our soils and climate, their habits and structure, their diseases and the insect life that preys upon them—in short, give us botany, chemistry, and entomology as applied to our business, and we will give you results less unsatisfactory than those that too often characterize the slip-shod orchard culture of today.

"Our possibilities," then, should not be sought for in the lines of ignorance, while all required and needed information of a practical and scientific nature can readily be had at those institutions of learning with which your state is so amply provided.

At one of your meetings, a few years since, I was interested in listening to a paper from one of the professors of your Agricultural college, on the use of wood ashes as a fertilizer for fruit trees; and so strong was the impression left as to their value for that purpose, that ever since then I have been using them largely for this purpose and I have found them valuable beyond my anticipations, as a plant food, for everything in the way of fruits to which I apply them, and it seems to me if we of the east can afford to purchase and pay transportation a long distance for them you certainly can not afford to allow them to be carried off from your fields.

But as I shall have occasion to refer to this subject in another connection, I will simply say, try two or three tons of wood ashes and two hundred to three hundred pounds of bone meal per acre to your orchards, once in two to three years, and watch for the results.

PREPARATORY WORK.

I am well aware that I am addressing men of wide experience and practical habits, who may doubt the wisdom and expediency of fruitgrowing on an extended scale; and yet it is to just such minds that I desire to appeal, with the hope that I may advance some ideas that may arouse you to appreciate the possibilities within your reach, undertaken with intelligence and prosecuted with the same zeal and enthusiasm that would be required to succeed in any other undertaking.

Cease to regard trees and plants as so created that they can care for themselves, with ability to derive their nourishment from the atmosphere or some other unknown source, requiring no effort on your part. It is a fatal mistake to suppose that a favorable response will follow such treatment.

For years, nitrogen, potash, and phosphoric acid have been drawn from the soil at a fearful rate, with no corresponding effort to their restoration; and yet we are taught that these are the essential elements of all plant life, and that potash, more than any other one element, will contribute to produce the hard, good wood, the well developed, rugged bud, and the vigorous, strong leaf, giving a combination indispensible to the foundation of a future crop of fruit.

This preparatory work must be laid out in advance, by careful, judicious culture and proper feeding, if satisfactory results are desired. Who can say that, had this liberal policy been adopted several years since, and these apple orchards been generously fed with these elements in one form or another, they would not have been fitted to resist the fearful attack of scab, the cost of which was the loss of the apple crop the past season?

Preventives are often efficacious in all plant diseases, while curative results are rarely seen.

It is said that varieties there are, whose foliage is so strong as to be impervious to the work of fungus. If this be so, may not sorts more tender and sensitive be rendered less so by the generous use of such fertilizers as aid to this end? We ask the applegrowers of this state to carefully consider this subject, as we assure you that you must manage to maintain a healthy foliage, by some method, in order to be insured crops of fruit.

We believe in any and every appliance that will contribute to the general health and vigor of everything we grow, for herein we look for our possibilities. We are told that many varieties of fruit have not in themselves a sufficient degree of power to fertilize their own blossoms. It is certainly so with strawberries, grapes, and our native or wild plum, and recent experiments indicate that it may be equally true of many sorts of apple, pear, and our finer cultivated plums and cherries. Certainly this is a subject full of interest, and may possibly work a revolution in our future systems of planting. Who can say that in this one condition may not be found a solution of many crop failures?

We are living in a wonderfully progressive age, in which science as applied to fruit-culture may yet play a part we little imagine. Let no man ignore the grand work being done by state and government in our behalf.

DO NOT PLANT IN BLOCKS.

We suggest, would not a more general intermingling of varieties in our commercial orchards be a step in the right direction? It is said that, so

closely allied are the plum and cherry, the pollen of the one will fertilize the other. If this be so, this may in a measure account for an annual crop of each in a small orchard planted in alternate rows. When we consider that our experimental stations, agricultural colleges, as well as department of agriculture at Washington, are all actively engaged in efforts to solve problems of vital interest to the wide-awake fruitgrower, we think we have great reason for encouragement, and one should prosecute this work with great zeal while availing himself of all required knowledge now at his command.

Faith and works, however, are required to go hand in hand, in this our favorite occupation. The investment must be made before returns can be expected, and sometimes the heart is sick in waiting.

RECOLLECTIONS OF A BEGINNING.

Well do we remember when our first venture was made, and the few acres planted stigmatized as an exhibit of our folly. We had the land and not much else. We could not sell it for half its cost. We believed in the work, and thought we could see the future profits to follow; but how to get the trees and plants, and carry all forward in such a skillful manner as to insure the end sought, was a puzzling question. We read and thought and decided to go ahead as best we could; and so often were we called a fool that we were sometimes led to question our own sanity. No mistake, our surroundings do have their influence, and often lead us to doubt our own abilities; but faith and hard work will bring their reward, and ten per cent. income on $2,000 valuation per acre, for successive years, we regard as a sufficient reward for the hours of toil in the accomplishment of our possibilities, while we have to smile at our doubting neighbors, some of whom have fallen into line and are pursuing the same work.

We would not be misconstrued, however, nor would we wish to mislead any as to the profits in fruitgrowing. It has its downs as well as ups. Low rates of interest mean low prices for everything produced, hence war prices should not be anticipated; but we do mean to say that no investment can be made in this or any other good fruitgrowing state, in the way of soil tillage, that will pay a larger percentage, one year with another, than when judiciously expended in growing such fruits as are adapted to the soil on which they are planted.

Note, if you please, this question of adaptability. It is important, none more so. A disregard of it has been productive of failures beyond computation. We believe so thoroughly in the adaptability of certain portions of your state for gowing certain fruits with such unerring success that, were we twenty years younger, we should not hesitate to push some interests of this kind in a very large way on land now waiting for the work of the skillful cultivator, only to afford returns that can not be overestimated. Nowhere east of the Rockies can the stone fruits, as well as some others, be grown and marketed with the same success of profit as on the east shore of your great lake.

As plums are my favorite fruit, and the area of country where they can be grown successfully is quite limited, you can readily understand that my large venture would be on this fruit, with a fair intermingling of others that might be regarded as desirable and fitted for the location.

SOME INSTANCES OF SUCCESS.

There are those in your own state whose methods of culture and experience could enable them to give you illustrations of their work and results that would, I am sure, be quite astonishing; and I trust I may not be regarded as overstepping the bounds of propriety in quoting instances of what has been accomplished in the production of different fruits in other sections, in illustration of "our possibilities."

Several years since, a party in planting an orchard of apples was told by an old man that he would never live to see a paying crop from it. This may have inspired him to accomplish results that, under other circumstances, might not have been attained. The eighth year from planting, from seven hundred trees, he picked seven hundred barrels.

Not far away, upon the same ridge, stands an orchard of three hundred trees, twenty-two years planted, that has never yet, in its entire product, produced an amount per tree equal to the other in its eighth season. The one is a striking illustration of the result of good care and judicious feeding, the other an equal illustration of the folly of neglect.

Upon what was one of the best grain farms of our state, fifteen years ago, was planted a small pear orchard. Said the owner to me last season, "for four years those pear trees have given me more clear money than the remainder of the farm of 131 acres—four acres against 131 acres. What a lesson in percentage!

Five years ago, a man of more good sense than capital paid $175 per acre for 16 acres which he immediately planted to pears, quinces, plums, peaches, and cherries. In compliance with my request, lately he kindly gave the facts and figures as to his operations. The fourth year his net returns amounted to $600. The past season, $1,375. Total cost, $5,000. Interest, $1,500. In all, $6,500. Returns, $1,975. Another opportunity to study the question of percentage.

A small orchard of sour cherries, planted eighteen years ago, has returned to the owner an average of $10 net per tree for the past ten years. As this fruit can be planted at the rate of 100 trees per acre, surely cherry-growing ought to be regarded as sufficiently profitable, even though the product be divided by two or three.

An acquaintance, with 100 trees of Fellenberg or Italian prune, sold the crop of 1892 for $1,000.

Three years ago in October last, were planted 100 dwarf pears which, in the June following, were rebudded or worked over into another variety, and being exceedingly thrifty, the buds were at once forced out to save a season's growth. The crop from same was sold in the month of November for $98.50. Multiply this by four, as 400 dwarf pears can be grown to the acre, and the result is no mean comment on the much-abused Kieffer pear, which ranks in the orchard list of profitable sorts.

A party engaged in growing currants for market has for three years kept an account of the disbursements and receipts from a single acre devoted to this fruit, and he tells me that his average net returns are about $160.

On a more extended scale, an orchard of thirty acres, made up of an assortment of all fruits, has given the owner for the past nine years net returns equal to $3,500 per annum. This orchard is seventeen years planted but this sum does not include the crop of 1892, which yielded about $6,000.

In these instances cited, good culture, good feeding, and business methods have prevailed in the management, and while they may be said to be exceptional cases, no good reason exists why they should not be more general. What man has done man may do.

AS TO SOME NEW VARIETIES.

Regarding varieties, we believe that no iron-clad rule can be laid down that will apply with equal force to all sections and surroundings. Hardiness, productiveness, and market qualities are the three important factors to be considered in the growing of all fruits for market; and yet, how rarely is this combination considered in the selection of an orchard list.

Experience goes to show that varieties are often fickle in habit and will not do alike well on different soils, hence need of intelligence and discretion in making the selection, while the three essentials above named are considerations worthy the attention of the commercial orchardist.

We are among those who believe that there should be such a revision of our fruit lists as would enable a planter to determine, by looking at a catalogue, what sorts could be regarded as specially fitted for the market orchard, and what for table or house use. Quite too many that are marked good, very good, or best, can not be grown for four prices over what they are even sold for, in the markets to which they are shipped. Any wonder that our friends shake their heads in doubt when told of "our possibilities?"

I can give only a glance at these salient points, with the hope of awakening thought and study on the part of the inquiring mind, while passing on to the end of my already too lengthy paper.

As new fruits are constantly being brought to notice, some of which will undoubtedly be found of value, we will name a few of promise.

The Sutton's Beauty apple had its origin in Massachusetts. It is exceedingly productive, hardy, of fine quality, beautiful in appearance, in size corresponding to a medium-size Baldwin, and keeps well into April.

The Martha crab excels in beauty and quality anything yet introduced in the way of crabs, and as it sells at a higher price than anything ever marketed in the shape of a crab, we believe that it may be worth growing where such fruit is in demand.

The Longfield, an apple of Russian origin, promises to meet the demands for a very stylish and good apple for our city fruit stands in the month of September. It is very hardy and exceedingly productive.

A seedling of Early Rivers peach, known as Horton's Rivers, combines the early ripening of its parent with more firmness of flesh, and is as perfect a free-stone as a Crawford. In other respects it is much like its parent. It certainly is an acquisition.

The Hynes' Surprise, sent to us from Texas, is a stylish, hardy free-stone of the Hale's Early type, but so far, with us, has shown no disposition to decay, as do most of that type. We regard it valuable.

A new apricot, having its origin in New York state, and known as the Harris, has been found very productive, large, of good quality, and ripening in July, and is very profitable. One party, in 1891, had several hundred bushels, a portion of which were purchased by a canning factory, and he sold the product to Boston and New York houses at a profit of fifty per cent.

Of new plums there is no end. The great demand seems to be for very

early and late sorts in the main, with some other better sorts to supplant the old mid-season varieties like Lombard and others. Of these newer ones we have the Field, a seedling of the Bradshaw, ten days earlier, otherwise resembling its parent in size and general appearance. It is very hardy, productive, and promises well. Gueii, Hudson River Purple Egg, Prince of Wales, and Peters' Yellow Gage are all desirable, and cover the ground well at their season of ripening, while Stanton Seedling, Grand Duke, and Monarch aid in extending the plum season late into September and early October, and are wanted in all markets because of their size and style. The Back Diamond, for beauty and productiveness, is unexcelled. It ripens about September 10.

So far the newly introduced Japanese varieties show themselves very hardy, and productive beyond our powers to describe. The name Botan seems to be a general name for a family, of which we have a number differing quite materially in character. The earliest we have, styled No. 26, is the poorest in quality, and yet, by reason of its early ripening, July 15, meets with ready sale in our city markets. Botan (Abundance, as it is often sold) is very good, but we believe not equal to True Sweet Botan, or the Yellow Japan; while as regards productiveness, Burbank's Japan excels them all. We have of this variety, grown one hundred fruits to the square foot, while the same branches producing this fruit were making from two to three feet of new wood.

To those interested in growing Damsons we desire to say, the French Damson is superior in health and productiveness to any of this family, out of seven or eight varieties that we have tested.

As for cherries, the Montmorenci Ordinaire and English Morello, as sour; and Windsor and Schmidt's Biggareau, as sweets, we regard as more profitable than any others grown.

DEMAND VS. QUALITY.

The merchant must cater to the wants of his customers, and just so with the successful fruitgrower. The markets require the very early and late sorts as well as those whose style fit them for retailing from the fruit stands, and in the production of varieties that meet these requirements as a rule, look for profitable returns.

We would not be understood as ignoring quality, but if compelled to discriminate as between quality and quanity, with style and good handling properties in favor of the latter, we should assuredly cast our ballot in favor of quantity in planting the commercial orchard.

To illustrate more fully the idea we wish to convey, let us take the currant. That variety having the strongest foliage; that will best resist the depredations of the currant worm, that will produce the largest crop to the acre, that will make the most jelly from a given amount of fruit, of the most attractive color, and hence will give to the producer the largest returns for his labor, is quite beautiful in appearance, and yet, if to be eaten from the hand or from the table, would be regarded as the poorest in quality of any currant grown (indeed, I should regard it as totally unfit for table use), and yet in my opinion it should rank high in the commercial orchard. I refer to the Prince Albert. For table use, Moore's Ruby, as a red, and White Imperial as a white, by reason of their excellent quality, should be found in every family garden.

In like manner we could go through the whole catalogued list of fruits,

making selections here and there which, when compiled into an orchard list, we believe would constitute a collection from which the commercial orchardist could figure with a tolerable degree of certainty as to his future possibilities in fruitgrowing.

Is this not a practical work for a practical fruit man of Michigan, thus to compile a list of valuable orchard sorts that can be referred to by future planters as thoroughly adapted to the purposes sought?

Sure it is that new interest is being awakened on this and kindred subjects connected with fruitgrowing, and with a soil, climate, facilities, and markets unsurpassed, abundantly accessible, we can but feel that a field is open and ready for a rich harvest to all whose inclination and taste fit them to engage in the most elevating, ennobling, and healthful occupation in which mankind can engage. Hence we urge upon you, when considering the legacy to be handed down to the family now growing up, teach the girls as well as the boys to love horticultural pursuits, educate them thoroughly in botany, chemistry, and entomology, and neglect not to plant such a variety of those fruits as can be grown with success in your locality, on which practical results can be sought and attained, and the coming generation will be in a position to reap a reward far beyond our fondest anticipations as to the possibilities of future fruitgrowing in your state.

ROT AND BLACK-KNOT.

At conclusion of Mr. Willard's paper a question was asked by Mr. BIRD of Ann Arbor, "How do you get rid of plum rot?"

Mr. WILLARD: In the first place, I feed the trees well. In a measure, rot may be averted by strong, healthy foliage. I also carefully remove the rotting fruit; but, really, we do not have much rot in New York. I think defoliation has much to do with it. Barn manure is a good fertilizer for plums, but I use wood ashes, getting them by the carload from Canada, and bone meal. I think these make harder wood than do other fertilizers. Plums, of all fruits, need abundant feeding.

Mr. JOSHUA HILL of Pontiac had asked by letter if a ten per cent. solution of sulphuric acid would cure black-knot.

"Well," said Mr. WILLARD," I would not care to try it. I would only cut the dog off right back of the ears."

Mr. POST: Have you ever used chemical potash?

Mr. WILLARD: O yes, I would not hesitate to use it, but ashes are better. Something beyond the potash and phosphoric acid is obtainable from them. I never saw such results as from two tons of ashes and 300 pounds of fine-ground bone, per acre, to a worn apple orchard, on light soil in Massachusetts.

Mr. KELLOGG: Use of ashes is all right, but don't set the hired man to do it. My man put ashes very thickly on raspberries, among the canes, and when it rained the ashes "ate up" the acre of raspberries.

FIGHTING FUNGI.

Prof. TAFT: I agree with Mr. WILLARD, that much is gained against fungous diseases by keeping the foliage healthy, and I would use ground bone as a fertilizer. But we can fight plum rot with fungicides, and can check leaf fungi by use of copper sulphate spray, and, earlier in the season, the Bordeaux mixture. I know instances wherein the rot has thus been either checked or wholly prevented. Cutting off black-knot is the best thing to do, but the knots must be burned, otherwise spores will spread from them. Sulphuric acid will kill the knots, but it will also kill the trees. Cut them off and cover the cut with linseed oil, which will be fatal to any remaining spores. Tincture of iodine will answer the same purpose. [In answer to a question from Mr. Kellogg.] Some Germans, and some people in this country, have held that copper sulphate is harmful to the roots; but I have found that, while five per cent. of it in some soil, kills and three per cent. harms, one half of one per cent. has no effect. At the strength the solution is ordinarily used, it would take many years to get enough into the soil to do any injury. Corrosive sublimate in weak solution is said to prevent shothole fungus and rot of the plum. It is a good insecticide also, but dangerous to have about.

Mr. D. WOODARD: My thriftiest plum trees stand in an old barnyard, and I used both copper sulphate and Bordeaux mixture, yet there is where I had most rot.

Prof. TAFT: The trouble was from the manure. There was too much nitrogen and so a too soft growth.

Mr. WILLARD, to Mr. MORRILL: No stone fruit is proof against curculio, though there may be slight difference in propensity to rot. There is no better method than jarring to fight the curculio—I will let my wife's relatives do all the spraying of plums, for this purpose, and I will stick to jarring. I run fourteen "bugging machines," and it don't cost much to operate them, not more than 15 to 20 cents per tree for the season. I work the machines at any hour of any day but Sunday—the Lord looks after the curculio on Sunday.

Mr. STEARNS: The jarring process often results in injury to trees from blows by mallets.

Mr. WILLARD: I have no such trouble. I use a crutch-shape tool and push the tree sharply, not strike it. I would have the trees headed as low as can be and yet get to them for "bugging." I would have the branches not higher than three feet from the ground. I roll the ground before "bugging," so as to have less trouble in wheeling the machines from tree to tree.

Mr. WOODARD: I fasten an old clothes-wringer rubber to the end of a pole, place the rubber against the tree and strike the other end of the pole. I use sulky wheels for the machine, but carry the sheet only ten inches from the ground.

DISCUSSION OF WORLD'S FAIR MATTERS.

Prest. LYON: When the state commission's committee on pomology, arboriculture, and viticulture was first constituted it was composed of eight persons, but before a meeting had been called it was increased. It was then divided into subcommittees and more members added, each subcommittee charged with certain subjects and myself made ex-officio chairman of each. Messrs. WESTON and STEVENS were present at the organization and notified the committee that $4,000 would be devoted to its objects, but the committee was instructed to make no expense that could not be paid outside of this sum. Several months later Mr. WESTON wrote me, intimating that some of it might be used for present needs; and so I wrote Mr. EDMISTON and others that bills for boxes for trees would be paid. This reached Mr. BELDEN, who wrote Mr. WESTON questioning this expenditure. Both these gentlemen wrote me, saying I had gone too far. Later, Mr. WESTON wrote me that he was ready to enter my order for fruit cans. I answered that I would make such an order if it would be backed by the commission. I heard no more for some time, and then from secretary STEVENS, saying the order would be backed. Hence I supposed nothing more would be expended, even if this was. The next event was a call from Mr. J. J. WOODMAN of Paw Paw, who said he had been given charge and was ready to make expenditure for canning. I thought this discourteous, though having utmost confidence in Mr. WOODMAN. I have therefore felt there was nothing more for me to do, and but for the advice of friends I would have resigned. The subcommittees have done nothing, because they had the same understanding that no funds could be used; that the $4,000 must be held to pay costs of transportation and care in Chicago. I have recently been in Chicago to help make the rules and premium lists for the horticultural display, and was promised that a copy of them would be here today, but Mr. SAMUELS has not sent it. I query if it is worth the while of this society, since it has been ignored, to make an exhibit of next year's fruit; yet I asked Mr. SAMUELS about it, if space could be found and entry made, and was assured it could be. It might not be good policy to antagonize the commission, but the complaints against it are by no means confined to horticulturists. We were provided insufficient means, and even that was not available when it should have been.

AN APOLOGY FOR THE COMMISSION.

Mr. WOODMAN: It is a mistaken idea that the whole of this work of the pomological exhibit has been put into my hands; but I was asked to go and see the South Haven people about canning fruit. I am here to learn what has been done or can be done about the matter. The commission understands that you gentlemen are to do this, and I am here as a representative of the commission to learn what you propose to do and how you mean to do it. Mr. WESTON has said to me, "They have the $4,000, why don't they go on and use it?" I am here to learn your wishes and intentions, and will convey them to the commission at their meeting in Chicago next week. The commission, in the beginning, thought they could get everything done gratis, but soon found that everyone wanted pay. They may not have been wise in all their measures. None of them are experienced in such work, nor even in holding fairs. They set aside $10,000 for agriculture, and $4,000 of this for horticulture. It is not too much, it is not enough, for that, but there is not enough for the rest of the agricultural exhibit. They have changed this somewhat, and seem well disposed to correct errors. I think horticulture is better provided for than anything else save mining and forestry. You made a splendid exhibit at the Centennial and yet had no money. Perhaps it would be better had there been none now. We must all go into our pockets and help. Mr. WOODMAN waxed eloquent over the grandeur of Michigan, which he pronounced the garden of the world—and, as he had seen a deal of our globe, he deemed himself qualified to judge of it—and continued: What is true of our state otherwise is true also of her fruits, and this should be fully shown at the fair. There have been too many committees and too little head. A man of nerve and push is needed to superintend collection and forwarding of this exhibit. Your president is one of the best experts in fruits in this country. He should be in Chicago to care for the exhibit. He can not run over the state, and should not be asked to do so. Select some good, active, pushing man.

Mr. LYON: There is no feeling between Mr. WOODMAN and myself, but there seems to be a question between Mr. WESTON and me. He expressly said I must not expend one dollar of the appropriation, and in this Mr. STEVENS concurred. But he now says, "They have the money, why don't they use it?" Until Mr. WOODMAN came to me and reported this, I had no assurance that any expenditure could be made from that fund.

Mr. WOODMAN: I scarcely like to think there is an issue between Mr. WESTON and Mr. LYON. Mr. LYON'S word is to be taken fully; but while Mr. WESTON may have said so he must have changed his mind or there is a misunderstanding.

ANOTHER SHOWING OF THE COMMISSION'S QUEER WAYS.

Mr. MORRILL: At our meeting one year ago, Mr. BELDEN, of our state commission, and CHIEF SAMUELS of the World's Fair, agreed that this society ought to be put in charge of the horticultural exhibit, and it was understood that they would urge the state commission to take this course. When the committee was organized at Grand Rapids, I was put in charge of small fruits. This was in the early spring. I heard nothing more until July, when Mr. BELDEN drove to my place and asked me to do some canning. I was too busy and had been unable to arouse any interest among my people, but finally agreed to fill the cans. I told him I might have to buy some fruit, and asked if any money was to be had for such purpose. "No," said he, "there is some money but it must be used for transportation and other expenses." Mr. BELDEN left. When I could, I got about and secured some fruit. I waited three weeks for cans, and then received a letter from either Mr. WESTON or Mr. STEVENS, asking me to do the same things. I answered, and later wrote for cans, but was told Mr. WOODMAN had been given charge of the work. Now Mr. WOODMAN comes and asks what we are doing? I wrote Mr. LYON and he replied that he had been relieved, but did not say how. There seems to be a great deal of confusion between Messrs. WESTON, STEVENS and BELDEN.

Mr. WOODMAN: I received a telegram from Mr. WESTON to "start that pomological wagon" and get the canning of fruit started. I got JUDGE RAMSDELL appointed to take charge of the canning, and I suppose he has done it. He had authority to go on and make bills and draw pay. But I have nothing to do with the pomological exhibit save to start others to work making it. I believe this society will be instructed that the $4,000 are yours and you must go ahead and use them. I am confident that it is the commission's wish that you go ahead and make this exhibit.

WHO TAKES THE RESPONSIBILITY.

Prof. TAFT: Are we to understand that *this society* can have $4,000 with which to make the pomological exhibit?

Mr. WOODMAN: I mean that the committee will do it, by and with the advice and co-operation of the horticultural societies of the state.

Mr. SCOTT: As I understand it, members of that committee are to expend their own money and take their chances of getting it back some time or other.

Mr. WOODMAN: It is a rule of the state, in all its dealings, to pay for no service until it has been rendered. This is a rule of the state, not of the commission.

Mr. WATKINS: I am one of the committee on pomology. I have found men who wish to make exhibits, or collect them, and they ask me if the expenses thereof (they willingly give their time) will be paid. I ask Mr. WOODMAN, what will be paid?

Mr. WOODMAN: I will not attempt to answer. I have no authority to say. Let this society recommend a superintendent, who will be put in charge by the commission and he may go ahead and make arrangements and expenditures.

Mr. WATKINS: Men of that kind are scarce and if one is found he must be paid. He can not be secured for nothing.

Mr. WOODMAN: I shall leave tomorrow morning, and I ask to be advised then of any action that may have been taken.

A paper upon the general subject of the World's Fair exhibit was here read by Mr. A. G. GULLEY.

MR. LYON WAXES EMPHATIC.

Mr. LYON: I doubt if any one suspects I would not assume any responsibility belonging to me in this matter. Had I understood the situation to be different from what I have described, I most certainly would have acted. I believed it was the duty of the committee to gather the exhibit, and some one to have charge would be appointed afterward. When Mr. WOODMAN came to me with different instructions from those I had received explicitly from Mr. WESTON, it was too late for all but the very latest peaches. And such has been the trouble all through. The commission is not "up" in its business enough to understand when to act, nor how. I understood all the while that the commission would appoint a superintendent at Chicago when the time of need of such a person came. Not in all cases, either, has the commission's plan of auditing been pursued by the state: for in two cases at least has this society been given the expenditure of such a fund.

Mr. W. W. FARNSWORTH, secretary of the Ohio Horticultural society: Our state commission turned their horticultural exhibit wholly over to our society, and we have the expenditure of the state fund of $8,000.

Chairman GARFIELD: This society has not been recognized in the slightest degree by the state commission, and use of the word "society" by Mr. WOODMAN is done unadvisedly. Discussion of the subject here is tolerated only because some members of the commission are also members of the society.

SIMILAR SITUATION IN NEW YORK.

Mr. S. D. WILLARD of Geneva, N. Y.: We have had much the same trouble in New York. I insisted, before the commission, upon an appro-

priation of $25,000 in order to beat Michigan. The commission got up to $10,000, but we refused it. So matters stood until September, when the matter was finally talked over, and our persistence was rewarded with $40,000—"only go ahead," they said. Meantime one of us had taken in hand the grape interest and expended a large sum of money. He may get it back sometime, and he may not. I made a collection of apples, but my work has not been paid for. The trouble is that these men of the commissions have no comprehension of the labor involved and the need of prompt payment. And besides competition with us New Yorkers, you Michigan men must look out for the Canadians. Here sits Mr. SMITH of Ontario, listening to all this, and his people are getting ready to go to Chicago and beat all of us in the apple exhibit; and, I want to tell you, you must be careful and active or they will do it.

Mr. BIRD: Mr. WILLARD has been talking sense. The need is of money and enough of it. It is late, but not yet too late so far as the fruit of next season is concerned.

SUMMING UP THE MATTER.

Mr. MORRILL: We may get some help from the next legislature, but some one should have known at the beginning that a definite sum was obtainable. But up to date there has been no definite promise of a single dollar for any specified purpose. I put the question direct to Mr. BELDEN, if there was any money with which to pay the cost of collecting the exhibit, and he said: "No, sir. There is a fund, but it is for transportation. But you would better keep a memorandum of what you expend, and when we get through we may be able to fix it up somehow."

Mr. LYON gave notice that he would submit a proposal for legislative aid to the society direct. This was greeted with applause.

Mr. MONROE: I have not thought it best to make any recommendation to the commission. They were advised by Chief SAMUELS of what it was best to do in this matter, but saw fit to make an independent committee. That is very well and we have no fault to find. But until the commission directly state to some one, "Go ahead and make these expenses and we will pay them"—until they will say this, it would be an imposition upon any man to ask him to go about making expense to himself and others.

Mr. MORRILL: That involves the intent of a motion I meant to make. The chair may hold me out of order; but as the commission has sent Mr. WOODMAN here to confer with us, it would seem well for us to ask them what they wish us to do.

Chairman GARFIELD commended this and suggested that Mr. MONROE

be instructed to make a formal statement to Mr. WOODMAN of the position of the society as relates to the commission.

By motion Mr. MONROE was so instructed.

Mr. LYON submitted the following resolution:

Resolved, That a committee of three or more persons be appointed by the chair to prepare and present to the incoming legislature an application for an appropriation, of not less than ten thousand dollars, to be expended under the direction of this society in the preparation, placing, and conducting of a horticultural exhibit at the coming Columbian Exhibition.

The reading of this was greeted with cries of "Good!" and other manifestations of approval, and it was adopted by a unanimous vote.

A CATEGORICAL STATEMENT.

At the evening session, in accordance with the vote of instruction, Mr. MONROE made to Mr. WOODMAN the following statement: There is only an amicable feeling on the part of this society toward the state commission, but we have had no intimation from the commission that anything was desired of us. We have discussed the fair at each recent meeting of the society, and of course feel a deep interest in it. A committee (Messrs. GARFIELD, WATKINS, and myself) was sent one year ago to confer with the commission, and we were courteously heard. We tried to show them why horticulture should have special favor, because there is no money value in a prize to an exhibitor, beyond the amount of the premium, and very much labor is involved in preparation. But the commission emphasized the fact that the appropriation is small, and urged that all work of preparation must be done gratis, only pay for care of it in Chicago being given. We told them how complete we desired to make the exhibit — to have it embrace the trees, vines, and plants, as well as fruits in fresh, canned, dried, and manufactured forms, including a very full supply of the fruits of 1893 in fresh condition, from the earliest to the latest. They at a later meeting set aside $4,000, of which $1,000 were to be used for preparing trees and. possibly, for removal of them to Chicago last fall. Yet payment for the printing of circulars instructing in this work was made only after a personal appeal to Mr. WESTON. I can fully corroborate Mr. LYON as to his having received instructions from the commission that no part of the appropriation could be used for expenses of preparation. We sent out circulars, and soon found that trees for the exhibit would be contributed, but the person offering them could not afford the expense of the boxes. The commission for a long time refused to pay for these, and when they relented it was too late. When they got around to the ordering of cans, it was again too late. The commission has no horticulturist in its mem-

bership, and no conception of what should be done in this department, and so it has dragged along in this disastrous way. So as horticulturists (not as members of this society) we desire Mr. WOODMAN to show to the commission that some one should be supplied with money and given authority to proceed with the work. But until this is done, no one cares to venture the expenditure of a single dollar. The horticultural committee must know that there is money and that necessary bills will be paid. We of the committee have had no word nor letter authorizing us to expend a single dollar, up to the present time. We think as a society we can send no message to the commission, having nothing to do with the matter.

Mr. WOODMAN: It seems to me a statement should be drawn up, showing what has been done and what should be done, and I think the horticultural societies, and not the commission, should suggest the man for superintendent of the work. No man would like to take such a place unless he knew he was the choice of the horticulturists. I am satisfied that I am correct in saying that the commission understand that the $4,000 are set aside for use by the committee, and will be paid out upon their order. Mr. WOODMAN closed with a plea to the horticulturists to overlook the errors of the commission and take hold and make the exhibit.

Mr. GARFIELD: The commission and the committee should get together and settle things. This society has no lot nor share in them, not having been recognized by either in any way.

Mr. WATKINS: Mr. BELDEN has general charge of the agricultural exhibit, and Mr. WOODMAN has been specially appointed to assist him. What need of another?

Mr. WOODMAN: Mr. BELDEN is sick or he would have been here in my stead, as I wish he had been.

Voices: "A change for which we are not sorry." "No!" "Not at all!" etc.

ANOTHER RESOLUTION.

Touching this subject, the committee on president's address, later, made this report:

Further, we desire to recommend that the society adopt the following resolution, with reference to so much of the president's address as refers to our relationship to a horticultural exhibit at the World's Fair.

Resolved, That this society feels a great interest in the proper exhibit of the horticultural products of the state at the World's Columbian Exposition, but that, inasmuch as we have not been recognized in any way by the State World's Fair Commission, as a proper agent for making a display of these products at the fair, we do not feel authorized to even attempt a suggestion as to the management of such an exhibit; but, if the commission desires the aid of this society, a communication to that effect will receive prompt attention.

Tuesday Evening Session.

The programme for this session was made up of three short lectures by members of the faculty of Michigan university. First came some reports and resolutions, when the regular order was taken up, beginning with

PROF. V. M. SPALDING ON "MICHIGAN FLORA."

The indigenous flora of Michigan has always presented many points of interest to those who have given any attention to the natural resources of our state, and there are some reasons why it should be of special interest to professional cultivators of flowers and fruits.

Since the days of the first explorers and settlers, this flora has been steadily, and in some localities rapidly, changing. Forest fires have swept over wide areas, and in place of the magnificent representatives of the primeval forest have come up briars and poplars. The farmer has industriously, and of course necessarily, cleared his land, exterminating here a moccasin flower and there a fringed gentian or harbinger of spring. Borne on the winds, or scattered in clover seed, or thrown out of car windows, have come in like a flood, Canada thistles and prickly lettuce, daisies, and quack and bur-grass and other noxious weeds. The removal of the sheltering woodland is followed by the slow death of shade-loving plants, and drainage of low tracts means the extinction of many more.

All this is inevitable, but as a result our native flora has already undergone such changes that probably no one living would be able, from existing data, to give an accurate account of the natural vegetation of the state as it was in the days of the aborigines. Nor can those who come after us know what our present flora is, except as it is permanently recorded by us in carefully preserved lists and herbaria. The geological history of the state, so far as it remains, is kept in imperishable form, but its botanical history is subject to vicissitudes that render its complete preservation, even while it is in the making, well-nigh impossible. Those who best understand these facts regret very deeply every unnecessary sacrifice of our original flora, and want to keep, just as long as possible, every living thing *where it is and as it is.* But, apart from such changes, taking our flora as we find it, let us glance at some of its prominent and characteristic features.

One not familiar with the natural productions of Michigan, and at the same time accustomed to notice botanical peculiarities, would, upon entering the state for the first time, notice a number of marked and interesting features. He could hardly fail to be impressed, even now, with the great forest wealth of the state and the natural areas of its distribution, the wide belt of pine land, the heavily timbered hardwood sections, the oak openings, the pine barrens, each with their characteristic sorts of woody plants, among which such northern species as the spruce and fir, and the southern, warmth-loving coffee-tree, gum-tree, and pawpaw, have alike found a congenial home. With these a host of lesser trees and shrubs, woody climbers, and, finally, bushes and undershrubs, making a grand total of over 200 woody species occurring within our limits. He would observe, corresponding with the great variety of soil and climate, a similar profuse-

ness of herbaceous plants, many of the species, in like manner, having immigrated from north and west and south; would note the thousands of lakes and bogs that provide a secure home for numerous water-loving species; and by no means least, he would see how bravely and persistently different sorts of forage plants have clothed our fertile acres and are pushing on to cover the spots left bare by the lumberman's axe. It would need only such a casual survey of the flora of the state to appreciate the great variety and abundance of the species composing it.

It is important to learn, if we may, something about its origin and relationship. Where did the sixteen hundred and more flowering plants that are now domiciled within our borders, come from? We know from the rocks beneath our feet that they did not always live here, and we have even seen with our own eyes the invasion of hardy intruders, some of them from beyond the seas, as they have spread through our territory and encroached upon the ground once held by native species.

Let us proceed by the easiest way, and notice, first, the plants that are known to have come in comparatively recently from foreign countries.

There are about two hundred of these, a large proportion of them from Europe. They include the weeds of civilization, that one sees everywhere from the seaboard to the Mississippi. They are common enemies, but, like other foreigners, have come to stay. With them are a good many that have escaped from cultivation and are here and there maintaining a precarious foothold, or by some favorable combination of circumstances are making a fairly successful fight with the older occupants of the soil. The history of these introduced species, in their wanderings over the earth's surface. dispersed by wind, water, animals, and the hand of man, would fill a volume. Many of them are perfectly at home in every quarter of the globe, cosmopolitan in their habits, and no more of us than is the meek-eyed celestial who does our washing and receives our Christian abuse.

Turning now to the remaining twelve to fourteen hundred species that really belong here, and that we have every reason to believe were growing within the borders of our territory long before the advent of white settlers, we find ourselves confronted by no easy task.

A comparison of our truly indigenous species with those of other parts of the country, followed by a more extended survey of the plants of the globe, leads to a number of important conclusions, two of which require special notice.

In the first place it is apparent that the indigenous flora of Michigan is so far identical with that of the adjacent states, and in fact with that of a territory extending far to the east, northeast. and southeast, that it is to be studied as a part of this larger flora, rather than as an independent or isolated assemblage of species; and in the second place, it is plain that this larger flora is related in a similar way to one of much wider range, extending far beyond the limits of the continent, but still embracing many of our most familiar species and their immediate relatives. An illustration will serve to make this clear. There is perhaps no more characteristic and better known representative of the Michigan flora than the white pine, *Pinus Strobus, L.*, that in years past occupied a broad strip of territory lying to the northward of the 43d parallel, to which it gave the name of the Michigan pine belt. While a most characteristic species, however, its range is far beyond the limits of the state, extending northward through Canada and eastward to the gulf of St. Lawrence, southward along the Alleghanies as far as Georgia, and northwestward through Wis-

consin and Minnesota into the territory beyond the national boundary. It thus becomes a conspicuous member of that more comprehensive flora belonging to the Atlantic states and the region of the great lakes. Furthermore, what is true of the white pine is true also of very many other species that go to make up our flora. They belong not to Michigan exclusively, but to the wider region of eastern North America. Throughout this great area the vegetation, in its broad features, is essentially the same. The forest trees of Michigan and Wisconsin are, in general, identical with those of New York and New England, Pennsylvania, Virginia, and Canada. The beech, maple, and basswood, oak, hickory, and hornbeam, willows and ashes and walnuts, and a long list of other familiar trees and shrubs, with a still longer list of herbaceous plants, have stamped upon this whole region its well-known and characteristic features.

As previously intimated, a relationship similar to that already noticed between the Michigan flora and that of the remaining lake and Atlantic states, may be traced between the latter and the vegetation of a much wider region extending far beyond the limits of the American continent Similar, but not quite identical; for, while a given Michigan plant has precisely the same botanical character in whatever part of the eastern United States it may occur, outside of this region, particularly beyond continental limits, such an identity of specific characters may or may not be retained. To recur to the plant that has already served as an illustration, the white pine of Michigan is everywhere, in eastern North America, the same species, identical in every specific feature, and hardly manifesting variation enough to afford ground for the varieties that have sometimes been assumed to exist. Beyond the limits of the continent the white pine is not indigenous. It is represented, however, in southern Europe, by the Cembrian pine, *Pinus Cembra, L.*, and in southern Asia by the Bhotan pine, *Pinus excelsa, Wall.*, species that resemble it so plainly as to at once suggest close relationship, and yet readily distinguishable by characters that are generally admitted to be of specific value. There is a peculiar interest attaching to these related forms, so like and yet so plainly different, as if challenging the botanical expert to point out marks by which they are to be distinguished from their new world congeners, and to tell, if he can, how they came to be growing so far from them and from each other. This is but a single case out of very many. We often find, on the mountains of the Scandinavian peninsula, or further east in northern Siberia, and with remarkable frequency in Japan and eastern Asia, plants either absolutely identical with our own or closely related to them.

The reason for this peculiar distribution of related or identical forms, as pointed out by Professor Gray many years ago, it is to be sought in the geological history of the northern hemisphere. During the so-called glacial period the plants of Greenland and northern Europe and Asia were driven southward by the cold to flourish for a time in lower latitudes, retreating again to the north with the return of a warmer climate, but leaving here and there, in secluded swamps or in the cold recesses of the mountains, on either side of the globe, a representative to tell the story of migrations more ancient and escapes more thrilling than those of Trojan or Viking.

Of our own Michigan plants, a very considerable number have apparently had just such a history. They range far northward into Labrador and still higher latitudes, where they are quite as much, perhaps more, at home than they are with us, and several occur as identical or closely related species in eastern Asia.

It is impossible here to discuss the successive steps by which, from such data, another link in the chain of evidence bearing upon some of the most difficult questions regarding organic evolution has been wrought out and found to stand the test. Enough has been said to show how impossible it is to take an intelligent general survey of the flora of such a state as this without, at the same time, extending our range of vision, both in space and time. To know in their just relations the plants of Michigan, one must know, in a restricted, perhaps, but nevertheless a very real sense, the plants of the world. On the other hand, the whole scientific world, without regard to national boundaries, is interested in the study and preservation of the flora of Michigan. The extermination of a single plant in some out-of-the-way corner, while apparently a small affair, may be the blotting out of the single remaining record of an important chapter in the earth's history, a record that, once lost, can never be restored.

Without dwelling further upon such considerations, may I briefly suggest some of the possibilities of our Michigan flora that naturally occur to those who are engaged more or less constantly in its study?

It can hardly be doubted that, in ornamental planting, particularly, we are still making too much of imported plants and too little of the products of our own soil. Our indigenous species of elm, maple, and basswood are superior in vigor and beauty to those imported from Europe, and our pine and hemlock far more graceful in their habit than the stiff foreign conifers that have so long usurped their place. There is no reason for saying that the foreigner must go, but there is the highest reason for determining that the native-born denizen of the soil shall stay. We have found out that our own white elm is worth more than all the introduced species together, for lawn and street planting, but we have still much to learn regarding the capabilities of a long list of indigenous trees still seldom used.

The same thing holds true regarding our native flowers. Many of them are as exquisitely beautiful as the lillies, orchids, and heaths of the most distant regions of the globe; yet we have made remarkably slow progress in learning their habits and how to care for them, as they slowly accommodate themselves to the changed conditions under which they must live, if they live at all, after the complete transformation of our territory from a wilderness into a highly cultivated state. Some of these, like the beautiful wind-flower, *Anemonella thalictroides*, will flourish in all their wild beauty on the merest handful of congenial soil. Others are shy of the controlling hand of man, and doubtless some may be wholly incapable of surviving the changes of advancing civilization; but here are the representatives of a most beautiful flora, one that has most perfectly adapted itself to all the varied features of this magnificent peninsula, fading away from our sight, year by year. Surely, if we can not do more, we can at least give to some of them the necessities of life, leave here and there a sheltered nook for their undisturbed growth, and study their habits and the conditions necessary for their preservation.

Our indigenous fruits may well claim still more of the attention of those who have the practical skill and the scientific instincts requisite to a determination of their actual or potential value. I have but little knowledge of what may have been attempted already in this direction, but I do know from actual trial that our own blueberries, cranberries, raspberries, strawberries, and wild plums are good, and I doubt not they might be made much better. Then there is the papaw, the possibilities of which as a cul-

tivated fruit are well worth considering, and Juneberries, currants, and wild gooseberries, some of which have established a good claim to a place among our cultivated fruits. Doubtless it would take many generations to determine the capabilities of some of these, but it would seem desirable that their systematic study should be undertaken without further delay. The experiment stations exist for just such work. The universities, unfortunately, as a rule, have neither land, time, nor money available for the purpose.

One of the possibilities of our Michigan flora lies in the restoration, in some reasonable degree, of its once almost boundless forest wealth. A single conifer has contributed more to the wealth of this state than any other product of its soil or mines or lakes. There will always be thousands of acres of land within the state exactly adapted to its growth and ill-adapted to other purposes.

Judging by what has already been accomplished on many wornout New England farms, there is no reason to doubt that, with a minimum of initial expense, and with hardly any subsequent outlay, the barren tracts of Michigan that are constantly reverting to the state because their owners can not pay the taxes, would bear a famous crop of pine in fifty years or less, worth more than everything else that could be painfully dug out of the soil at many times the cost. It is not to be expected that the state will very soon undertake the raising of pine timber for use fifty years hence, but it may well provide for such a series of careful experiments that, half a century from now, those who come after us will know, as they do in Europe today, how long it will take and what it will cost to produce a thousand feet of a given quality of wood, and by what method it is to be accomplished.

The possibilities of our flora are not all of a hopeful character. We have become painfully aware, even within a few years past, of the capacity of foreign weeds for entering and actually taking possession of the land. There is no doubt that, in spite of these vile intruders, the land will be tilled and the harvest gathered as it has been in the past, but it is a pitiful spectacle to see the weary tiller of the soil entering upon this unequal and well-nigh hopeless contest with a ubiquitous enemy. Whatever may be thought of the duty of the state in regard to any other suggested lines of action, there is no possible doubt that existing laws ought to be rigidly enforced. With this, as with other public nuisances, every good citizen ought to stand with every other on the common ground of absolute extermination when it can be accomplished, restriction to the narrowest limits meantime, and, until it is thoroughly cleaned out, a relentless fight.

He would be a bold prophet who should undertake to predict the changes through which our Michigan flora must inevitably pass as the decades and centuries roll slowly by. What new arrivals there will be from foreign shores we can not even guess. What losses we shall sustain through the extermination of indigenous species we may more easily imagine, but are in no position to enumerate. What welcome restorations and additions there may be are alike unknown. But there can be no doubt that, in the future, even more than in the past, the hand of man will be a controlling factor. Whether in other directions man fixes his fate, or his fate fixes him, it is certain that, within pretty wide limits, the future of our flora will be determined by the character of our immigration, the thrifty or careless habits of our farmers and fruitgrowers, destructive or conservative instincts of botanical collectors, the occurrence of forest fires,

and various other agencies immediately or remotely under human control. As it exists today, the flora of Michigan, in its varied wealth of grasses, flowers, fruits, and trees, is one of the most beautiful and productive on the face of the earth. It becomes us to preserve where we can not improve it, and to hand it down to the generations who succeed us, so far retaining its original charm and freshness that they may still say, as we do, in looking upon our birthright, "*Si quæris peninsulam amœnam circumspice.*"

DR. V. C. VAUGHAN ON "THE FOOD VALUE OF FRUITS."

When asked by my friend, Mr. SCOTT, to prepare a short paper to read before you, I thought I would like to say a few words on the value of fruit as food. It has appeared to me rather strange that, in this country where we have such a variety of fruits, more stress has not been laid upon their food value. I think that most people regard fruits as table luxuries which we may enjoy, but without which we could live just as well as not and not suffer any in health or vigor. That this view is not the correct one, I hope to show in this short paper. I shall confine my remarks to the use of fresh, ripe fruit, and shall not concern myself with the value of dried, preserved, or canned fruit. In thus limiting my remarks, I do not wish it to be understood that I do not appreciate the value of the last mentioned articles of diet, but the limitation which I have placed upon this paper is for the purpose of enabling me to bring out prominently a few points which I consider of great importance. The most important constituents of fresh fruit are the nitrogenous substances, the sugar, the organic acids, and the inorganic salts.

The chief nitrogenous substance is a vegetable albumen which is present in small amount, and whose actual food value is not great, and we will not take any time in discussing it.

The per cent. of sugar varies in ripe fruits from about two in peaches to as much as 17 or 18 in hothouse grapes. The origin of the sugar in fruit is of interest and gives rise to a question which the scientist has not fully answered yet. That it comes from the starch in some fruits is unquestionably true; but other fruits, as grapes, contain no starch. It is generally stated that in grapes the sugar, which increases remarkably in amount during the process of ripening, is formed at the expense of the organic acids, which are known to decrease in amount at the same time. This very plausible explanation is, however, probably incorrect. During the ripening process there is a marked increase in the amount of alkaline base (potassium), and this, by neutralization, diminishes the quantity of free organic acids, and thus the decrease in the acidity is accounted for without resort to the supposition that the organic acids are converted into the sugar. The increase in the sugar during ripening is most probably due to an increased supply of this constituent from the juices of the vine or tree.

It has also been supposed that the after-ripening, which occurs in apples and other fruits after they have been gathered, is due to an increased formation of sugar. Certainly these fruits become sweeter by the after-ripening process, but the researches of Portele and Marsh make it highly probable that the increased sweetness is due to the slow conversion of one sugar (dextrose) into another (lactose), the latter sugar being sweeter than the former.

In the sugars of ripe fruit we have an easily digestible, valuable food substance.

The chief object in writing this paper is to emphasize the value of the organic acids contained in fruit as constituents of food. The chief organic acid in apples, pears, plums, apricots, and cherries, is malic. Grapes contain both malic and tartaric acids, while berries abound in malic and citric acids. The value of these acids in the prevention of scurvy is well known. This disease was formerly one of the most serious which afflicted sailors on long voyages. These men were compelled to live upon salted meats and dry bread, and scurvy prevailed among them. The discovery that this disease could be prevented by the addition of fruit acids to the food saved many lives, and was a great boon to commerce. Now every vessel starting on a long voyage has its casks of lime-juice, and the sailor no longer dreads scurvy. It must not be supposed. however, that the disease no longer exists. Dr. Northrop recently reported several cases of scurvy among children in New York city, and some of them were children of rich parents. The extensive employment of "baby food" is found to act upon children very much the same as the diet of the sailor acted upon the adult one hundred years ago. The gums are softened, sometimes ulcerated; the eyes become bloodshot; hemorrhagic spots occur on various parts of the body; the limbs become painful, as if from rheumatism; the urine is often bloody, and the disease may terminate fatally. I say that this disease is not unknown to the medical profession, and I have seen two cases of it here in Ann Arbor.

The above mentioned symptoms only appear when the demand for fruit acids becomes imperative, and milder cases often escape the attention of the most watchful and wide-awake physician. Many more cases are never brought to the attention of the physicians. Moreover, the demand for fruit acids must have its effect among adults as well as among children. It only shows itself more promptly among the young on account of the greater susceptibility of their organisms to the deprivation of any valuable food substance.

Again, the fruit acids are converted into alkali during their passage through the body, and thus they tend to prevent many of those painful sensations which we are accustomed to designate as rheumatism. Of course, I do not claim that the more liberal use of fruit would relieve all kinds of rheumatism, because the varieties of this affection are numerous and the causes are often complicated.

There is another reason why fruit should be more largely eaten with our meals. The volume of food is of some importance in satisfying hunger, and fruits furnish a comparatively large volume without overtaxing the organs of digestion and assimilation.

Fruits increase the peristaltic movements of the intestines, and probably have some effect upon the action of the liver.

I hope that I have said enough to convince any one who might have been skeptical on the subject, that fruit should not be regarded merely as a luxury, but as an essential part of our daily rations. Much more might be said upon this subject, but, as I have stated, my object has been to make prominent the food value of wholesome, ripe fruit.

At conclusion of Prof. VAUGHAN'S paper, he was asked by Mr. GARFIELD: "Do you advise against the eating of grape seeds?" "Yes," said Mr. VAUGHAN, "I always advise against it, but, like much other of my advice,

I never take it myself. Instances of harm by inflammation in appendix vermiformis, from swallowing grape or other seeds, are very rare. Often those presumed to have had this trouble really died of other cause. I always tell my children not to swallow them, but always do it myself. Of all the millions of people who daily swallow some such seeds the number harmed is almost infinitesimal."

PROF. J. B. STEERE ON "WILD AND CULTIVATED FRUITS OF THE AMAZON."

The study of foreign fruits and foreign fruit supply is of twofold interest to us. It interests us as fruit-raisers, in an economic way. If the foreign fruits can be furnished good enough in quality and cheap enough, they may to some extent take the place of our own fruits and thus injure the home producer, as cheap foreign wools injure the sheep-raiser. This will be much more the case if the fruits are of the same kind as our own. If they are entirely distinct, the chief result will probably be to increase the amount of fruit used. The introduction of foreign fruits, then, interests all of us, as it increases the variety of pleasurable and healthful things to be enjoyed.

The use of foreign fruits depends not only upon the actual quality, which makes the demand for them, but upon the absolute possible supply, upon the keeping quality of the fruit, and upon the distance and cost of transportation. If any one of these requisities is wanting in a fruit, it will be of little value to us. The so-called grape-fruit, the shaddock of the east, can probably be produced as cheaply as the orange, but its quality forbids its general us. Many of the finest tropical fruits in the world never appear in our markets because they are either too delicate for transportation or are produced at such a distance from us as to make their transportation unprofitable.

When a foreign fruit of good quality can be furnished us in good condition and cheaply, it is sure of recognition. Before the year 1865, bananas were a rare sight in our markets. There are more carloads of bananas sold in Ann Arbor now in a year then there were bunches then. This great growth in consumption depends upon the good quality of the fruit (not at all the best in this case), upon its keeping qualities, and upon the fact that an abundance of territory for its successful cultivation has been found near enough our ports to make transportation cheap.

The puzzle of botanists is in the fact that fruits and other plants grow in zones of climate. No one can well say why an orange should not be as hardy as an apple, and fruit as well in Michigan as Florida, but it does not. Neither do we, as we approach the equator, find a climate, as we might be led to expect, in which all the plants of the world shall find seasons and conditions for fruiting; but the hardier fruits and plants of the north, like its animals and men, have been left behind, and it is as difficult to raise roses and potatoes, and even grapes, in equatorial Brazil as it would be to raise pineapples and bananas here. I found an old Portugese steamboat captain at Para on the Amazon, putting ice about his roses that he might be able to get a few flowers; and the poor Spanish priests of the Philippines are always experimenting with grapes, and think it noteworthy if they can get a few poor bunches.

Every plant, at least every plant which is highly organized enough to be

valuable as a fruit, has its own narrow zone where it is in perfection, a belt on each side of this where it can exist, and the rest of the world is entirely unfit for it.

A table of zones with their corresponding fruits and vegetables could be formed. The fruits would read somewhat as follows:

7.—Huckleberries, cranberries.
6.—Currants, gooseberries, cherries.
5.—Strawberries, pears, blackberries, apples.
4.—Plums, peaches.
3.—Grapes, apricots, figs.
2.—Custard apples, lemons, oranges, mangoes, pineapples.
1.—Mangostans, durians, bananas, plantains, alligator pears.

This table can not be made exact, from the fact that, while a genus of plants has its general zone of temperature, each species has its own special zone, so that while the finer grapes would be found to be subtropical, some of the hardier ones may reach up into the colder temperate regions, and some poor, tasteless strawberries might be in subtropical regions.

This fact of the existence of plants in zones has in it much of value to our fruit-raisers. Instead of spending time and money in trying the practically impossible feat of raising apricots and figs, it will pay us better to spend our time in multiplying and improving those fruits which are at home in this climate.

There are, then, certain fruits, among them the finest in the world, the durian, mangostan, and mango, and the finer bananas, which can only be produced in perfection near the equator. The question whether these fruits shall ever be seen in perfection in our markets and on our tables depends upon the existence of a territory near enough our ports in which the requisite conditions for their growth exist. We may consider ourselves fortunate that such a land does exist, with all the conditions of tropical climates, virgin and fertile soils in unlimited quantity, and this in the hands of a friendly and neighboring people.

A cord drawn from the port of New York to the equator, touches land at the mouth of the Amazon in South America, at about 3,000 miles, or in Africa in the region of the mouths of the Niger and Congo, at a distance of about 4,500 miles. The Amazon, then, and perhaps the Orinoco, become important to us as the probable future source of supply of the finer equatorial fruits, as yet unknown to us. With the mouth of this great river within five or six days' steam of New York, and with improved means of refrigerating, and electric trains from New York, we need not despair of seeing mangoes and durians and mangostans upon our tables, and bananas so delicious that those now in our markets would never be mentioned again. There are remains of buried cities of former civilizations at the mouth of the Amazon; but in the native fruits of the great river there is little to show that these ancient inhabitants had paid much attention to their cultivation. Most or all of the cultivated fruits of the country are of eastern origin and were introduced from the East Indies by Spaniards and Dutch after the conquest. Those in most ordinary cultivation are the orange, banana, plantain, pineapple, and mango. The oranges and pineapples find the climate near enough to suit them so that they fruit readily, and may remain living some time when deserted in the jungles, but they finally succumb to the native vegetation. Their quality is indifferent, and the natives take no means to improve them. The

mango, also an eastern fruit, has reached here in only one of its varieties, and this one of the poorest. The trees are hardy, and they are often planted for shade along the streets of the towns. The fruits are green, stringy, and resinous, and one in eating them can get little idea of the mango as found in the East Indies. The one fruit which, in spite of all neglect, is abundant and always good, is the banana. The varieties grown are immeasurably better in quality than those in our markets. The fruits themselves are shorter and round and smooth, with oily, light yellow skin, and their flesh is as soft and smooth as a custard. They are frequently brought in perfection by steamers to New York, and there is no reason why they should not in time supplant the variety now in our markets. The plantain, another species of the same genus as the banana, has great food value as well as use for fruit, being cooked in the ripe state and eaten as we use cooked fruits, and baked in a green state, when it becomes a substitute for bread used by thousands of the inhabitants of the river. The bread-fruit has been transplanted in the seed state, the seeds being cooked and eaten like chestnuts.

While the Portuguese and Spaniards transplanted these eastern fruits, they left behind the finest, the mangoes and the durians and mangostans of the equatorial regions of the east. We may expect our sister republic of Brazil to soon take up the introduction of these fine fruits. There can be no question of their flourishing, and we may soon have American enterprise and capital used in raising these fruits on the virgin lands of the Amazon, as they are now invested in banana-raising in Venezuela.

Some of the wild and semi-cultivated fruits of the Amazon, of American origin, which are worthy of note, are the cashew, alligator pear, certain leguminous trees with the fruit in pods, and asai palm fruit.

The cashew has become known from its curious fruit, in which the seed hangs outside of the fleshy fruit. The seed itself is edible, and the fruit, which is light red or purple, of the size and shape of a small pear, is tough and inedible, but filled with an acid but pleasant juice. It would probably be of no value for export. The trees are abundant in the forests in the Amazon region.

The alligator pear will probably become of more importance. The fruit is the size and shape of a large pear, and green in color. The taste is hard to describe, being hardly more fruity than that of pickled olives. It is eaten with salt and pepper.

The markets of the river towns are always supplied with great pods, looking like immense bean pods, which are full of snowy white, sweet, juicy pulp, surrounding the seeds. They grow upon low, spreading, ornamental trees with immense white flowers.

The most noteworthy native fruit of the Amazon valley is the asai. On all the low, half-flooded lands about the mouth of the Amazon, one sees clumps of a beautiful palm, with delicate stems of five or six inches in diameter and growing to thirty or forty feet in height, with a crown of lovely, delicate, drooping leaves. Beneath these are often seen great grape-like clusters of fruit, purplish black in color and of the size of cherries, the clusters being often two or three feet in length and weighing twenty or thirty pounds. This is the asai palm. The fruits are little cocoa-like nuts with a thin film of rich fruit covering them. They are put in hot water and then rubbed together, when the fruit comes off looking like dark purple cream. It is eaten with sugar, is called vinho de asai (asai wine), and is as good as fine strawberries and cream.

The Brazilian has to compete with the monkeys and the toucans and the parrots for this fruit, for they have all learned that the thin pellicle of fruit is rich and nutritious. The Indian puts his bare big toes into a loop made of the asai leaves, for they are tough, both toes and leaves, and, grasping the tree, draws his feet up and pressing the loop against the trunk, raises his body, and in this way rapidly ascends to the fruit, which he cuts off and lets carefully down with a string. The trees are slender and never stand straight, and sometimes the stem breaks and lets him down, but the ground is soft and swampy below.

Then to this immense Amazon region, as yet practically undeveloped, we must not only look for new factors in our food products, for a new supply of cotton, for new ornamental and useful woods, and for new drugs, but also for new and finer fruits than any that have yet reached our tables.

Wednesday Morning Session.

Beginning the session, Mr. ALBERT JACKSON of Lowell introduced the subject of freight classification of peaches. The classification is very unjust as to peaches, said Mr. JACKSON. In crates they are reckoned as first class; but in baskets (any kind of basket) they are charged one and one half first class rates. All other fruits are first class only, even berries and grapes. This comes about through the rate having been first class in the first place, when peaches were shipped in crates, but increased when the round fifth-bushel baskets came into use. There was reason enough for it then, but there is none now, with the fruit all shipped in bushel or climax baskets. Bushels are even of less trouble than crates. The local railway men in Grand Rapids admit the wrong, but say the remedy lies with the freight classification committee in New York, and it takes a long while to effect a change. At a meeting of the Grand River Valley society, the West Michigan society, and the Fruitgrowers' association, in Grand Rapids, lately, a resolution for a joint committee of those societies and the State society was passed, to secure from the railway companies a favorable change of this unjust classification, and three members chosen, and the secretary of the West Michigan society instructed to write Secretary Reid, which I understand he has not done. I move the appointment of a member of the committee.

The motion was carried without dissent, and Mr. J. J. PARSHALL of Ann Arbor was made a member of the joint committee.

Chairman Garfield made some felicitous remarks about our sister states, Ohio and New York, and the neighboring province of Ontario, and called out representatives of the three who were present.

THE EMPIRE STATE'S COMPLIMENTS TO THE WOLVERINE.

Mr. S. D. WILLARD of Geneva, N. Y., highly complimented the society as "the leading organization of fruitgrowers in the west." Once when he was about to start to one of these meetings, President Barry said to him, "Can't you induce some of those Michigan fruitgrowers, who know so much more than we do, to come down here and teach us something?" He spoke warmly of Michigan as a state, and said she ought to be, if she is not, the best state in the Union for the fruitgrower. The great lake is close by for protection, and the prairie states, which can not raise fruit, are at her doors for fruit consumption, and their demand for fruit must greatly increase. He gave examples of great success in other localities, and said they were only proof of what may be done on an extensive scale in Michigan. A taste for the growing of fruit, however, is necessary to success in it. He spoke of the elevating tendencies of horticulture, and heartily commended the remarks of President Angell about educating boys and girls at school in the elementary principles of the art.

OHIO AND ONTARIO FELICITATE.

Mr. W. W. FARNSWORTH of Ohio, secretary of the Ohio State society, expressed his gratification with the meeting, and wished for more of mutual acquaintance among the horticulturists of the various states.

Mr. A. M. SMITH of St. Catherines, Ont., told of the pleasure the meeting had afforded him, and extended greeting from the Ontario Fruitgrowers' association. He had always received profit and knowledge from visits to the Michigan fruitgrowers, and hoped for more of it in the future, both for himself and his fellows. He had expected Michigan to defeat Canada at Chicago, but felt encouraged to believe it would not be so unless there should be a very material change.

FUTURE OF TRUCK-FARMING IN MICHIGAN.

The secretary read the following paper from Mr. GEO. W. LONSBURY of Allegan, upon "The future of truck farming in Michigan."

There is a belt of land bordering on lake Michigan, known as the fruit-belt. Not a county in Michigan, bordering on the lake, but has more or less of this soil, and it will be hard to find its equal in this broad world, in supplying the varied wants of man, or giving better returns for his labor. Lying as it does at the very door of Chicago, just across the lake, connected by both steamer and rail, giving an outlet for both summer and winter traffic, the future possibilities of this section can hardly be estimated, especially as to truck farming. Land is comparatively cheap. Large tracts lying along Black river, in Allegan county, are still unimproved, and they have been recently drained. Their soil is of deep muck, and of a superior

quality, well suited to the growing of onions, potatoes, celery, cabbage, tomatoes, cucumbers, carrots, parsnips, lettuce, sweet corn, beets, squashes, pumpkins—in fact, nearly everything in the truck line can be grown in abundance on these lands, provided one uses a little brains with it; and the more brains the better. Instead of eternally growling and cursing everything and everybody, the weather not excepted, we should put more thought to preparing our land, attending our crops, exchanging ideas with others, and formulating plans to better our condition.

At the present price of labor we can grow potatoes for thirty cents per bushel, one year with another; onions at forty cents, and other truck in proportion.

TRANSPORTATION THE CHIEF OBSTACLE.

The great problem is the cost of transportation. If we send our truck to Chicago on commission, it costs in some cases more than half to get it to Chicago and have it sold. We pay twenty-five cents for a barrel. It costs at least five cents to get the barrel to the farm and packed, fifteen cents to get it to the boat, twenty-five cents across the lake, five cents cartage, and fifteen cents commission (if potatoes are fifty cents per bushel), making one dollar and fifty cents for a three-bushel barrel. Adding these several items together, we have ninety cents for transportation and selling, leaving sixty cents per barrel, or twenty cents per bushel. Fifty cents per bushel is a good price for potatoes, and could we get our share of it, we would be well paid for our labor. The question now arises, how shall we remedy this evil?

WHAT CO-OPERATION MIGHT DO.

Let us see what there is in co-operation. Could the farmers unite and build or lease a line of steamers capable of carrying cargoes worth from ten to twenty thousand dollars, these cargoes would comprise everything grown or raised along the lake shore, to be sold direct from the boat on the other side. The whole transaction could be done for ten per cent. at the start, and for less after the business was fully established. Sell direct to the groceryman or any others wishing to buy.

The same arrangement could be made with railways for winter traffic. Have our own cars, large and commodious, built especially for the business. With these arrangements, the Michigan lake shore would become a veritable suburb of Chicago, so far as market gardening goes. By this method we could give them pure milk and gilt-edge butter, and eggs and poultry. This alone would become a grand feature of the scheme.

Under our present regime, were it not for selling on track we should find ourselves "in a hole" nearly every time. Under the new system here proposed, we should handle our root crops in sacks, to be returned. Ten cents per bushel would then cover the entire cost of taking to market and selling. On the basis of fifty cents per bushel, as we before stated, this would leave us forty cents per bushel at the farm, a fair compensation for our potatoes, just double what we would receive under the present system.

What we want is the local trade of Chicago, and we can get it if the farmers will act in concert. There is just as much business capacity among them as any other class of men. All it needs is proper development. Nearly every other class of business is ruled by combinations, and the

farmers must combine for self-protection. The Farmers' Alliance would have been a grand institution had it been devoted to mutual improvement, letting politics entirely alone.

In order to fully develop the resources of our state we must have better harbors. Humanity demands it, commerce demands it, and the people demand it. The time will come when the true American spirit will rise above party ties and unite in demanding a suitable outlet for the products of this growing section.

BETTER ROADS WOULD HELP.

Good and permanent country roads will do much to make possible the changes here spoken of. The products of a truck farm are very heavy. Easy grades and solid gravel roads would lessen the cost nearly one half in getting our stuff to lake or railway.

If our legislature does not move in the matter of their own accord, they should be flooded with petitions for the improvement of wagon roads. This work should be largely done by convict labor, and a stop put to the manufacture of goods by enforced labor at forty cents per day coming into competition with the same article manufactured with labor at one dollar per day.

REPORT ON FRUITS AND MODELS.

Mr. NELSON BOGUE of Batavia, N. Y., submitted the following report from the committee on fruits and models, which was adopted:

We find from the Cold Storage company of Kalamazoo, fifteen plates of remarkably well preserved varieties of apple. The plates of Hubbardston, Ben Davis, and Spy were particularly fine. This display shows what the system of cold storage will do to prolong the season of fruits worth preserving.

The fine display from the Agricultural college consists of ten varieties of apple, four of pear, and one of orange quince.

The collection of apples was grown by F. G. PORTER, Lenawee county. To him are due many thanks for aiding so extensively to make up this fine exhibit.

The display of pears from EMIL BAUR of Ann Arbor contains eleven varieties. The Angouleme, Anjou, and Vicar were particularly fine. Added to these are seven varieties of apple and samples of fruit syrup.

Next comes the exhibit of C. W. MILLETT of Port Huron, made up of ten varieties of apple. The object was to show the disastrous effects of apple scab and to furnish subjects for discussion by Prof. FAIRCHILD.

JOHN C. SCHENCK of Ann Arbor shows fine samples of quinces and pears. Your committee would make honorable mention of a plate of magnificent Josephine de Malines pears from Mr. S. D. WILLARD of Geneva.

We find a very creditable exhibit of grapes, and would favorably mention the collection of fifteen varieties, in excellent condition, shown by W. F. BIRD of Ann Arbor; also three plates of seedlings from C. P. CHIDESTER of Battle Creek. These show some keeping properties and are very good in quality.

The display of canned fruits is exceptionally fine. JACOB GANZORN of Ann Arbor shows ten cans, made up of raspberries, plums, and peaches in assortment. W. F. BIRD of Ann Arbor shows ten cans. Your committee would specially commend the samples of peaches, raspberries, strawberries and crabs. Miss SARAH FLETCHER of Ann Arbor exhibits twenty cans, consisting of perfect specimens of peaches, quinces, currants, pears, and plums. In this display are cans of pickled citron and muskmelon, also cans of blackberry and grape jam. There are also eleven glasses of superior jelly in variety. Added to the above are six specimens of fruit vinegar. The variety and excellent appearance of this collection is especially worthy of most honorable mention.

Your committee find themselves unable to give proper expression in describing the life-like and natural appearance of the wax specimens of fruit and vegetables placed

on exhibition by Mrs. STANLEY POTTER of South Haven. We understand that these are a part of a collection to be shown at the Columbian Exposition, and we know they will be a very interesting and instructive feature of the horticultural department.

LUTHER PALMER of Dexter exhibits three cases of shipping crates and boxes for berries, also one crate for carrying grapes.

Prof. TAFT places before us three cases of insects, showing some of the enemies to successful fruitgrowing.

N. BOGUE,
D. G. EDMISTON,
R. M. KELLOGG.

Following his report, Mr. BOGUE said he had learned to prize very highly these meetings of Michigan pomologists, and meant in the future to attend as many of them as possible. He had supposed the New York men were models in fruitgrowing, but found they could get "pointers" by coming to the Peninsular state. All the papers and discussions had been interesting to him, but most of all the reports, from different localities of the condition of the business of fruitgrowing. The one by Mr. RICE, concerning the Port Huron and northern region, had been worth all the expenses of his trip.

Mr. ROLAND MORRILL of Benton Harbor spoke of the conditions of truck farming in that vicinity, and agreed to supply the same in the form of a paper, which we may presently expect.

DISEASES OF THE APPLE.

Dr. ERWIN F. SMITH of the national department of agriculture, was present in place of Prof. FAIRCHILD, to speak of "The diseases of the apple." Apple scab we have with us always, although some years much worse than others, on both the apple and pear. There is little of it in dry seasons, at time of blooming, but when the weather is wet and warm it is very abundant. Exhibiting samples, Mr. SMITH said that if the scab is not very abundant it does not much distort the fruit, but yet injures the sale. When abundant, the fruit is very much distorted and gnarly and practictically worthless. If no scab appears before the apples are the size of cherries, there is not likely to be any; so, if fungicides are kept on till then, safety of the crop is established. Black rot of the grape is almost wholly prevented by use of the copper fungicides; and, while not so much is known of their results upon the apple, it is known that much can be accomplished and the crop made saleable. We must have a fungicide that will not hurt the foliage, and yet destroy the scab. The Bordeaux mixture is the best so far known, though it is hard to make and apply. It should be used first just as the blossoms open, and again when they fall; next when the apples are not larger than peas, and the fourth time when they are the size of cherries. If the weather is dry and not cool, not so many sprayings will be necessary. The past season was a very bad one, both

for the fruit and foliage, both being nearly ruined in southern Michigan. The Bordeaux mixture helps the foliage also, and so tends to make a better crop the ensuing season. In making this fungicide. dissolve six pounds of copper sulphate in five gallons of water, adding, when it is dissolved, fifteen gallons more. Make milk of lime by mixing four pounds of unslaked lime in six gallons of water, adding this to the copper solution. Any force pump will do, except a small one—get a large one that will throw a strong stream, and a nozzle that will throw a very fine spray. On the whole, for Bordeaux mixture, the Vermorel nozzle is the best, but no perfect one, for trees, has yet been made. The Wellhouse nozzle, invented by a Kansas man, is excellent, but is not yet made for the trade. The Galloway knapsack pump is as good as any of its kind. I can not say if the Bordeaux mixture will injure bees. It must be just right or it will not work well. There must be lime enough to entirely neutralize the accidity of the sulphate of copper. To test it, have a strong solution of the yellow prussiate of potash. Add a few drops of the mixture, and if there is no reaction (no change of color), all is right. If the mixture turns a chocolate-red color, add more lime. Free sulphate of copper will burn the trees. Have all ready before hand, and watch closely for blooming.

Prof. L. R. TAFT of Michigan Agricultural college, replying to a question from Mr. MORRILL, said Paris green may be added to the Bordeaux mixture, and do no harm, but rather good; but it is unsafe to the foliage when in the copper sulphate solutions. Continuing, Mr. TAFT agreed with Mr. SMITH in the main, but, as to the first application, would be careful, as the Bordeaux mixture may destroy bees, and it may also affect the pollen and prevent fertilization. If Prof. FAIRCHILD has tried it and proved it safe, it is well; but from his own observation he could not recommend spraying the open blossoms. If the mixture is applied just as the bloom falls, the fungus will be held in check. He has almost completely killed the fungus, and not begun until the apples were as large as cherries. He would add Paris green (one pound to 200 gallons of water) to Bordeaux mixture, and use for the first time after the blossom falls. The damage done by scab is not appreciated by the ordinary grower. He may have but a few bushels of culls, and think them of little consequence as a loss; but by spraying they might have been made double their size and of full market value. He would use the same strength of mixture, at first, but only one third as strong for the later applications. This lessens the cost, and there is less clogging of the nozzle, and it makes the Bordeaux the cheapest of all the fungicides. It is well not to buy the copper sulphate at the drug stores, for the price is too high. He had bought for three cents per pound, and it may be had for four by the barrel, and five cents in ten-

pounds packages, while the druggists charge fifteen. He had used pumps with cog gear, but now uses, and much prefers, sprocket wheels and endless chain. The cogs often slipped when the wagon passed over uneven ground. Answering a question, Prof. TAFT said he would use chemical fertilizers, such as ashes or potash salts or phosphates and bone; or, on poor soils, sodium nitrate. These will give trees less liable to disease, but the sodium nitrate should be used on poor soils only. By use of these fertilizers on good, well drained soils, we can certainly raise good fruit.

Mr. J. N. STEARNS of Kalamazoo: I have been spraying fruits the past ten years or more, and wish to emphasize some points in the work. Early spraying is of the utmost importance. It should be done, with fungicides, before any green can be seen in the buds, and the spraying continued until the blue color can be seen on the bark. I have found spraying to prevent defoliation of the plum. There is trouble in dissolving the copper. I have learned to place in a coarse sack and suspend it in a barrel of *warm* water. It is very important that the lime should be fresh. I use four pounds of copper sulphate to five (better six) pounds of lime, in forty gallons of water. I like the Nixon nozzle, and have no trouble with it if the Bordeaux mixture is strained through a coffee sack or some such coarse fabric. I do not spray during the time of full blossoming. I believe that use of the Bordeaux mixture prevents rot of the plum, at least it apparently had that effect with me last season. I use Paris green in the last three sprayings. Prof. DAVIS came to my place last year and experimented three weeks with spraying and jarring; and he caught only two curculio in the portion of the orchard that was sprayed. The trouble is, I think, with those who fail, they do not begin early enough.

Said Prof. E. G. LODEMAN of Cornell university experiment station: At Cornell we have sprayed King and Baldwin apple trees with a combination of Bordeaux mixture and Paris green and London purple, and with Paris green only. The Bordeaux mixture was four pounds of copper to six of lime in forty gallons of water. Part of the lime used was air-slaked, which is in strength, compared with unslaked, as 10 is to 13. We began rather late, four or five days after blossoming, and were too late. It should have been done before the blossoming; and yet we reduced the scab from 25 to 40 per cent. with Bordeaux mixture and the arsenites, and 15 to 20 per cent. with the Paris green alone. The lime neutralizes the soluble arsenic and makes the combination the safer.

Mr. S. D. WILLARD: I have found London purple equally good with Paris green when in combination with Bordeaux mixture, because the lime neutralizes the arsenic in either, so that the foliage is not burned. I have a half dozen sheets of burlap, through which to strain the Bordeaux mix-

ture, using and washing them alternately, for they will clog in the straining. It is very important to have all ready when the time for use comes.

Prof. TAFT said he used London purple in combination with lime, because cheaper and in that case quite as cheap.

Dr. SMITH: Nozzles that will not do, are Graduate and Boss. Like most others, I am prejudiced against spraying when the trees are in bloom, but no harm has come to grapes, from spraying at that time, and Prof. FAIRCHILD says the work must be done then. There is great necessity that the water be clean, free from chaff, splinters, etc. It has been observed that sprayed trees make a better growth.

COMMITTEE REPORTS.

Reports were made from various committees, and adopted, as follows:

ON THE PRESIDENT'S MESSAGE.

Your committee to whom was referred the suggestions embodied in the annual message of President LYON, beg leave to report that, in carrying out the suggestions of that part of the address which considered the change of the date of the annual meeting, we desire to offer the following resolutions for action of this society:

Resolved, That the action of the executive board, in its summer meeting, with reference to the change in date of the annual meeting, and in noticing an amendment to the constitution of the society providing that the annual meeting shall occur between the holidays, be considered the action of the society.

Resolved, That the resolution offered by Mr. MONROE, at said summer meeting, concerning the change of date of the annual meeting, and which by motion was laid over, be considered a notice of an amendment to the constitution, providing for a change of the date of the annual meeting from the first to the last week in December.

Resolved, That, previous notice having been given, Article IV of the constitution of this society be, and is hereby, amended to read as follows: "The annual meeting of the society, for the election of officers, specified in Article II, shall occur during the time between Dec. 25 and 31 of each year, according to call of president and secretary, and the election shall be held during the second session of such meeting.

Further, we desire to recommend that the society adopt the following resolution, with reference to so much of the president's address as refers to our relationship to a horticultural exhibit at the World's Fair:

Resolved, That this society feels a great interest in the proper exhibit of the horticultural products of the state at the World's Columbian Exposition, but that, inasmuch as we have not been recognized in any way by the state World's Fair commission, as a proper agent for making a display of these products at the fair, we do not feel authorized to even attempt a suggestion as to the management of such an exhibit; but, if the commission desires the aid of this society, a communication to that effect will receive prompt attention.

ON RESOLUTIONS.

Resolved, That the thanks of the State Horticultural society be extended to the Washtenaw County Horticultural society, and the citizens of Ann Arbor, for the invitation to meet here and for the hospitality received at their hands.

Resolved, That we appreciate the kindness of Dr. ANGELL and the university authorities for the invitation to visit the university and inspect the buildings and equipments.

Resolved, That, for the delightful music kindly furnished by the Ann Arbor guitar and banjo club, and by Prof. C. L. CLEMENT and Miss MINNIE DAVIS, we do now extend our hearty thanks.

Resolved, That we offer a hearty greeting to the visiting delegates from neighboring societies, and that we are glad to see them with us now, and extend them a strong invitation to be present at future meetings of the society. The words of cheer received from W. W. FARNSWORTH of the Ohio Horticultural society, S. D. WILLARD of Geneva, N. Y., NELSON BOGUE of Batavia, N. Y., and A. M. SMITH of St. Catherines, from the Fruitgrowers' association of Ontario, are always gladly received.

Resolved, That the thanks of the society be extended to Drs. ANGELL, STEERE, and VAUGHAN, and Prof. SPALDING, of the university, for the interesting and instructive papers furnished by them.

Resolved, That in the presence of Hon. J. J. WOODMAN, superintendent of the Michigan agricultural exhibit at the Columbian Exposition, we are glad to recognize the interest shown by the state commission in the horticultural exhibit, and we hail with joy the statement by Mr. WOODMAN that the commission has, even at this late date, determined to place the sum appropriated for the purpose, namely, $4,000, in the hands of the committee on the horticultural exhibit.

Resolved, That this society places itself on record as upholding the work of the national department of agriculture, under the direction of the Hon. J. M. RUSK, particularly in the divisions of entomology, botany, mycology, and forestry. The plan of sending members of the various divisions to represent the department at the meetings of this and kindred societies seems to us a valuable one, and we are glad to welcome among us today Dr. ERWIN F. SMITH, special agent of the department in the division of mycology, and we hereby extend our thanks to Dr. SMITH for the valuable address made by him.

Resolved, That we appreciate the presence of the reporters of the Orange Judd Farmer, the Washtenaw Evening Times, and the Detroit and Chicago dailies, and that we extend our thanks to the proprietor of Cook's hotel for the reduced rates granted and for the attention received.

L. R. TAFT,
R. MORRILL,
J. N. STEARNS.

ON LEGISLATION.

Your committee would recommend the appointment of a special legislative committee, whose duty it shall be to look after the various measures that may come up, of interest to this society, particularly the appointment of a food commissioner, World's Fair appropriations, and any and all matters of interest.

We would also recommend the appointment of a committee to investigate prices of evaporated fruits, as asked for in the resolution of L. B. RICE, referred to this committee.

We would also suggest, as a subject germane to this legislative committee, the awakening of an interest in the study of trees, plants, and fruits in our common schools, and that teachers be required to pass an examination on this subject.

R. M. KELLOGG,
L. B. RICE,
C. J. MONROE.

ON OFFICIAL REPORTS.

Your committee to whom was referred the reports of the secretary and treasurer, beg leave to report that we have examined the books and accounts of the same, as well as the vouchers connected therewith, and find the same to be correct. All of which is respectfully submitted.

D. G. EDMISTON,
L. B. RICE,
ALBERT JACKSON.

ON FLOWERS AND PLANTS.

Your committee charged with the duty of reporting upon the display of plants at this meeting, beg leave to say that we are delighted to have this branch of horticulture represented in the exhibit at this annual meeting. So long as this society shall remain a horticultural society, a display of plants and flowers should brighten every session. One of the most delightful features of English rural life is the love of plants and flow-

ers, which leads to the adornment of the most modest laborer's cottage with the treasures of the floral kingdom, which cost little in money and effort, but bring sunshine and joy to those who appreciate them. If our society, through its efforts and example, can awaken in our people a sentiment which shall lead to the embellishment of our homes with plants and flowers, from the humblest cottage to the most elaborate mansion, it will accomplish a work of as much value as to lead all people to eat plentifully of wholesome fruits.

This, your committee takes the liberty to say in connection with the exhibit of plants at this meeting, in order to emphasize the desirability of making more of this section of the work of our society.

The display of twenty-five plants, in variety, is by Messrs. Cousins & Hall, and is a credit to their establishment, and your committee are glad to give testimony as to their beauty as an attractive accompaniment of this meeting.

CHAS. W. GARFIELD,
MISS LUCY POTTER,
MISS SARAH FLETCHER.

Messrs. C. J. MONROE, L. B. RICE, and J. N. STEARNS were appointed a committee on legislation.

Messrs. A. TUCKER, L. B. RICE, and H. D. DAVIS were appointed committee to investigate the cause of the decline in price of evaporated fruits.

Replying to a question, Dr. SMITH said that peach yellows has been increasing in southwestern Michigan. It has become very bad about Fennville, so much so that it seems hopeless to plant trees there at present, in the immediate vicinity of the village and for some distance west. It seems to be spreading thence toward the lake shore. If one man is allowed to let diseased trees stand, all those surrounding him are in danger. Trees may be reset, where yellows has destroyed others, if the region is not generally diseased. Great numbers have been reset at Benton Harbor, where all perished some years ago, and they are doing well.

Mr. MORRILL: The only way is to cut the diseased tree the instant you know it to be diseased, and burn it right where it stood.

Some fitly spoken words from Mr. GARFIELD, concerning the pleasures of the meeting, closed the session, and final adjournment was made.

MICHIGAN EXPERIMENT STATION BULLETINS.

POTATOES.

Bulletin No. 85, April, 1892.

For three years considerable attention has been given to experiments with potatoes, the work including, in addition to variety tests embracing nearly two hundred market varieties, a line of experiments covering a greater portion of the methods of culture, such as depth of planting, manner of cutting seed, amount of seed, distance of planting, manures and fertilizers, and manner of application, etc.

In 1889 the season was quite favorable, and very even and fairly reliable results were obtained, while in 1890 and 1891 the crops suffered from extremely hot, dry weather, so that the yields were low, and while the results obtained seemed reliable, and could be readily explained by the character of the season, the conclusions that might be drawn from them would only hold true in similar seasons. The past year, in particular, our variety tests were hardly satisfactory, as, although the appearance of the plats was promising up to the 15th of July, the severe drouth that set in at that time caused them to ripen prematurely, and made it almost impossible to learn as to the season of the varieties. The late varieties were at the height of their growth, and as the vines were withered and dry within a week after the hot weather of the first of August, the yield was greatly reduced.

The land upon which the potatoes were grown was in excellent tilth and of more than average fertility. No manure or fertilizers were used, except in the plots specially set aside for the purpose. The land was a deep, well-drained, heavy sandy loam, and grew a crop of winter squashes in 1890, almost without manure. The soil was much above the average of the state, and the care given the crop was the very best.

TEST OF VARIETIES.

The variety test included one hundred and forty-two sorts, of which ninety-two had been grown for at least one year previously. The fifty new kinds were obtained from D. C. Hicks, No. Clarendon, Vt., Hiram Presley, Port Huron, and H. C. Markham, Ann Arbor, Mich.

The usual amount of seed of each kind planted was two pounds, in one-ounce pieces, but in a few cases only one pound was obtained. Whatever the amount of seed potatoes used, the weight used in each hill was the same. When the full amount was planted they were given a space of 33 feet in the row, and three feet two inches between the rows. The land was furrowed five inches deep, and the seed pieces, dropped in the bottom of the furrow, were covered two inches. The planting of the varieties was done on the 15th of May, and they were harvested the first week in Sep-

tember. The vines were protected from the Colorado beetle by applications of Paris green mixed with plaster at the rate of 1 to 100. Little or no rot was seen when they were harvested.

They received frequent cultivation up to the middle of July, and the ground was left as level as possible.

Owing to the premature ripening of most of the varieties, the quality was not of the best, and as this was due in part to the character of the season, no mention was made of it.

TABLE I.—*Variety tests.*

Number.	Variety.	Seedsman.	Per cent vegetation.	Per cent vigor.	Season.	Blight.	Marketable maturity.	Total yield in bushels.	Corrected.		
									Total.	Market.	Small.
1	Alaska	*O. H. Alexander	100	95	Med	b	Aug. 8	91.5	91.5	44.9	46.6
2	Albino	*Vaughan	100	96	Ey		" 8	116.5	116.5	91.6	24.9
3	Algoma	Hiram Presley	100	97	Med		" 17	96.2	96.2	75.6	20.6
4	Alligator	*W. W. Rawson & Co	100	100	Late	b	" 12	97.2	97.2	41.6	55.6
5	Arizona	*Vaughan	100	98	Late	b	" 12	119.8	119.8	73.2	36.6
6	Badger State	*Vaughan	97	97	Late	b	" 15	86.5	89.2	50.8	38.4
7	Blaine, J. G.	H. C. Markham	94	98	Ey		" 8	129.8	138.1	112.5	25.6
8	Boley's Northern Star	*Vaughan	100	100	Late	b	" 15	143.1	143.1	76.5	66.6
9	Bannock	*D. B. Harrington	100	100	Late	b	" 17	141.5	141.5	101.6	39.9
10	Barstow	H. C. Markham	100	98	Late	b	" 12	63.4	63.4	48.3	15.1
11	Beauty of Hebron	*Jerrard	100	100	Ey		" 8	206.4	206.4	193.2	13.2
12	Belle of N. Brunswick	*Jerrard	100	100	Med		" 15	166.5	166.5	99.9	66.6
13	Ben Harrison	*M. Crawford	100	97	Ey		" 8	121.5	121.5	73.2	48.3
14	Bliss Seedling No. 2	College	100	93	Late	b	" 15	161.5	161.5	116.5	45
15	Bliss Seedling No. 8	College	100	98	Med		" 19	206.4	206.4	109.8	96.6
16	Bliss Seedling No. 9	College	100	100	Late	b	" 19	128.2	128.2	111.6	16.6
17	Bliss Seedling No. 12	College	100	100	Late	b	" 12	164.8	164.8	136.5	28.3
18	Bonanza	H. C. Markham	100	100	Med		" 17	145.2	145.2	121 7	23.5
19	Brownell's Best	*Vt. Station	97	98	Med		" 8	131 5	135.5	62.6	72.9
20	Brownell's Winner	*Burpee	100	100	Late	b	" 19	193	193	166	27
21	Clark's No. 1	*Vt. Station	100	95	Ey		" 19	108	108	83	25
22	Chautauqua	Hiram Presley	100	94	Late		Sept. 5	192.5	192.5	170.5	22
23	Copper Mine	*D. B. Harrington	97	97	Late	b	Aug. 15	86.5	89.2	62.2	26.6
24	Crown Jewell	H. C. Markham	100	99	Late	b	" 15	208.3	208.3	177.1	31.2
25	Cream of Field	H. C. Markham	85	94	Med	b	" 7	75	88.2	61.8	26.4
26	Dakota Red	*Vt. Station	100	100	Late	b	" 17	179.8	179.8	146.5	33.3
27	Dandy	*Jerrard	100	97	Late	b	" 12	131.5	131 5	99.9	31.6
28	Delaware	*M. Crawford	100	97	Med	b	" 15	116.5	116.5	69 9	46 6
29	Dictator	*Vt. Station	100	96	Late		" 24	62.7	67.7	56.1	6.6
30	Early Oxford	*J. J. H. Gregory	100	100	Ey		" 12	213	213	159	54
31	Early Harvest	*M. Crawford	100	97	Ey		" 8	139	139	66	73
32	Early Maine	*Jerrard	100	97	Ey		" 8	126	126	54.9	71.1
33	Early Market (Vick's)	Hiram Presley	100	95	Ey		" 8	178.7	178.7	171.9	6.8
34	Early Minnesota	Hiram Presley	100	100	Ey		" 8	240.6	240.6	213.1	27.5
35	Early Pearl	H. C. Markham	94	100	Ey	b	" 15	277.8	295.5	276.3	19.2
36	Early Puritan	*Jerrard	97	99	Ey	b	" 12	206.4	212.7	164.7	48
37	Early Rose	*Jerrard	100	97	Ey	b	" 12	228.4	228.4	186.8	41.6
38	E'ly Six Week Market	Hiram Presley	100	100	Ey	b	" 12	165	165	151.3	13.7
39	Early Vermont	*Jerrard	100	100	Ey	b	" 17	178.1	178.1	156.6	21.6
40	Early White Beauty	Hiram Presley	100	100	Ey	b	" 8	220	220	183.7	36.3
41	Empire State	*Jerrard	100	99	Late		Sept. 5	273	273	248.1	24.9
42	Everitt	*Vt. Station	100	100	Med		Aug. 8	103.2	103.2	60	43.2
43	Excelsior	*Vt. Station	100	97	Med	b	" 12	168.1	168.1	124.9	43.2
44	Extra Early (Burpee)	*Vaughan	100	97	Ey		" 8	156	156	88	68
45	Farina	H. C. Markham	100	98	Med	b	" 15	131.4	131.4	100	31.4
46	Faust 1889	*J. V. Faust	100	100	Ey		" 12	203	203	175	28
47	Feek's Extra Early	*Vaughan	100	96	Ey	b	" 12	109.8	109.8	38.1	71.7
48	Fearnaught	H. C. Markham	100	99	Med	b	" 15	175.1	175.1	151	24.1
49	Freeman	Wm. Henry Maule	100	100	Ey	b	" 12	213.6	213.6	171.8	41.8
50	Ft. Collins No. 83	*Col. Agr'l College	97	97	Ey	b	" 12	241	248	184	57

* Grown from college seed.

TABLE I.—*Continued.*

Number.	Variety.	Seedman.	Per cent vegetation.	Per cent vigor.	Season.	Blight.	Marketable maturity.	Total yield in bushels.	Corrected.		
									Total.	Market.	Small.
51	Gardner's Early	*Gardner	100	97	Ey		Aug. 8	126	126	60	66
52	Gregory's No. 1	*Vt. Station	100	100	Med	b	" 12	203	203	153	50
53	Gregory's No. 2	* "	100	97	Med		" 15	160	160	109	51
54	Green Mountain	*Vaughan	97	100	Late	b	" 17	158.4	158.4	91.8	66.6
55	Hampden Beauty	H. C. Markham	100	96	Late	b	" 15	114.7	114.7	98.6	16.1
56	Halo of Dakota	Hiram Presley	100	100	Late	b	" 22	261.2	261 2	247.5	13.7
57	Harbinger	*Jerrard	97	100	Med		" 8	119.8	123.4	63.4	60.0
58	Hicks' No. 12	D. C. Hicks	100	100	Ey		" 8	151.0	151.0	123.8	27.2
59	Hicks' No. 81	" "	100	98	Med	b	" 12	169.1	169.1	147.9	21.2
60	Hicks' No. 101	" "	88	95	Med		" 17	151.0	171.5	102.8	68.7
61	Howe's Premium	*G. D. Howe	100	98	Ey	b	" 8	152	152	125	27
62	Ideal	*Crawford	100	98	Late	b	" 17	258	258	129.0	129.0
63	Imperator	*	97	97	Late	b	" 24	138.2	137.3	82.3	55.0
64	Ionia	O. C. Nummer	100	94	Med		" 17	68.7	68.7	48.1	20.6
65	Iowa Beauty	Hiram Presley	100	97	Ey		" 8	155.5	155.5	138.0	17.5
66	June Eating	*A. Crane	100	97	Ey	b	" 8	124	124	31	93
67	Leather Coat	College	97	100	Med	b	" 8	148.8	152.1	82.5	70.8
68	Lee's Favorite	*Vt. Station	100	99	Ey		" 12	170	170	133	37
69	Lazell's Seedling	Hiram Presley	100	100	Med	b	" 12	228.7	228.7	220.0	87
70	Matchless	*	91	98	Med	b	" 15	83.2	91.4	31.0	60.4
71	McFadden's Earliest	Hiram Presley	100	98	Ey		" 8	237.5	237.5	220.0	17.5
72	Mexican Wild	*	100	94	Late		Sept. 5	48.2	48.2	8.3	39.9
73	Minister	*Crawford	100	97	Ey	b	Aug. 8	124.8	124.8	48.3	76.5
74	Mitchell's Seedling	H. C. Markham	100	100	Med	b	" 15	178.1	178.1	141.9	36.2
75	Monroe Seedling	*Farm Dep't	100	99	Late	b	" 17	133.2	133.2	96.6	36.6
76	Morning Star	*Vt. Station	100	98	Late	b	" 17	180	180	113	67
77	Mrs. Foraker	*M. Crawford	100	96	Med	b	" 12	91.5	91.5	30.4	61.1
78	Nameless No. 1	*Farm Dep't	100	99	Late	b	" 17	143.9	143.9	94.0	49.9
79	Nameless No. 2	*Farm Dep't	100	100	Late	b	" 17	104.8	104.8	69.9	34.9
80	New Queen	*J. J. H. Gregory	100	100	Ey		" 8	193	193	131	62
81	New Zealand	H. C. Markham	94	87	Ey		" 8	111.7	118.8	102.7	16.1
82	Nott's Victor	Hiram Presley	100	100	Med	b	" 12	175.0	175.0	166.3	8.7
83	Nott's No. 8	*Vt. Station	100	100	Ey		" 8	166	166	111	55
84	Ohio Junior	*M. Crawford	97	99	Ey		" 8	93.2	96.1	49.7	46.5
85	O. K. Mammoth	*Vt. Station	100	98	Med	b	" 7	168.1	168.1	131.5	36.6
86	Pecan	*M. Crawford	94	98	Late	b	" 17	33.3	34.3	11.2	24.4
87	Peoples	D. C. Hicks	100	98	Late	b	" 15	166.1	166.1	163.1	30.0
88	Perfect Peachblow	College	100	99	Med	b	" 12	63.2	63.2	16.9	46.3
89	Perfection	H. C. Markham	90	100	Med	b	" 12	213.4	237.4	214.9	22.2
90	P. & W. Victory	Hiram Presley	100	99	Med		" 17	231.0	231.0	220	11
91	Polaris	*Farm Dep't	100	97	Ey		" 8	124	124	31	93
92	Putnam's Beauty	*Vt. Station	88	100	Late	b	" 15	113.2	151.3	128.8	22.5
93	Putnam's Early	* "	100	95	Ey	b	" 12	185	185	117	68
94	Putnam's New Rose	* "	100	96	Ey	b	" 12	194	194	124	70
95	Putnam's Select	* "	91	98	Med		" 17	100	109	55	54
96	President Lincoln	*Gardner	100	100	Late	b	" 22	191.4	191.4	154.8	36.6
97	Queen (New)	Gregory	97	97	Ey		" 8	288.0	295.8	268.3	27.3
98	Queen of Paris	Hiram Presley	100	100	Ey		" 8	336.8	336.8	309.3	27.5
99	Queen of Valley	" "	97	98	Med		" 17	194.8	200.9	175.0	25.9
100	Randall's Beauty	*Vt. Station	100	99	Ey		" 8	142	142	75	67
101	Red Star	*T. B. Main	100	98	Med	b	" 12	123.2	123.2	96.6	26.6
102	Rochester Favorite	College	100	100	Med	b	" 12	156.8	156.8	120.2	36.6
103	Rogers Seedling	D. C. Hicks	100	100	Ey		" 8	193.2	193.2	181.2	12.0
104	Rose's No. 74	H. C. Markham	100	97	Med	b	" 12	147.9	147.9	132.8	15.1
105	Rural Blush	*Vt. Station	100	100	Late	b	" 15	206.4	206.4	146.5	59.9
106	Rural N. Y. No. 2	*J. M. Thorburn & Co.	100	100	Late		" 17	138.1	138.1	103.2	34.9
107	Signal	Hiram Presley	100	100	Ey		" 8	261.2	261.2	238.7	22.5
108	Snow Queen	H. C. Markham	100	96	Ey		" 8	75.5	75.5	48.3	27.2
109	Solanum Jamesii										
110	Star Russet	Hiram Presley	100	99	Med	b	" 12	178.7	178.7	156.2	22.5

* Grown from college seed.

TABLE I.—*Continued.*

Number.	Variety.	Seedman.	Per cent vegetation.	Per cent vigor.	Season.	Blight.	Marketable maturity.	Total yield in bushels.	Corrected.		
									Total.	Market.	Small.
111	Storr's Seedling	H. C. Markham	90	95	Ey		Aug. 7	115.	127.7	91.6	36.1
112	Stray Beauty	*Jerrard	97	100	Ey	b	" 8	118.2	121.6	93.3	28.3
113	Summit	*E. E. Stine	100	98	Med		" 17	181.4	181.4	128.2	53.2
114	Sunlit Star	H. C. Markham	100	100	Ey		" 8	172.1	172.1	144.9	27.2
115	Superior	*W. Atlee Burpee	100	100	Med	b	" 12	103.2	103.2	39.9	63.3
116	Supplanter	Hiram Presley	100	100	Med	b	" 12	206.2	206.2	178.7	27.5
117	Sutton	College	100	97	Late	b	" 22	148.7	148.7	119.4	29.3
118	Sylvan	H. C. Markham	100	95	Med		" 17	84.3	84.3	62.8	21.5
119	Thorburn	College	100	100	Ey		" 12	233	233	177	56
120	Thunderbolt	H. C. Markham	100	96	Ey	b	" 2	123.8	123.8	96.6	27.2
121	Timpe's No. 1	*J. T. Timpe	100	95	Med	b	" 12	68.2	68.2	21.6	46.6
122	Timpe's No. 2	* " "	100	98	Med	b	" 15	116.5	116.5	54.9	61.6
123	Timpe's No. 4	* " "	97	97	Ey	b	" 12	159.8	164.8	113.2	46.6
124	Timpe's No. 5	* " "	100	99	Ey		" 8	129.8	129.8	94.9	34.9
125	Timpe's No. 6	* " "	100	98	Ey	b	" 12	186.4	186.4	146.5	39.9
126	Timpe's No. 8	* " "	100	97	Med	b	" 8	113.2	113.2	26.6	86.6
127	Timpe's No. 9	* " "	100	98	Med		" 8	83.2	83.2	63.3	19.9
128	Tonhocks	H. C. Markham	100	100	Ey		" 8	263.7	263.7	228.7	35
129	Umpire	Hiram Presley	100	95	Med		" 17	187.5	187.5	164.7	22.8
130	Wallis Orange	*Farm Dep't	100	98	Late	b	" 17	158.1	158.1	121.5	36.6
131	Watson's Seedling	*Farm Dep't	100	99	Med	b	" 12	153.1	153.3	109.9	43.2
132	Way	Hiram Presley	100	96	Med	b	" 12	182.4	182.4	178.7	13.7
133	West's No. 1	*W. E. West	100	100	Ey		" 8	192	192	145	47
134	West's No. 2	* " "	100	97	Ey	b	" 8	123.2	123.2	61.5	61.7
135	West's No. 3	* " "	94	98	Med	b	" 12	264.7	281.5	239.7	41.8
136	White Elephant	*Jerrard	100	100	Late	b	Sept. 5	209.7	209.7	189.8	19.9
137	White Flower	H. C. Markham	90	100	Med	b	Aug. 12	170.0	188.8	108.3	80.5
138	White Early Ohio	Hiram Presley	100	97	Ey	b	" 8	210	210	192.5	17.5
139	White Star	*Farm Dep't	100	96	Late	b	" 24	161.5	161.5	88.3	73.2
140	Wixom	*Van Benschoten	100	99	Late	b	" 15	171.4	171.4	90.4	81.0

* Grown from college seed.

In previous bulletins notes upon the varieties grown previous to this year will be found, and we give below our notes of this year on the new sorts.

Algoma—Vigorous and even, 17–19 inches, fairly erect, medium green; stem fairly stout, leaves 6–7 inches; leaflets large, fairly even, rather slender, $1\frac{1}{2}$ by $3\frac{1}{2}$ inches, considerably blighted.

Tuber—Long, cylindrical, small, yellowish white with brown spots. Flesh white. No value.

Barstow—Not very vigorous, 14–17 inches, slightly spreading; light green, stems slender; leaflets irregular in size and shape, generally oblong with acute tip, $\frac{3}{4}$ by $1\frac{1}{2}$ inches. Killed by blight.

Tubers—Much like the Pearl of Savoy, perhaps slightly darker and a little earlier. Of no apparent value.

Beauty of Beauties—Vigorous and even, 14–16 inches high, low, erect, dark green; stem small; leaves six inches long, foliage thick; leaflets small to medium, $1\frac{1}{4}$ by $1\frac{1}{2}$ inches. Killed by blight.

Bonanza—Vigorous, 16–18 inches high, erect, dark green; stem stout; leaflets somewhat folded, irregular in size, average $1\frac{1}{4}$ by $1\frac{3}{4}$ inches. Somewhat blighted.

Tubers—Medium, long, round, flattened, smooth, seed end roughened, reddish pink. Eyes numerous, small, deep, covered, curtain* very long, edges distinct. A promising new sort.

* By curtain is meant the prominent ridge that often surrounds the eye.

Chautauqua—Even and vigorous, about like Umpire, 20 inches tall, fairly erect, dark green. Stem fairly stout. Leaves 6–7 inches long; leaflets medium, 1½ by 2 inches. Free from blight.

Tuber—Medium, long, flattened, angular, rose colored; skin smooth, tough. Eyes large, deep, or protruding. One of the best of the new sorts; very promising.

Cream of the Field—Uneven; best plants vigorous, 20 inches tall, erect, medium green. Stem stout. Leaves large, 6–8 inches long; leaflets rather large, ordinary shape, 1½ by 2½ inches. Considerably blighted.

Tubers—Large, oblong, round. Eyes small, medium depth, yellowish buff. Flesh yellowish white. Behavior unsatisfactory, due in part to the blight.

Crown Jewel—Even and vigorous, 18–20 inches, fairly erect, medium green. Stems rather slender. Leaves ordinary, 6–7 inches long; leaflets rather large and even, 1½ by 2¼ inches. Badly blighted.

Tubers—Medium to large, oblong, round; light buff; eyes medium; yellowish. Seems very promising as a market sort.

Early Market (Vick)—Vigorous and fairly even, 16–20 inches, fairly erect, light, medium green. Stem stout. Leaves 5–7 inches long; leaflets rather uneven, average medium size, 1½ by 2½ inches, somewhat slender. Killed by blight.

Tubers—Medium; something like the Early Ohio in shape and color. Flesh nearly white. Well worth trying as an early sort.

Early Minnesota—Even, fairly vigorous, 20–22 inches, very spreading, medium green. Stems stout. Leaves 6–7 inches long; leaflets small to medium, 1¼ to 1½ inches. Killed by blight.

Tubers—Large; oblong; reddish buff. Eyes large, but even with the surface; smooth; yellowish white. Early and one of the most promising of the new early varieties.

Early Pearl—Very even and vigorous, 18–24 inches. Tall, spreading, medium green. Stems stout. Leaves 6–8 inches long; leaflets uneven and numerous, the largest 1½ by 2 inches. Badly blighted.

Tuber—Medium to large size, long, regular, dark red; eyes large, but even with the surface; flesh yellowish white. Its behavior this year places it well towards the head of the list of medium early sorts.

Early Six Weeks Market—Low and small, fairly vigorous and even, 14–16 inches tall, erect, medium green. Stems stout. Leaves 5–6 inches long; leaflets very uneven, average 1¼ by 1¾ inches. Killed by blight.

Tubers—Small; roundish oblong; buff. Eyes medium, even with the surface. Flesh yellowish. Made a fair showing and, if as early as is claimed, it can have a place among the extra early sorts.

Early White Beauty of Hebron—Fairly vigorous and even, 16–18 inches tall, somewhat spreading, medium green. Stems fairly stout. Leaves 6 inches long; leaflets medium size, 1½ by 2 inches. Killed by blight.

Tubers—Medium to large; yellowish buff; slightly oblong, flattened. Eyes small, medium depth, yellowish white. Promising as a medium early sort.

Farina—Fairly vigorous, 14–16 inches tall, erect; dull, dark green. Stems fairly stout. Leaves 4–6 inches long; leaflets irregular, obtuse, oblong, with acute tips. Badly blighted.

Tubers—Long, 6 inches by 1 inch; light buff; smooth. Eyes shallow;

solid; flesh yellowish white. Very starchy and mealy, but not very productive.

Fearnaught—Even and vigorous, 20–24 inches, erect, dark medium green. Stalks fairly stout. Leaves 6–7 inches long. Leaflets fairly even and large, 1½ by 2 inches. Badly blighted.

Tubers—Large, long, flattened; white. Eyes few, medium. Flesh white.

Freeman—Growth strong and vigorous, slightly injured by blight.

Tubers—Oblong, flattened. Eyes at surface; smooth and even. Skin light buff; flesh nearly white. Very promising.

Halo of Dakota—Large, even and vigorous, 20–24 inches, spreading, dark green. Stem stout. Leaves 6–7 inches long, foliage thick; leaflets fairly even, medium size, 1¼ by 2 inches.

Tubers—Large, oblong, slightly flattened. Eyes medium, buff, solid. Flesh yellowish white. Very promising. Stands nearly at the head of the late sorts.

Hampden Beauty—Fairly even and vigorous, 18–20 inches tall, fairly erect, medium green. Stem rather slender. Leaves 6–8 inches long; leaflets slightly uneven, but rather long and slender, largest 1½ by 3 inches. Badly blighted.

Tubers—Oblong, flattened at the stem end, small. Color, yellowish buff. Eyes medium. Flesh yellowish white. Not promising.

Hicks' 12—Fairly vigorous and even, 16–18 inches tall, spreading, medium green. Stem fairly stout. Leaves 6–7 inches long; leaflets somewhat uneven, 1½ by 2 inches. Killed by blight.

Tubers—Medium to large, reddish buff, oblong, flattened. Eyes small, rather deep, yellowish white. Promising as an early variety.

Hicks' 81—Fairly even and vigorous, 18–20 inches tall, somewhat spreading. Leaves 6–7 inches long; leaflets rather uneven, largest average 1¼ by 1¾. Badly blighted.

Tubers—Small, oblong, flattened; reddish pink, sometimes purple tinged. Eyes small, shallow; curtain long, indistinct. Well worth longer trial.

Hicks' 101—Plants low, 14–16 inches tall, somewhat spreading but not sprawling; dark green. Stem small. Foliage thick. Leaves rather more than eight inches; leaflets even and large, often 1½ by 3 inches. Somewhat blighted.

Tuber—Long, slim, regular, flattened. Skin quite light; smooth. Eyes shallow. Less valuable than either of Hicks' other seedlings.

Ionia—Plants even and fairly vigorous, 14–16 inches; rather low and erect; medium green. Stem small. Leaves 5–6 inches long; foliage thick. Leaflets slender, fairly even, 1½ by 2 inches. Somewhat blighted.

Tubers—Small, oblong ovate; whitish buff. Eyes small; flesh white. Of no value.

Iowa Beauty—Very vigorous, even, 20–22 inches tall; erect; medium green. Stem stout. Leaves 6–8 inches; foliage thick. Leaflets medium size and fairly even, 1½ by 2 inches. Killed by blight.

Tubers—Round; medium; eyes quite large and deep; yellowish buff; flesh white. At best only fairly promising.

J. G. Blaine—Fairly vigorous, 18–20 inches tall, spreading, medium green. Stem fairly stout. Leaves 6 inches long; leaflets rather uneven; somewhat slender, 1¼ by 2. Killed by blight.

Tubers—Long, round, conical; skin smooth, reddish pink. Eyes many, small, shallow. Has shown few valuable features as yet.

Lazell's Seedling—Plant even and fairly vigorous, 16-18 inches tall, slightly spreading; dark medium green. Stem stout. Leaves 6–8 inches long; leaflets small to medium, uneven, 1½ by 2 inches. Killed by blight.

Tubers—Medium to large, oblong, flattened; reddish buff. Eyes very large and deep; flesh slightly yellow, quite solid, rather coarse. Very promising as a medium late variety.

McFadden's Earliest—Vigorous and even, 18–20 inches tall, very spreading, light green. Stem stout. Leaves 6–8 inches long; leaflets uneven, small to medium, 1¼ by 1½ inches. Killed by blight.

Tubers—Medium, oblong, round, generally flattened at the stem; reddish buff. Eyes medium; flesh yellowish white; quite promising. One of the best of the new early kinds.

Mitchell's Seedling—Even and fairly vigorous, rather short, 18 to 20 inches, erect, medium green; stem stout; leaves 6 to 7 inches long, leaflets fairly even, medium size, 1½ by 2 inches; badly blighted.

Tubers—Small, round, flat; skin somewhat rough; light pink; eyes small, shallow; indistinct pink. Quite promising as a medium early sort.

New Zealand—Not vigorous, 14 to 16 inches tall, spreading, medium green; stem stout; leaves 6 inches long; leaflets rather uneven, 1½ by 2 inches; killed by blight.

Tubers—Oblong, round, dark buff; eyes medium; solid; flesh nearly white. Not very promising.

Nott's Victor—Very vigorous, even, 20 to 22 inches tall, fairly erect, medium green; stem stout; leaves 6 to 8 inches long; foliage thick; leaflets medium size and fairly even, 1½ by 2 inches; killed by blight.

Tubers—Oblong, slightly flattened, medium to large, smooth, eyes medium; flesh yellowish. Well worth trying.

Paris Rose—Even and fairly vigorous, 16 to 18 inches tall, very spreading, medium green; stems small, leaves six inches long; leaflets small to medium, 1¼ by 1½ inches; killed by blight.

Tubers—Small to medium, oblong, flattened, reddish, eyes small; flesh yellowish white.

Pearl of Savoy—Uneven and spreading, 18 to 20 inches tall; not very vigorous; medium green, stem fairly stout, leaves 6 inches long; leaflets medium in shape and size; somewhat blighted.

Tubers—Rather long, slender, buff; eyes medium depth, small; flesh yellowish.

People's—Even and vigorous, 18 to 20 inches tall; fairly erect, dark, medium green; stem stout; leaves 6 to 7 inches long; leaflets fairly even and large, 1½ by 2 inches; badly blighted.

Tubers—Large, oblong, flattened; skin rough, yellowish white; eyes small, shallow. A fairly promising late sort.

Perfection—Vigorous, 22 inches tall; rather spreading; medium green, stem stout, leaves 6 inches long; leaflets medium size, ordinary shape; killed by blight.

Tubers—Medium to large, oblong, stem end flattened; skin buff; flesh yellowish, eyes rather large. One of the best of the medium late sorts.

P. and W. Victory—Very even and vigorous, 20 to 22 inches tall, fairly erect dark green, stem stout, leaves 6 to 7 inches long; foliage thick; leaflets medium size, 1½ by 2 inches; considerably blighted. One of the most productive kinds grown.

Queen of Paris—Vigorous and even, 20 to 22 inches tall, spreading;

medium green. Stem stout. Leaves 6 to 7 inches long; foliage fairly thick; leaflets medium to large, 1½ by 2 inches. Killed by blight.

Tubers—Medium to large, yellowish buff, nearly white. Eyes small; flesh yellowish white. In every respect very valuable. The most productive early kind grown.

Rogers' Seedling—Even, rather low and spreading; medium green. Leaves 6 inches long; leaflets rather uneven, the largest 1½ by 2½ inches. Stem stout. Killed by blight.

Tubers—Medium, round, conical, color red; eyes small. Well worthy of trial as an early sort.

Rose's No. 74—Vigorous and fairly even, 18 to 20 inches tall, rather spreading. Stem rather small. Leaves 6 to 7 inches; leaflets rather uneven and mostly small, 1 by 1½ inches. Killed by blight.

Tubers—Medium, round oblong, color much like the Early Rose. Eyes medium large; flesh yellowish white. Not as productive as many of the other early kinds, but still quite promising.

Signal—Not very vigorous, 16 to 18 inches tall, spreading; dark medium green. Stems fairly stout. Leaves 6 to 7 inches; leaflets uneven, average 1½ by 2 inches. Killed by blight.

Tubers—Medium to large, smooth, oblong, flattened. Eyes fair size, light buff; flesh yellowish white. Very promising as an early kind.

Snow Queen—Fairly even and vigorous, 18 to 20 inches tall, fairly erect; medium green. Leaves 6 to 8 inches long; leaflets small to medium, largest 1½ by 2 inches; killed by blight.

Tubers—Medium, regular, oblong, flattened; yellowish white with brown spots. Eyes large; flesh nearly white, very solid. Of excellent quality but not productive.

Star Russet—Even and vigorous, 16 to 18 inches tall, erect; dark green. Stems small. Leaves 6 to 7 inches long; foliage thick; leaflets rather uneven, small to medium, 1¼ by 1½ inches. Killed by blight.

Tubers—Oblong, generally flattened; reddish buff; badly scabbed. Eyes quite deep. Promising as a market variety.

Storr's Seedling—Vigorous, 18 to 20 inches tall, erect; dark green. Stem stout. Leaves 6 inches long; leaflets medium size, fairly even. Slightly affected by blight.

Tubers—Medium, nearly round; buff. Eyes very deep. Flesh cream colored. Worthless as judged from one year's trial.

Sunlit Star—Even and vigorous, 18 to 20 inches, spreading, medium green; stems fairly stout; leaves rather large, 6 to 8 inches long; leaflets 1½ by 2 inches; killed by blight.

Tubers—Medium to large; oblong, reddish russet; flesh yellowish. Promising.

Supplanter—Even and vigorous, 18 to 20 inches tall, spreading, medium green; stems fairly stout; leaves 6 to 7 inches long; leaflets rather uneven, small to roundish, 1¾ to 2 inches; killed by blight.

Tubers—Medium to large, oblong, round, flattened at the stem end; reddish buff, eyes rather large and deep; flesh yellowish white, solid. Promising as a market variety.

Sylvan—Not very vigorous, 14 inches tall, erect, light green; stem stout; leaves 6 inches long; leaflets fairly even, rather slender, largest 1½ by 2 inches; somewhat blighted.

Tubers—Medium long, round, slightly rough, seed end russeted, yellowish white; eyes medium to shallow. Seems to be of no value.

Thunderbolt—Rather low, 18 inches, erect, medium green, stem small; leaves 5 to 6 inches long, leaflets rather uneven; largest 1½ by 2 inches; killed by blight.

Tubers—Small, round, reddish buff; eyes medium deep; flesh yellowish white. Will never set the world afire.

Tonhocks—Rather uneven, 18 to 20 inches tall, somewhat spreading, light green; stem fairly stout; leaves medium size, 6 to 7 inches long; leaflets medium 1½ by 2 inches; killed by blight.

Tubers—Medium, round to oblong; reddish buff; eyes small; flesh yellowish white. Well worthy of trial.

Umpire—Very even and vigorous, 20 to 22 inches tall, erect, dark, glossy green; stem fairly stout, leaves 6 to 7 inches long, foliage thick; leaflets small to medium, 1¼ by 1½ inches; somewhat blighted.

Tubers—Small, long, round, smooth, yellowish white; eyes small, shallow. Of no more than ordinary productiveness.

Way—Fairly vigorous and even, 18 to 20 inches tall, fairly erect, dark, glossy green; stem fairly stout, leaves 6 to 7 inches long; leaflets medium to large, 1½ by 2 inches; killed by blight.

Tubers—Medium, oblong to long, nearly round, yellowish buff, solid. Promising.

White Early Ohio—Fairly vigorous and even, 18 inches tall, spreading, medium green; stem fairly stout, leaves 6 to 7 inches long; leaflets uneven, small to medium, 1¼ by 1½ inches; killed by blight.

Tubers—Medium, oblong, slightly flattened; eyes medium scarcely sunken, flesh yellowish white; something like the Early Ohio in form; upon which it seems an improvement.

White Flower—Even and fairly vigorous, 18 to 24 inches tall, somewhat spreading, medium green, stalks somewhat slender; leaves 6 to 8 inches long; leaflets large and even, 2½ by 2 inches; killed by blight.

Tubers—Large, long, round, smooth, white; eyes shallow, sometimes protruding. Hardly worthy of extensive cultivation.

THE BEST VARIETIES TO PLANT.

As an extra early sort, Howe's Premium* has again shown itself one of the best. Although only fairly productive, it is of excellent quality, and for home use well worth planting.

Of the new sorts we can not make exact comparisons as to season, on account of their premature ripening, but McFadden's Earliest and Queen of Paris showed little signs of blight; were ripe on August 8, and produced, the former 237.5 bushels, and the latter 336.8 bushels. They seemed to be nearly as early as Premium, and were much more productive. Of other early sorts the more promising were New Queen,** 288 bushels, Tonhocks, 263.7 bushels, Signal, 261.2 bushels, Early Minnesota, 240 bushels, Early White Beauty of Hebron, 220 bushels, Beauty of Hebron,* 206 bushels, Early Oxford,** 213 bushels. Following within a week as medium early sorts were, Early Pearl, 277.8 bushels, Thorburn,* 233 bushels, Fort Collins No. 83,** 240 bushels, Early Rose,* 228.40 bushels, Putnam's New Rose,** 194 bushels, Early Puritan, 206 bushels, Freeman, 213 bushels and Faust's 1889,** 203 bushels. The best sorts that would be classed as medium late were West's No. 3, 264.7 bushels (rather coarse),

* The number of stars after a variety indicate the number of years it has been previously favorably reported on.

P. and W. Victory, 231 bushels, Lazell's Seedling, 228.7 bushels, Perfection, 213.4 bushels, and Supplanter, 206 2 bushels.

The best late sorts were Empire State,* 273 bushels; Halo of Dakota, 261.2 bushels; Ideal,* 258 bushels; White Elephant,** 209.7 bushels; Crown Jewel, 208.3 bushels; and Rural Blush,** 206.4 bushels.

The above lists were made out from the behavior of the varieties the past season, but it so happens that of the varieties which were also grown in 1890, every one was on the selected list for that year (with the exception of West's No. 3, which is too coarse to be valuable), and quite a number which have been grown for three or four years were highly commended in 1888 and 1889. The stars after the names of the varieties indicate, according to the number, that they have been found valuable for one or two years.

SHALL WE PLANT THE SEED END?

For three years now we have made experiments to learn whether or not the practice of many farmers of throwing away the "seed" end of the potatoes is a wise one. The past year the test was made in duplicate with Clark's No. 1 and Beauty of Hebron, each variety being tried with two rods of row with seed from the middle and from the stem and seed ends of thirty-three potatoes, using four pounds of seed, or in all for the test twenty-four pounds.

The following table shows the result with each variety, the average of both, and the average for three years. It will be noted that the yield of market tubers has been found largest from the seed end, both as the average for 1892, and for the three years, with the next largest yield from the stem end. Contrary to the usual opinion the yield of small tubers has without exception been smallest from the seed end.

TABLE II.—*Comparative yield of stem, middle and seed ends.*

	Clark's No. 1.						Beauty of Hebron.					
	% Vigor.	Market maturity.	No. of eyes in the seed.	Yield in bushels.	Market.	Small.	% Vigor.	Market maturity.	No. of eyes in the seed.	Yield in bushels.	Market.	Small.
Stem end of potatoes, 4 lbs.	99	8-15 b	112	193.1	153.1	40.0	96	8-22 b	278	173.1	131.5	41.6
Middle of potatoes, 4 lbs.	98	8-15 b	124	188.1	119.8	68.3	97	8-19 b	115	144.9	98.1	46.8
Seed end of potatoes, 4 lbs.	100	8-17 b	314	179.5	140.3	39.3	97	8-19	258	190.3	164.8	25.5

	Average yield.			
	1891.		For three years.	
	Market.	Small.	Market.	Small.
Stem end	142.3	40.8	173.4	37.9
Middle	108.9	57.5	143.1	45.2
Seed end	152.5	32.4	183.5	30.5

It should be noted that the pieces for seed—stem, middle and seed ends —were cut from the same tubers.

From duplicate trials for three years, or six experiments in all, it would seem that the practice of cutting off and throwing away the seed ends of potatoes designed for planting is needless, and therefore wasteful.

Notes on the vigor and appearance of the vines in each section were taken at frequent intervals, and will give some idea of the growth. "July 2. Stem and middle sections about alike, 15 inches high, 5 vines to the hill; the seed end section quite even in size, 17 to 18 inches high, 5 to 6 vines to a hill." "July 14. The seed end section is the tallest, and leads in vigor; the stem section slightly uneven." "Aug. 1. Seed end section still leads in vigor; can see no difference in earliness; about two inches taller than the others."

As a rule the eyes near the seed end are stronger, and produce more vigorous shoots than do those of either middle or stem end, and as the number of shoots that develop, although the eyes are twice as numerous, is little if any larger, we might expect a stronger and more even growth of plants and a consequently larger yield of tubers, and our results show this to be the case.

AMOUNT OF SEED TO USE.

In order to get light on the various sides of this question, the experiments were arranged in two or three different ways. It at once appears that the proper size of the seed for each hill will depend on the distance between the hills, and this of course will vary the amount per acre. The question was first considered as only applying to plats with one foot between the hills. Two varieties, Clark's No. 1 and Beauty of Hebron, were used for the test, and the seed was prepared as in previous years, by cutting the tubers in halves lengthwise, and using one piece in the plot for the halves; the other half was again cut lengthwise, and one piece used as a quarter, and this was kept up until we had secured halves, quarters, eighths and single eye pieces, from the same tubers. An equal number of whole tubers of each variety were planted to ascertain the yield from whole large tubers.

Throughout the season up to August 1, there was a very perceptible difference in the size of the tops, the height decreasing from those of the whole tubers down to the single eyes.

Naturally being earlier, and of course more forward in their development when the hot weather came, we could expect a somewhat larger yield from the large tubers than from the small ones, but this could not account for the *very marked* increase.

TABLE III.—*Yield from different amounts of seed, one foot apart.*

	Clark's No. 1.						Beauty of Hebron.					
	% Vigor.	Market Maturity.	No. of eyes in the seed.	Yield in Bushels.	Market.	Small.	% Vigor.	Market Maturity.	No. of eyes in the seed.	Yield in Bushels.	Market.	Small.
Whole potatoes, 10 lbs.	100	8-17 b	459	233.5	129.8	103.7	100	8-22b	461	244.7	179.8	64.9
Halves of potatoes, 5 lbs.	98	8-15 b	268	186.4	104.8	81.6	98	8-15b	254	159.8	103.7	56.1
Quarters of potatoes, 2½ lbs.	96	8-15 b	120	126.5	79.7	46.8	96	8-15b	128	76.5	39.8	36.7
Eighths of potatoes, 1¼ lbs.	94	8-17	83	94.8	73.2	21.6	94	8-19	68	63.2	41.6	21.6
Single eyes, 10 oz.	92	8-15 b	33	64.9	50.1	14.8	92	8-15	33	61.5	46.8	14.7

	Whole.	Halves.	Quarters.	Eighths.	Single eyes.
Market average of the two varieties	154.6	104.2	59.7	57.4	48.4

	Whole.	Halves.	Quarters.	Eighths.	Single eyes.
Market average for three years	177.5	169.4	135.3	121.3	99.8
Average amount of seed	58.9	28.6	14.7	7.5	4.3
Net gain per acre	118.6	140.8	120.6	113.8	95.5

The total yield in bushels per acre will be seen to be *four* times as much from whole tubers as from single eyes, with a gradual but regular decrease of yield as the size of the seed decreased. There was less difference in yield of marketable tubers, but the average yield was more than three times as great. As is usually the case, also, the yield of small tubers was in proportion to the size of the seed pieces used.

The average yield for three years gives about the same results, except that the past season, for the reason given, was unusually favorable for whole tubers.

We find that although for the three years the average yield of the large seed (whole) potatoes was greater than any of the smaller ones, that the greatly increased amount of seed more than equaled the increased yield, and hence it was less profitable than the use of halves. When planted one foot apart the average result for three years would show that from 25 to 28 bushels per acre gave best results. For two or three feet between the hills of course a smaller amount of seed would seem desirable, and for that reason another experiment was arranged to ascertain the proper distance apart in rows for different-size pieces.

DISTANCE TO PLANT POTATOES.

The distances selected were for eyes, 1, 1¼, 1½, 1¾, 2, and 2½ feet; for halves and quarters 1, 1½, 2, and 2½ feet, and for whole potatoes 1, 2, and 3 feet. The results obtained are shown in Table IV.

TABLE IV.

Distance for planting potatoes.	Type 2.					O. K. Mammoth.				
	Per cent vigor.	Market maturity.	Yield in bushels.	Market.	Small.	Per cent vigor.	Market maturity.	Yield in bushels.	Market.	Small.
1 ft. apart { 50 halves weighing 6½ lbs.	100	8-19	193.6	146.3	47.3	99	8-17b	122.1	79.2	42.9
1 ft. apart { 50 quarters weighing 4 lbs.	98	9-8	140.8	104.5	36.3	98	8-17b	118.8	81.4	37.4
1 ft. apart { 50 eyes weight 2 lbs.6 oz.and 2 lbs.	96	9-8	101.2	77	24.2	96	8-19	83.6	67.7	15.9
1¼ ft. apart { 40 eyes weighing 1 lb. 6 oz. and 1 lb. 10 oz.	93	8-25b	113.3	101.2	12.2	95	8-19	73.7	52.8	20.9
1½ ft. apart { 33 halves, weighing 5 lbs.	100	8-19b	194.7	137.5	57.2	97	8-17b	133.1	91.3	41.8
1½ ft. apart { 33 quarters, weighing 2½ lbs.	97	9-8	146.3	114.4	31.9	97	8-17b	113.3	70.4	42.9
1½ ft. apart { 33 eyes weight 13 oz. and 1 lb.1 oz.	94	9-8	74.8	66	8.8	93	8-19	84.7	59.4	25.3
1¾ ft. apart--28 eyes weighing 13 oz.	92	9-8	70.4	49.5	20.9	92	9-8	68.2	53.9	14.3
2 ft. apart { 25 halves, weighing 3 lbs.	99	9-8	158.4	136.4	22	96	8-19	101	93.5	7.5
2 ft. apart { 25 quarts, weighing 1 lb. 10 oz.	95	9-8	138.6	113.3	25 3	95	8-17b	95.7	71.5	24.2
2 ft. apart { 25 eyes, weighing 10 oz.	96	9-8	36.3	33.6	3.3	94	8-15	17.6	13.2	4.4
2½ ft. apart { 40 halves, weighing 5¼ lbs.	96	8-25b	130.9	108.9	22.0	95	8-19	127.6	108.9	18.7
2½ ft. apart { 40 quarters, weighing 2 lbs. 12 oz.	95	9-8	102.3	92.4	9.9	99	8-25b	74.8	58.8	16

In making up our seed it was found that the supply of large whole tubers of Type 2, and O. K. Mammoth were exhausted and Clark's No. 1, and Beauty of Hebron were used in their stead. For this reason no comparison of the yield of wholes at different distances can be made with that of the pieces.

The following Table gives the result arranged in a different way, both for the year 1891, and the average for 1890 and 1891:

TABLE V.—*Distances for planting different sized pieces.*

	Distance apart in rows.													
	1		1¼		1½		1¾		2		2½		3	
	Total crop.	Market.	Total crop.	Market.	Total crop.	Market.	Total crop.	Market.	Total crop.	Market.	Total crop.	Market.	Total crop.	Market.
Single eyes	92.4	72.3	93.5	77	79.7	62.7	69.3	51.7	26.9	23.1				
Quarters	129.8	92.9			129.8	92.4			117.1	92.4	88.5	75.6		
Halves	157.8	112.7			163.9	114.4			129.7	114.9	129.2	108.9		

TABLE V A.—*Average for two years.*

	Distance apart in rows.													
	1		1¼		1½		1¾		2		2½		3	
	Total crop.	Market.	Total crop.	Market.	Total crop.	Market.	Total crop.	Market.	Total crop.	Market.	Total crop.	Market.	Total crop.	Market.
Single eyes	76.5	58.2	74.8	58.5	61.8	55.6	55.7	41.6	31.00	24.05	.....	.....	.....	.....
Quarters	87.5	67.5	.....	.....	89.9	61.7	.....	.....	76.45	57.55	73.75	47.65	.....	.....
Halves	122.9	76.5	.....	.....	115.2	77.1	.....	.....	92.95	76.36	80.60	67.75	.....	.....

TABLE VI.—*Showing gain over seed to gain over seed at different distances.*

		Amount of seed in bu.	Amount of yield in bu.	Difference.
1 foot	Halves, weighing 6½ pounds	28.6	112.7	84.1
	Quarters, weighing four pounds	17.6	92.9	75.3
	Eyes, weighing 2¼ pounds	9.9	72.3	62.4
1¼ feet	Eyes, weighing 1 3-16 pounds	5.2	77	71.8
1½ feet	Halves, weighing 5 pounds	22.00	114.4	92.4
	Quarters, weighing 2½ pounds	11.00	92.4	81.4
	Eyes, weighing 15 ounces	4.12	62.7	58.58
1¾ feet	Eyes, weighing 13 ounces	3.5	51.7	48.2
2 feet	Halves, weighing 3 pounds	13.2	114.9	101.7
	Quarters, weighing 1 10-16 pounds	7.15	92.4	85.25
	Eyes, weighing 10 ounces	2.75	23.1	20.35
2½ feet	Halves, 5¼ pounds	11.5	108.9	97.4
	Quarters, 2 2-16 pounds	4.67	75.6	70.93

In 1891 the single eyes gave the largest yield at a distance of 1¼ feet; the quarters gave practically the same yield of market size at 1, 1½ and 2 feet, but when we consider the amount of seed required, those at 2 feet furnish the largest net yield; the halves also show little difference at the distances between 1 and 2½ feet, but the net yield of market tubers would be largest at 2 feet.

A comparison of these conclusions with the results secured as the average of two years' trial, and with four varieties (Table VI) shows but little difference, and the largest net yield of all was secured from halves, using 13.2 bushels of seed per acre at two feet, as shown both in one year's trial (Table IV) and the average for two years (Table V A).

SHOULD SMALL POTATOES BE USED AS SEED?

In the above experiments whole large potatoes or various-size pieces of large tubers were used as seed, and it was found that the best net results were secured with halves of large potatoes and the question arises, if whole potatoes of half the weight of the large whole ones were used, would they not have produced as good results?

If such be the case it would admit of the use for seed, of potatoes that are just under market size, and which are therefore of little value except for stock feeding.

TABLE VII.—*Halves against whole tubers.*

	Clark's No. 1.					Beauty of Hebron.				
	Per cent vigor.	Market maturity.	Yield in bushels.	Market.	Small.	Per cent vigor.	Market maturity.	Yield in bushels.	Market.	Small.
Halves, each weighing 4 oz.	100	8-17 b	219.7	124.8	94.9	100	8-19	226.3	149.8	76.5
Whole potatoes, weighing 4 oz.	100	8-12 b	296.3	173.1	123.2	100	8-19 b	266.4	176.4	110
Halves, each weighing 2 oz.	97	8-12 b	219.7	139.8	76.9	97	8-15 b	209.7	127.5	82.2
Whole potatoes, weighing 2 oz.	97	8-12 b	199.8	88.2	111.6	97	8-19	233.5	133.2	100.3
Halves, each weighing 1 oz.	96	8-12 b	167.1	107.2	59.9	96	8-19	191.4	139.8	51.6
Whole potatoes, each weighing 1 oz.	96	8-12 b	211.4	131.5	79.9	96	8-15 b	191.4	158.1	33.3
Halves, each weighing ½ oz.	95	8-12 b	154.8	128.2	26.6	95	8-19	206.4	141.5	64.9

	Am't of seed bu. per acre.	Av. market yield per acre.		Net gain, bu.; yield over seed.	
		1891.	2 years.	1891.	2 years.
Halves, weighing 4 oz.	55	137.3	107.4	82.3	52.4
Wholes, weighing 4 oz.	55	174.8	125.9	119.8	70.9
Halves, weighing 2 oz.	27½	133.7	115.5	106.2	88
Wholes, weighing 2 oz.	27½	110.7	102.3	83.2	74.8
Halves, weighing 1 oz.	13.8	123.5	111	109.7	97.2
Wholes, weighing 1 oz.	13.8	144.8	110.4	131	96.6
Halves, weighing ½ oz.	6.8	134.9	107.2	128	100.2

As grown in 1890, halves of any weight gave a larger *market* yield than whole tubers of twice the size, and the largest net yield was found from halves of two ounce potatoes or at the rate of 13.7 bushels per acre.

This year the results are more irregular and owing to the unfavorable season, and it may be to some irregularity of the soil that was not apparent to the eye, it is difficult to draw definite conclusions from them. The largest *net* yield for two years has been secured from halves planted at the rate of 6.8 bushels per acre, and the next best yield from halves at the rate of 13.8 bushels per acre. They were all planted one foot apart, and from the experiments to learn the distance apart for planting it would seem that even better results could be obtained by the use of the same amount of seed per acre planted 2 feet apart.

Regarding the use of small potatoes for seeding it would seem that at

the present price of potatoes it would be better to feed the small potatoes to stock, for which they are worth at least one fourth as much as corn, and use large potatoes cut so as to plant at the rate of from 12 to 15 bushels per acre.

If one has a large supply of small potatoes, just under market size, and has no use for them, it would pay, perhaps, to use them for seed; but as advised last year, this practice should not be kept up from year to year, without obtaining a new stock of seed potatoes.

In the experiments to ascertain the best depth for planting, the results seemed to favor covering the seed about 3 inches. This seems to be correct for dry seasons.

FERTILIZERS FOR POTATOES.

The plots used for the experiments with fertilizers contained 4 square rods each, and as these were duplicated with the fertilizers above and below the seed, each fertilizer mixture was tested upon 1-20 of an acre.

The fertilizers used were stable manure, under and over the seed, and as a mulch between the rows, wood ashes, nitrate of soda, sulphate of ammonia, dissolved bone black, ground bone, muriate of potash and sulphate of potash, each alone, and in various combinations, besides Odorless (Iron) Phosphate, Bone and Potash and Homestead Superphosphate, of the commercial mixtures.

The manure was applied at the rate of 20 loads (10 cords) per acre; the ashes at the rate of 40 bushels; sulphate of ammonia at the rate of 160 lbs.; nitrate of soda, 240 lbs.; muriate and sulphate of potash. 240 lbs., and ground bone and dissolved bone black, 400 lbs. The highest application to any one plot consisted of a mixture of 240 lbs. muriate of potash, 240 lbs. nitrate of soda, and 400 lbs. ground bone at an expense of $16.00 to $18.00 per acre. The least expensive fertilizer was 240 lbs. of sulphate of potash, at a cost of $3.50.

Four varieties were used in the test in each plot, but by an error in selecting the seed, only two of these were the same throughout, and exact comparisons can not be made except of the yields of these varieties. The following tables show the yield of each variety, and the average yield obtained from the use of the different fertilizers.

TABLE VIII.—*Fertilizer test.*

Plots.	Clark's No. 1.	Beauty of Hebron.	Type 2.	O. K. Mammoth.	Dictator.	Rochester Favorite.	Average.	
I	317.3	272.4	230.4	230.4	.....	.....	262.6	Mulch between rows.
II	218.7	177.3	126.0	145.8	.....	.....	166.9	Nothing.
III	255.6	236.7	176.4	216.0	.....	.....	221.2	Fertilizer under seed.
IV	230.4	170.0	172.4	212.4	.....	.....	196.3	Fertilizer over seed.
V	244.8	228.6	212.4	190.8	.....	.....	219.1	Manure under seed.
VI	209.7	168.4	135.0	169.2	.....	.....	170.6	Nothing.
VII	236.7	244.8	183.6	199.8	.....	.....	216.2	Fertilizer under seed.
VIII	186.3	175 5	157.5	168.4	.....	.....	171.9	Fertilizer over seed.
IX	.....	.....	149.0	148.5	192.6	162.0	163.	Wood ashes.
X	.....	.....	154.8	171.0	172.8	190.8	172.2	Nothing.
XI	.....	.....	175.5	215.1	191.7	157.5	184.9	Fertilizer under seed.
XII	.....	.....	153.0	163.8	153 9	101.7	143.1	Fertilizer over seed.
XIII	.....	.....	216.0	224.1	193.5	121.5	188.8	Manure over seed.
XIV	.....	.....	109.8	124.2	171.1	110 7	128.9	Nothing.
XV	.....	.....	261.0	243.0	272.4	147.6	231.	Fertilizer under seed.
XVI	.....	.....	231.3	209.7	234.0	122.4	199.3	Fertilizer over seed.
XVIII	.....	.....	136.8	107.1	126.0	91.8	115.4	Nothing.
XIX	.....	.....	196.2	185.4	234.0	162.0	194 4	6 lbs. sulphate of potash under seed.
XX	.....	.....	206.2	241.2	202.6	111.6	190.4	6 lbs. sulphate of potash over seed.

Plots.	Dictator.	Rochester Favorite.	Type 2.	Sutton.	Average.	
XXI	216.0	100.8	147.6	279.6	186.0	6 lbs. nitrate of soda, 10 lbs. dis. bone, 6 lbs. muriate potash.
XXII	166.4	141.3	171.1	234.0	178.2	4 lbs. sul. ammonia, 10 lbs. dis. bone, 6 lbs. muriate potash.
XXIII	191.7	183.6	172.8	244.8	198.2	4 lbs. sul. ammonia, 10 lbs. dissolved bone.
XXIV	144.0	115.2	120.6	208.8	147.2	10 lbs. dissolved bone, 6 lbs. muriate of potash.
XXV	193.5	180.0	259.2	316.4	244.8	10 lbs. odorless phosphate.
XXVI	198.9	120.6	171.0	318.6	202.3	20 lbs. "Homestead" fertilizer.
XXVII	162.9	142.2	153.0	243.0	175.3	20 lbs. bone and potash.
XXVIII	180.9	150.3	147.6	242.2	180.2	20 lbs. dissolved bone black.

Average.—Plats I to IX.

Nothing	168.7	Fertilizers under seed	218.7
Fertilizers	201.4	Fertilizers over seed	184.1
Manure mulch	262.6	Manure	219.1

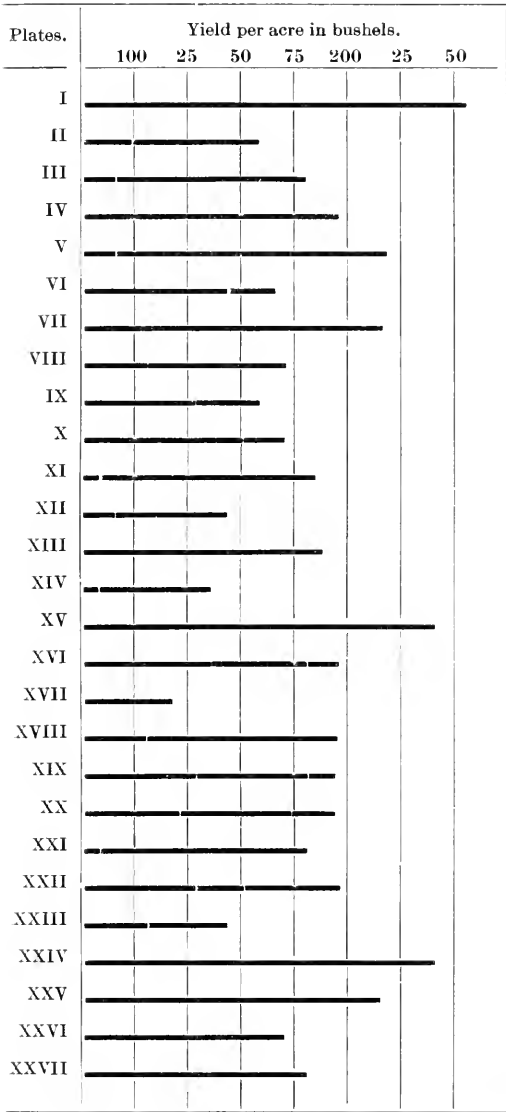
Plats IX to XXI.

Nothing	143.8	Fertilizers under seed	203.4
Fertilizers	190.5	Fertilizers over seed	177.6
Manure over seed	188.8		

Plats I to XXI—Type No. 2 and O. K. Mammoth.

Nothing	137.9	Fertilizers under seed	205.2
Fertilizers	198.4	Fertilizers over seed	191.6
Manure	210.8		

TABLE IX.—*Average results with fertilizers.*



By reference to the tables it will be seen that the highest yield was obtained when manure was used as a mulch between the rows. This would seem natural, as it would both provide plant food, and prevent evaporation of soil water, which could not be spared in a season like the last. The manure used *under* seed gave about 50 bushels more of potatoes to the acre than did the adjoining unfertilized plot. Manure *over* seed in the furrow produced 60 bushels more than the check plot without fertilizers, owing in part probably to the effect as a mulch.

The average results from manure used in the different ways was 84.2 bushels in favor of the use of manure, when all the varieties were considered, but with the two varieties that were used in all the plots considered, the results show 73 bushels gained in yield by the use of manure.

This, even at the present low price of potatoes, will well repay for the cost of the manure, and as fully one half of the fertilizing value of the manure is left in the soil to feed future crops, it becomes doubly profitable.

As will be noticed, the fertilizers were used in duplicate, half being worked into the soil under the seed, and the balance scattered along the row after the tubers were covered.

The results show quite a decided gain from those placed under the seed, but they might have been reversed had there been rains to dissolve and carry down the plant food placed above the seed.

Comparing the yield of Type No. 2 and O. K. Mammoth on the unfertilized, and on the plots enriched with fertilizer, we find a gain of 60.5 bushels per acre from the use of fertilizers. This gain seemed very regular throughout, as in the first eight plots the gain was 32.7 bushels, counting all varieties. In the second series of twelve plots it was 46.7 bushels.

Wood ashes seemed to have no fertilizing value, but, as potash sulphate gave a gain of more than 75 bushels per acre over an adjoining unfertilized plot, it would seem that there was some local irregularity of the soil.

While it can readily be shown that the fertilizers were used with profit, it is difficult to say which of the chemicals were most necessary. The nitrogen perhaps had the least effect, but the potash and ground bone whether alone or together seemed to increase the yield.

Of the commercial mixtures the Odorless phosphate made the best showing. Although it was not apparent, the soil may have been naturally very rich in the plot to which it was applied, and this may in part account for the large yield.

The Homestead superphosphate was also a profitable one to apply, the average yield being 202.3 bushels, which was somewhat higher than was secured from the chemical mixtures.

SUMMARY.

1. The seed end is as good, if not better, than any other part of the potato for planting, and as a rule produces fewer small tubers.

2. As a rule, medium-size potatoes cut into halves lengthwise, using at the rate of 13 to 15 bushels of seed to acre, will produce best net results, planted one and a half or two feet apart.

3. If smaller seed is used, the eyes should be 15 inches apart, and pieces containing two or three eyes, about 18 inches. At distances over $2\frac{1}{2}$ feet the number of hills is so much decreased that the yield is lessened.

4. When potatoes are cheap, it does not pay to use small potatoes as seed, but when seed potatoes are high, tubers the size of hens' eggs may be used for one year without greatly decreasing the yield.

5. Even on fairly rich soil, manure or fertilizers can be used with profit. When manure can not be obtained without hauling two or three miles, 500 pounds of mixed chemicals or of some good brand of commercial fertilizer will be cheaper to use, and will be a profitable investment.

L. R. TAFT.

INSPECTION OF COMMERCIAL FERTILIZERS.

BY R. C. KEDZIE.

Bulletin No. 86, July, 1892.

The law providing for the inspection of commercial fertilizers and regulating their sale was enacted in 1885. The law was designed to protect farmers from loss by the purchase of inferior or even worthless fertilizers offered for sale in our state. Other states requiring an inspection of fertilizers before they are offered for sale, a manufacturer who had inferior fertilizers for sale might find it profitable to offer such goods in states where no inspection is made, and farmers are not warned of the low grade of goods offered for sale. But for our inspection law this state might be made the dumping ground for worthless fertilizers. Farmers should make use of the information offered them by this law, and know what they buy and be able to judge of its commercial value.

The three most valuable materials in commercial manures are potash, phosphoric acid, and available nitrogen. Each of these has a commercial value, and the worth of any given quantity in the market may be stated in dollars and cents. Only these three substances are considered in the inspection of commercial fertilizers, because the other materials are of too little value to be purchased at high prices. The essential value of these fertilizers lies in the potash, phosphoric acid, and available nitrogen they contain. The law does not prescribe the amount of these substances in any fertilizer, but requires the manufacturer or dealer to certify the composition of the fertilizer, and to deposit a sample of the fertilizer with the Secretary of the State Board of Agriculture. In this way the composition of the fertilizer as claimed by the manufacturer is offered to the public. Samples of the fertilizer are gathered in the open market, and analyzed, and the results directly compared with the claims of the manufacturer in the bulletin. The farmer can thus find in the bulletin, on lines opposite each fertilizer, the amount of nitrogen, phosphoric acid, and potash as claimed by the manufacturer, and as actually found by analysis at this laboratory. If the analysis shows more of any given substance than is claimed, the goods are better than claimed; but if much less is found on analysis than is claimed, then the goods are proportionately of less value to the farmer. For example, an Ohio potato fertilizer was sold in the state last year that fell short of the claimed amount of available nitrogen by more than two per cent., and of potash by more than three per cent., and the fertilizer was not worth so much as claimed by $11 a ton. By consulting the tables in the bulletin, the market value of these commercial fertilizers can be estimated on the basis that available phosphoric acid is worth eight cents a pound, insoluble phosphoric acid three cents, potash six cents, and ammonia eighteen cents. As there are 20 times 100 pounds in a ton, if we multiply the value of a pound by 20, we get the value of one per cent. of each substance, and thus obtain a factor for obtaining the value of the material in a ton from the percentage given in the tables of the bulletin. One per cent. means 20 pounds in a ton, and if the material is worth eight cents a pound then each per cent. equals $1.60 a ton.

Multiply $1.60 by the per cent. of available phosphoric acid.
" .60 " " insoluble " "
" 3.60 " " ammonia.
" 1.20 " " potash.

The sum will give the market value of a ton of such fertilizer. Take for example Vegetable Bone fertilizer as found last year:

Ammonia 5.76 % × $3.60=	$20.74
Available phosphoric acid 5.40 % × 1.60=	8.64
Insoluble " " 1.48 % × .60=	89
Potash 7.80 % × 1.20=	9.36
Market value per ton	$39.62

In order to secure full information in regard to the composition of all fertilizers sold or offered for sale in this state, a license is required of every manufacturer or dealer in such fertilizers in this state. If the manufacturer takes out a license for any brand of fertilizer, such license protects all dealers in such fertilizer for the year; but if the manufacturer neglects or refuses to take out such license, then each dealer must take out a license to cover his sales. Any person who sells or offers for sale any fertilizer (whose retail price exceeds $10), that has not been thus licensed is liable to a fine of not less than $100 for the first offense and not less than $300 for every subsequent offense. The same fines hang over the dealer who sells goods, that are not up to the standard claimed. Dealers will show wisdom in refusing to handle the fertilizers of manufacturers who neglect or refuse to take out a license for their goods, or fail to keep their goods up to the standard claimed.

It may seem a hardship to the dealer to require a license from each one for every brand of fertilizer he offers for sale. Yet it is obvious that the system of inspecting and licensing is necessary to protect the farmers from heavy loss. But the factories are for the most part outside of our state and thus beyond the reach of our state law, and the only parties that can be reached are the local dealers. If a license is required of one, it must be required of all.

In order to give exact information on all these points, the full text of the law is printed.

[Session Laws of 1885, No. 26.]

AN ACT to provide for the inspection of commercial fertilizers and to regulate the sale thereof.

SECTION 1. *The People of the State of Michigan enact*, That any person or persons who shall sell or offer for sale in this state any commercial fertilizer, the retail price of which exceeds ten dollars per ton, shall affix on the outside of every package containing such fertilizer a plainly printed certificate, stating the number of net pounds therein; the name or trade mark under which such article is sold; the name of the manufacturer; the place of manufacture, and a chemical analysis, stating the percentage of nitrogen in an available form; of potash soluble in water, and of phosphoric acid in available form (soluble or reverted) and the insoluble phosphoric acid.

SEC. 2. Before any commercial fertilizer is sold or offered for sale, the manufacturer, importer, or party who causes it to be sold or offered for sale within this state, shall file with the secretary of the State Board of Agriculture a certified copy of the analysis and certificate referred to in section one, and shall also deposit with said secretary a sealed glass jar containing not less than two pounds of such fertilizer, with an affidavit that it is a fair sample of the article thus to be sold or offered for sale.

SEC. 3. The manufacturer, importer, or agent of any commercial fertilizer, the retail price of which exceeds ten dollars per ton as aforesaid, shall pay annually to the secretary of the State Board of Agriculture, on or before the first day of May, a license fee

of twenty dollars for each and every brand of fertilizer he offers for sale in this state: *Provided*, That whenever the manufacturer or importer shall have paid this license fee his agents shall not be required to do so.

SEC. 4. All such analyses of commercial fertilizers required by this act shall be made under the direction of the State Board of Agriculture and paid for out of the funds arising from the license fees provided for in section three. At least one analysis of each fertilizer shall be made annually.

SEC. 5. The secretary of the State Board of Agriculture shall publish in his annual report a correct statement of all analyses made and certificates filed in his office, together with a statement of all moneys received for license fees, and expended for analysis. Any surplus from license fees remaining on hand at the close of the fiscal year shall be placed to the credit of the experimental fund of said board.

SEC. 6. Any person or persons who shall sell or offer for sale any commercial fertilizer in this state without first complying with the provisions of sections one, two, and three of this act, or who shall attach or cause to be attached to any such package or fertilizer an analysis stating that it contains a larger percentage of any one or more of the constituents or ingredients named in section one of this act than it really does contain shall, upon conviction thereof, be fined not less than one hundred dollars for the first offense, and not less than three hundred dollars for every subsequent offense, and the offender shall also be liable for damages sustained by the purchaser of such fertilizer on account of such misrepresentation.

SEC. 7. The State Board of Agriculture by any duly authorized agent is hereby authorized to select from any package of commercial fertilizer exposed for sale in this state, a quantity, not exceeding two pounds, for a sample, such sample to be used for the purposes of an official analysis and for comparison with the certificate filed with the secretary of the State Board of Agriculture and with the certificate affixed to the package on sale.

SEC. 8. All suits for the recovery of fines under the provisions of this act shall be brought under the direction of the State Board of Agriculture.

Approved March 10, 1885.

For the information of the parties concerned, the fertilizers that have been licensed for 1892 will be indicated in the list of this Bulletin; also those that have not been licensed and whose sale is illegal in this state.

The primary object of this law is to give information in regard to the composition of commercial fertilizers, and to protect farmers from imposition and loss. The question of their agricultural value, and relation to crops and different kinds of soils is not touched. These subjects require a separate examination for determining the relative value of any given fertilizer with reference to different soils and crops. The farmer can settle for himself such questions by trials of the fertilizer on a small portion of a field and comparing the results with other parts of the same field and crop on which no fertilizer has been applied. The conditions of crop, soil, and climate are thus brought home to him more completely than any investigation in other places and conditions can furnish.

How the state may place before the farmers the agricultural value of the various fertilizers offered for sale is a very different subject from that contemplated by this law for the inspection of such fertilizers. Such law of inspection offers no advice whether the farmer shall buy such fertilizers, or depend upon the home supply. In case he determines to buy, it affords him some basis for calculating the commercial value of the different brands offered for sale, and to select honest goods which are found to be the same in the market as are claimed by the seller. He may also be on his guard not to buy the goods which are not licensed for sale as not worthy of confidence.

With this brief statement of the objects sought by inspection, and the results of analysis of goods selected in the open market as compared with the claims of the manufacturer, this Bulletin is submitted to the public.

AGRICULTURAL COLLEGE,
July 2, 1892.

Result of Analyses of Commercial

Manufacturer.	Trade Name.	Dealer and Locality.
Crocker Chemical Works, Buffalo, N. Y.	‡ Practical Ammoniated Superphosphate	Hester & Fox, Grand Rapids
Crocker Chemical Works, Buffalo, N. Y.	‡New Rival Ammoniated Superphosphate	H. P. Shutt, Kalamazoo
Crocker Chemical Works, Buffalo, N. Y.	‡Vegetable Bone Superphosphate	Hester & Fox, Grand Rapids
Crocker Chemical Works, Buffalo, N. Y.	‡ Potato, Hop and Tobacco Superphosphate	C. Vandoran, Adrian
Crocker Chemical Works, Buffalo, N. Y.	‡ Ammoniated Bone Superphosphate	G. A. Starkweather, Plymouth
Crocker Chemical Works, Buffalo, N. Y.	‡ Pure Ground Bone	H. P. Shutt, Kalamazoo
Crocker Chemical Works, Buffalo, N. Y.	‡ Ammoniated Wheat and Corn Superphosphate	H. P. Shutt, Kalamazoo
Crocker Chemical Works, Buffalo, N. Y.	‡ Buffalo Superphosphate No. 2	G. A. Starkweather, Plymouth
Crocker Chemical Works, Buffalo, N. Y.	‡ Special Potato Fertilizer	G. A. Starkweather, Plymouth
Cleveland Dryer Co., Cleveland, O.	‡ Buckeye Bone Superphosphate.	E. B. Niles, Blissfield
Cleveland Dryer Co., Cleveland, O.	‡ Ohio Seed Maker	Robert Birch, Plymouth
Cleveland Dryer Co., Cleveland, O.	‡ Potato Fertilizer	L. B. Sprucer, Holloway
Cleveland Dryer Co., Cleveland, O.	† Park and Lawn Fertilizer	Kanter Bros., Holland
Cleveland Dryer Co., Cleveland, O.	‡ Square Bone	Robert Birch, Plymouth
Cleveland Dryer Co., Cleveland, O.	‡ Ammoniated Dissolved Bone	C. S. Curtis Rochester

‡ Licensed; Sale legal.
* Not licensed: Sale unlawful if the retail price exceeds $10 a ton. Penalty for selling or offering for sale a fine of $100. See Sec. 6 of this law.

Fertilizers in Michigan for 1892.

Composition of Fertilizers as claimed by Manufacturer and Found on Chemical Analysis. Percentage Estimation.

	Available Nitrogen.	Phosphoric Acid.			Potash.—Soluble in Water.	
	Estimated as NH^3.	Available P_2O_5.	Insoluble P_2O_5.	Total P_2O_5.	Estimated as K_2O.	Estimated as K_2SO_4.
Claimed	1 to 2	8 to 10	1 to 2	9 to 12	1 to 2	2 to 3
Found	1.36	6.82	2.32	9.14	1.26	2.33
Claimed	1.50 to 2.50	10 to 12	1 to 3	11 to 15	1.60 to 2.70	3 to 5
Found	1.66	7.73	3.50	11.23	1.56	2.88
Claimed	6 to 7	6 to 7	1 to 2	7 to 9	6 to 8.	11 to 15
Found	4.74	6.17	.52	6.79	10.80	19.98
Claimed	2.50 to 3.50	10 to 12	1 to 2	11 to 14	3.25 to 4.30	6 to 8
Found	2.93	8.88	1.99	10.87	4.64	8.58
Claimed	3.50 to 4.50	10 to 12	1 to 2	11 to 14	1 to 2	2 to 3
Found	1.27	8.99	1.40	10.39	1.32	2.44
Claimed	2.50 to 4.00	----------	----------	25 to 28	----------	----------
Found	5.45	----------	----------	22.95	----------	----------
Claimed	2.50 to 3.50	10 to 13	1 to 2	11 to 15	1.60 to 2.70	3 to 5
Found	2.51	8.88	2.86	11.74	1.95	3.60
Claimed	----------	11 to 13	1 to 2	12 to 15	1.35 to 2	2.50 to 3.50
Found	.45	8.48	.60	9.08	1.58	2.92
Claimed	4.50 to 5.50	8 to 9	1 to 2	9 to 11	5.40 to 6.40	10 to 12
Found	4.43	9.53	1.47	11.	5.61	10.37
Claimed	3 to 4	9 to 10	2 to 3	11 to 12	1 to 2	----------
Found	2.83	9.23	3.50	12.73	.19	.35
Claimed	1.50 to 2.50	10 to 12	3.19	15 to 17	----------	----------
Found	1.59	11.51	2.68	14.19	----------	----------
Claimed	4 to 5	8 to 10	2 to 4	10 to 14	4 to 6	----------
Found	3.23	8.97	2.54	11.51	3.12	5.77
Claimed	----------	----------	----------	----------	----------	----------
Found	1.03	10.89	.10	10.99	.14	.25
Claimed	3 to 4	6 to 10.	----------	20 to 25	----------	----------
Found	5.03	----------	----------	22.	----------	----------
Claimed	1.50 to 2.50	10 to 12	----------	15 to 18	----------	----------
Found	1.22	10.10	2.85	12.95	----------	----------

Result of Analyses of Commercial Fertilizers

Manufacturer.	Trade Name.	Dealer and Locality.
Michigan Beef & Provision Co., Detroit, Mich.	‡ Farmers Favorite	W. S. Penfield, Detroit
Michigan Carbon Works, Detroit, Mich.	‡ Jarves Celery Grower	Geo. Hancock, Grand Haven
Michigan Carbon Works, Detroit, Mich.	‡ Jarves Drill Phosphate	H. Rogers & Bros., G'd Haven
Michigan Carbon Works, Detroit, Mich.	‡ Homestead Potato Grower	C. B. Waterloo, Port Huron
Michigan Carbon Works, Detroit, Mich.	‡ Banner Raw Bone Flour	C. B. Waterloo, Port Huron
Michigan Carbon Works, Detroit, Mich.	‡ Homestead Superphosphate	Geo. Hancock, Grand Haven
Northwestern Fertilizer Company, Chicago, Ill.	‡ Horseshoe Brand and Potato Grower	M. Wolverton, Blissfield
Northwestern Fertilizer Company, Chicago, Ill.	‡ Prairie Phosphate	J. F. Farnum, Kalamazoo
Northwestern Fertilizer Company, Chicago, Ill.	‡ Horseshoe Brand Corn Grower	W. A. Hayes, Rochester
Northwestern Fertilizer Company, Chicago, Ill.	‡ $26 Phosphate	P. Grenell, Lenox
Northwestern Fertilizer Company, Chicago, Ill.	‡ Garden City Superphosphate	J. F. Farnum, Kalamazoo
Northwestern Fertilizer Company, Chicago, Ill.	‡ Celery Grower	J. F. Farnum, Kalamazoo
Northwestern Fertilizer Company, Chicago, Ill.	‡ Fine Raw Bone	M. Wolverton, Blissfield
W. S. Dunbar, St. Joseph, Mich.	‡ Meat and Bone	Manufacturer
W. S. Dunbar, St. Joseph, Mich.	‡ Fish Guano	Manufacturer
Bradley Fertilizer Co., Boston, Mass.	‡ Dissolved Bone with Potash	C. Kraling, Kalamazoo

‡ Licensed: Sale legal.
† Not licensed: Sale unlawful if the retail price exceeds $10 a ton. Penalty for selling or offering for sale, a fine of $100. See Sec. 6 of the law.

in Michigan for 1892.—CONTINUED.

Composition of Fertilizers as Claimed by Manufacturer and as Found on Chemical Analysis. Percentage Estimation.

	Available Nitrogen.	Phosphoric Acid.			Potash.—Soluble in Water.	
	Estimated as $N H_3$.	Available $P_2 O_5$.	Insoluble $P_2 O_5$.	Total. $P_2 O_5$.	Estimated as $K_2 O$.	Estimated as $K_2 SO_4$.
Claimed	3.50 to 4.50	9 to 11	1 to 2	9 to 12	1.75 to 2.25	
Found	4.33	4.94	2.22	7.16	1.35	
Claimed	1.			1.	1.	
Found	2.48			13.13	.78	1.44
Claimed	1.25 to 2.	7.50 to 9.50	2 to 3	9.50 to 12.50		
Found	1.85	8.20	1.13	9.33		
Claimed	3 to 4	10 to 11	.50 to 1.50	10.50 to 12.50		6.50 to 7.50
Found	4.04	11.25	.28	11.53	3.67	6.78
Claimed	3.75 to 4.75			18 to 23		
Found	4.79			22.51		
Claimed	1.85 to 2.40	7.50 to 11		7.50 to 11		2.75 to 3.50
Found	2.60	10.08	.56	10.59	1.69	3.12
Claimed	3 to 4	7 to 9				2 to 3
Found	3.67		4.17	13.67	.98	1.81
Claimed	2 to 2.50			9 to 11		
Found	2.24	8.55	2.77	11.32		
Claimed	2.50 to 3	8 to 9			.54 to 1.08	
Found	2.80	8.27	4.71	12.98	0.08	0.15
Claimed	2 to 2.50			9 to 11		
Found	2.29	10.72	2.55	13.27		
Claimed	2.50 to 3	8 to 9	4 to 4.50	12 to 13.50	.54 to 1.08	
Found	2.73	9.24	3.28	12.52	.94	1.74
Claimed	3 to 4	7 to 9		7 to 9		2 to 3
Found	3.99	9.04	4	13.04	.59	1.09
Claimed	3 to 4			22 to 24		
Found	4.36			22.25		
Claimed						
Found	6.86	5.15	6.17	11.32		
Claimed						
Found	8.46	3.63	1.48	5.11		
Claimed	1 to 2	6 to 8		10 to 12	4 to 6	
Found	1.71	8.39	1.84	10.23	2.71	5.01

Result of Analysis of Commercial Fertilizers

Manufacturer.	Trade Name.	Dealer and Locality.
Bradley Fertilizer Co., Boston, Mass.	† Sea Fowl Guano	C. Kraling, Kalamazoo
Pottstown Iron Co., Pottstown, Pa.	‡ Odorless Phosphate	Grennis Perkins, Richmond
Lister's Agricult. Chemical Works, Newark, N. J.	‡ Lister's Success	John McCullough, Ypsilanti
E. S. Fitch & Co., Bay City, Mich.	† Pure Ground Bone	Manufacturer
E. S. Fitch & Co., Bay City, Mich.	† Lawn Fertilizer	Manufacturer
Joseph Lister, Chicago, Ill.	† Tankage	C. Engle, Paw Paw
Joseph Lister, Chicago, Ill.	‡ Pure Bone Meal	C. Engle, Paw Paw
Joseph Lister, Chicago, Ill.	‡ Azotine	C. Engle, Paw Paw
H. J. Baker & Bros., New York, N. Y.	‡ Complete Lawn Dressing Manure	Alfred Brown, Grand Rapids
H. J. Baker & Bros., New York, N. Y.	‡ Grade "A" for Potatoes, Special Truck Manure	Alfred Brown, Grand Rapids
Mape's Formula & Peruvian Guano Co., New York, N. Y.	† Warranted Genuine Peruvian Guano	C. Engle, Paw Paw
Mape's Formula & Peruvian Guano Co., New York, N. Y.	† Mape's Complete Manure for General Use	C. Engle, Paw Paw
Mape's Formula & Peruvian Guano Co., New York, N. Y.	† Mape's Manure for Potatoes	C. Engle, Paw Paw
F. C. Sturtevant, Hartford, Conn.	‡ Tobacco and Sulphur Fertilizer	Kanter Bros., Holland
	‡ Hammond's Slug Shot and Fertilizer	C. B. Waterloo, Port Huron
Grand Rapids Glue Co., Grand Rapids, Mich.	‡ Non Plus Ultra	Manufacturers

‡ Licensed: Sale legal.
† Not licensed: Sale unlawful if the retail price exceeds $10 a ton. Penalty for selling or offering for sale a fine of $100. See Sec. 6 of the law.

in Michigan for 1892.—CONCLUDED.

Composition of Fertilizers as Claimed by Manufacturer and Found on Chemical Analysis. Percentage Estimation.

	Available Nitrogen.	Phosphoric Acid.			Potash.—Soluble in Water.	
	Estimated as $N H_3$.	Available $P_2 O_5$.	Insolnble $P_2 O_5$.	Total $P_2 O_5$.	Estimated as $K_2 O$.	Estimated as $K_2 SO_4$.
Claimed						
Found	3.02	10.44	1.38	11.82	1.66	3.07
Claimed		4.92	15.95	20.87		
Found		5.15	11.19	16.34		
Claimed	1.25 to 2			10.50 to 12	1.50 to 2	
Found	2.07	8.19	1.91	10.10	1.94	3.58
Claimed						
Found	4.14			21.59		
Claimed						
Found	3.21	6.34	1.55	7.90	.82	1.51
Claimed						
Found	7.39	5.16	3.37	8.53	.14	.25
Claimed	3.05			24.65		
Found	4.45			24.02		
Claimed						
Found	14.18			5.37		
Claimed	4.50 to 5	5 to 6			7.50 to 9	
Found	3.57	5.87	.47	6.34	7.54	13.94
Claimed	3 to 6	5 to 8			7 to 10	
Found	5.78	4.87	1.90	6.77	11.73	21.70
Claimed						
Found	6.20	9.10	4.28	13.38	2.51	4.64
Claimed						
Found	4.28	8.33	1.74	10.07	4.44	8.21
Claimed						
Found	4.64	8.64	.83	9.47	6.98	12.91
Claimed						
Found	2.83			1.95	5.97	11.04
Claimed						
Found	.03			Trace	.64	1.18
Claimed						
Found	3.07	.74	2.09	3.83	.96	1.77

FRUIT REPORT.

BY T. T. LYON.

Bulletin No. 88, December, 1892.

To Prof. L. R. Taft, Horticulturist:

SIR—I herewith submit my report of operations, under your direction, at the South Haven Fruit Testing Sub-station for the year 1892:

The winter of 1891 and 1892 proved a comparatively mild one. Hence, although somewhat enfeebled by the protracted drouth of the previous autumn, trees and plants generally came through in apparently fair condition. A season of almost continuous rain commenced during the last days of March, which continued till growth was well under way, keeping the soil thoroughly saturated with water, seriously injuring, and in many cases utterly ruining trees and plants, especially strawberries and other small fruits.

The very general scarcity of the larger fruits during the grape season, had doubtless increased the tendency to the pilfering of this fruit while ripening. This finally became so serious that a watchman was employed for a few nights, with the apparent effect of somewhat checking depredations.

The bloom of most classes of fruit trees was unusually profuse, giving promise of a bountiful crop, especially of small fruits, peaches, plums, and cherries; but, apparently from the prevalence of cold, wet weather during the blooming season, the germs largely failed to develop and thus fulfil the early promise.

The purpose had been to give the trees and plants a thorough spray of copper carbonate prior to the growing season, but the material was received so late that only the plums, quinces, and a portion of the grapes were reached prior to the advent of the rainy season, which arrested the application, leaving no opportunity for a renewal till growth had become too far advanced for the purpose, though later sprayings were given with Bordeaux mixture.

Circumstances indicate that much benefit might have resulted from a general application of the spray of copper carbonate, and I deem it highly desirable that another spring the application be made general.

The result of the partial, and in many cases the entire failure of the crop of fruit, has been to render it impracticable to deduce trustworthy comparisons as to relative productiveness, hence these are generally omitted.

Considering the several classes of fruits as nearly as practicable in the order of their maturity, we come first to the

STRAWBERRY—*Fragaria.*

The column headed "Productiveness" in the following table, is copied from that headed "Matted Rows" in the report of last year:

STRAWBERRIES.—*Fragaria.*

Abbreviations for sexuality—b, bisexual; n p, nearly pistillate; p, pistillate.

Number.	Name.	Sexuality.	Origin.	Received.	First bloom.	First picking.	Last picking.	Hardiness.	Productiveness of 1891.	Remarks.
1	Alabama	b	Ala.	1890	May 18	June 20	July 1	11	26	Not valuable here.
2	Alpha	b	Ont.	1881	" 10	" 14	June 29	11	70	An early family berry.
3	Arnold Pride	b	Ont.	1881	" 17	" 23	July 11	8	51	Large, dull in color.
4	Atlantic	b	N. J.	1890	" 10	" 14	" 13	12	85	Lacks productiveness.
5	Australian Crimson	---	-------	1891	-------	-------	-------	--	---	Not well tested.
6	Barton Eclipse	p	-------	1891	May 14	-------	-------	--	---	Promising.
7	Beder Wood	b	Ill.	1890	" 14	June 25	July 13	12	144	Valuable for market.
8	Belmont	b	Mass.	1885	" 20	" 25	" 11	11	37	Desirable for home use.
9	Bessie	p	Ala.	1890	" 18	" 20	" 5	12	71	Not promising.
10	Black Defiance	b	N. J.	1875	" 17	" 20	" 1	12	47	Old, but still desirable.
11	Bomba	b	N. J.	1889	" 10	" 23	" 1	11	49	Lacks productiveness.
12	Boynton	b	-------	1891	" 14	-------	-------	--	---	Try further.
13	Bubach, No. 5	p	Ill.	1888	" 21	June 20	July 11	10	131	Large; a market berry.
14	Bubach, No. 24	b	Ill.	1890	" 17	" 17	June 29	8	22	New; not promising.
15	Bubach, No. 132	b	Ill.	1890	" 10	" 17	" 29	11	65	Same origin as foregoing.
16	Bubach, No. 137	b	Ill.	1890	" 14	" 20	July 11	12	103	Same source as last three.
17	Burt	b	N. Y.	1889	" 23	" 20	" 11	12	44	Much like Wilson.
18	Bright Ida	b	Ont.	1881	" 17	" 28	" 11	10	102	Prodnctive; lacks color.
19	Captain Jack	b	Mo.	1876	" 17	" 23	" 11	11	21	Lacks size.
20	Carmichael	p	Ohio	1890	" 28	" 27	" 11	9	15	Unworthy.
21	Cameronian	---	-------	1891	-------	-------	-------	--	---	Not properly tested.
22	Charles Downing	b	Ky.	1874	May 17	June 23	July 11	11	36	Old, still popular.
23	Charleston	b	Ohio	1890	" 18	" 23	" 11	12	28	May prove to be Nennan.
24	Cling To	b	Ohio	1890	" 11	" 23	" 11	11	10	Not desirable.
25	Cloud	p	La.	1888	" 17	" 20	" 11	10	57	Hardy; not profitable.
26	Covell	b	N. J.	1888	" 10	" 14	" 1	12	72	Sets too much fruit.
27	Crawford	b	Ohio	1889	" 13	" 25	" 9	10	56	Needs a longer trial.
28	Crescent	p	Conn.	1880	" 13	" 16	" 9	10	70	Very popular; market.
29	Cumberland	b	Pa.	1880	" 17	" 20	" 11	12	80	For a near market.
30	Daisy	p	Ohio	1890	" 13	" 23	" 11	12	35	Of little apparent value.
31	Dew	b	Mich.	1889	" 27	" 23	" 11	10	53	A very vigorous plant.
32	Duncan	b	Ind.	1876	" 10	" 20	" 11	11	57	Early and g od.
33	Dutter	b	Ind.	1889	" 20	" 23	" 11	11	83	Must have good culture.
34	Early Canada	p	Ont.	1886	" 17	" 23	" 11	12	52	Not profitable.
35	Edgar	---	Ill.	1890	-------	-------	-------	--	---	But partially tested.
36	Engle, No. 1	b	Mich.	1890	May 6	June 23	July 11	10	54	Promising.
37	Enhance	b	Ohio	1890	" 23	" 25	" 11	12	93	Large; productive; valuable.
38	Estelle	---	Mich.	1891	-------	-------	-------	--	---	Seedling by C. Engle.
39	Eureka	p	Ohio	1888	May 24	June 25	July 13	12	50	A good market variety.
40	Farnsworth	b	-------	1891	" 20	-------	-------	--	---	Only partially tested.
41	Felton	b	Ohio	1890	" 14	June 23	July 11	12	80	Needs further trial.
42	Florence	b	Ohio	1888	" 23	" 23	" 11	12	102	Valuable for market.
43	Galceron	b	Ga.	1888	" 18	" 23	" 12	12	48	Southern; of little value.
44	Gandy	b	N. J.	1887	" 31	" 25	" 11	12	36	Valued for its lateness.
45	Garrettson	p	Ont.	1886	" 11	" 27	" 11	10	79	Lacks productiveness.
46	Gem	p	Ill.	1890	" 18	" 17	" 9	11	149	Very promising.
47	General Putnam	b	-------	1890	" 25	" 20	" 11	12	---	Requires a fuller test.
48	Glendale	b	Ohio	1882	" 24	" 23	" 11	12	41	Very late.
49	Governor Hoard	b	Wis.	1888	" 11	" 20	" 11	12	136	Promising.
50	Great American	b	N. J.	1878	" 17	" 20	" 11	12	43	Must have high culture.
51	Great Pacific	p	Ill.	1890	" 13	" 23	" 11	12	139	Very promising.
52	Hampden	p	-------	1889	" 20	" 27	" 11	11	56	May prove valuable.
53	Hatfield	b	N. J.	1890	" 25	" 17	" 11	12	25	Unpromising so far.
54	Haverland	p	-------	1887	" 11	" 20	" 11	12	106	One of the most valuable.
55	Hinman	b	-------	1890	" 23	" 23	" 9	11	56	Not promising.
56	Hoffman	b	N. J.	1889	" 17	" 17	" 9	9	28	Valued further south.
57	Indiana	b	Ind.	1889	" 18	" 23	" 9	12	61	Not valuable.
58	Itasca	p	Ind.	1888	" 17	" 20	" 9	12	95	Of doubtful value.
59	Ivanhoe	b	Ohio	1889	" 17	" 16	" 1	9	45	Not promising.
60	Jersey Queen	p	N. J.	1886	" 23	" 23	" 13	12	24	Succeeds with high culture.

STRAWBERRIES.—*Fragaria.*—*Con.*

Number.	Name.	Sexuality.	Origin.	Received.	First bloom.	First picking.	Last picking.	Hardiness.	Productiveness of 1891.	Remarks.
61	Jessie	b	Wis.	1889	May 11	June 20	July 1	11	31	Fails to meet expectations.
62	Jucunda	b	Pa.	1876	" 24	" 25	" 11	11	29	Old; superseded.
63	Jucunda Improved	b	N. J.	1890	" 25	" 23	" 11	11	46	Of doubtful value.
64	Kentucky	b	Ky.	1876	" 20	" 27	" 11	12	32	Only valued for its lateness.
65	Lady Rusk	n p	Ill.	1889	" 25	" 20	June 27	12	56	Not productive enough.
66	Lehigh		Pa.	1891						Not yet fruited.
67	Lida	p	N. J.	1886	May 11	June 23	July 5	9	26	Sets too much fruit.
68	Lillie Monroe	b		1891	" 20					Not yet fruited.
69	Logan	b	Ind.	1888	" 18	June 20	July 11	11	60	Scarcely productive enough.
70	Longfellow	b	Ky.	1887	" 18	" 20	" 9	10	50	First berries large.
71	Louise	b	N. Y.	1889	" 23	" 25	" 11	12	67	Promising for market,
72	Lovett Early	b	N. J.	1891	" 20					Not properly tested,
73	Maggie	b	Ont.	1881	" 14	June 20	July 9	12	72	Lacks brightness of color.
74	Manchester	p	N. J.	1880	" 14	" 25	" 11	12	129	Valuable; plant overbears.
75	Mark	b	Ohio	1890	" 20	" 25	" 11	12	30	Not promising.
76	Martha	n p	Minn.	1887	" 17	" 20	" 11	12	85	A hardy market variety.
77	Marvel	l	Ohio	1890	" 14	" 23	" 9	12	74	Of doubtful value.
78	May King	b		1887	" 18	" 20	" 11	12	79	A good pollenizer.
79	Miami	n p	Ohio	1889	" 17	" 23	" 11	12	77	Promising for market.
80	Miller	b	N. J.	1890	" 20	" 25	" 11	12	45	Of doubtful value.
81	Michel Early	b	Ark.	1890	" 11	" 14	" 1	12	75	Early; not profitable.
82	Miner	b	N. J.	1878	" 18	" 23	" 11	9	59	An old market variety.
83	Monmouth	b	N. J.	1888	" 18	" 25	" 11	9	49	Lacks productiveness.
84	Moore	b	Mich.	1889	" 18	" 23	" 11	12	55	Like Jessie, but better.
85	Mount Holyoke	b		1891	" 20					Requires farther trial.
86	Mount Vernon	b	Kan.	1877	" 18	June 25	July 11	11	84	Late; valuable.
87	Mrs. Cleveland	p	Ohio	1888	" 18	" 20	" 11	12	119	Valuable for market.
88	New Dominion	b	Ont.	1878	" 13	" 25	" 3	12	63	Rich color; superseded.
89	Neptune	b	Ohio	1890	" 11	" 23	" 11	12	40	Not promising.
90	Ohio	p	Ohio	1888	" 25	" 27	June 27	12	39	Unproductive; late.
91	Ohio Centennial	b	Ohio	1889	" 17	" 20	July 13	11	79	Named for date of origin.
92	Ohio Monarch	b	Ohio	1891	" 20					Not yet fully tested.
93	Oliver	b		1890	" 18	June 25	July 13	12	76	Requires farther trial.
94	Ontario	b	N. Y.	1886	" 14	" 23	" 9	12	18	Much like Sharpless.
95	Oregon Everbearing		Oreg'n	1891						Not fully tested.
96	Osceola (Michel E'ly)	b	Mo.	1890	May 13	June 13	July 1	12	76	Need a fuller trial.
97	Parker Earle	b	Texas	1889	" 20	" 23	" 13	12	255	One of the most valuable.
98	Parry	b	N. J.	1886	" 17	" 20	" 11	12	67	Plant lacks vigor.
99	Pearl	b	N. J.	1888	" 18	" 23	" 11	11	75	Southern; hardy.
100	Phelps(Old Ironclad)	b		1878	" 11	" 23	June 29	12	44	A good pollenizer.
101	Porter	b	N. J.	1890	" 17	" 25	July 11	12	67	Apparently worthless.
102	Pineapple	b		1889	" 18	" 17	" 5	12	50	A family berry.
103	Puritan	b		1887	" 17	" 20	" 5	11	16	Apparently worthless.
104	Regina	p	Ala.	1890	" 30	" 23	" 11	12	11	Not valuable here.
105	Rio Vista		Va.	1891						Not yet fruited here.
106	Sadie	p	Ohio	1890	May 11	June 20	July 13	12	98	Try farther.
107	Saunders	b	Ont.	1889	" 13	" 20	" 10	11	68	Promising for market.
108	Seneca Queen	b	N. Y.	1878	" 17	" 23	June 23	12	83	Going out of cultivaion.
109	Sharpless	b	Pa.	1878	" 13	" 23	July 1	12	45	Lacks productiveness.
110	Shaw	b		1890	" 11	" 25	" 11	12	17	Not valuable here.
111	Shuster	n p	N. J.	1890	" 6	" 16	June 29	12	79	Valued in New Jersey.
112	Speece	b	Mo.	1890	" 17	" 23	July 3	11	63	Lacks productiveness.
113	Stayman, No. 1	n p	Kan.	1890	" 20	" 20	" 11	12	77	Promising.
114	Stayman, No. 2	n p	Kan.	1890	" 24	" 23	" 11	10	61	Promising.
115	Stevens	b	Ala.	1890	" 3	" 15	June 29	10	29	Of uncertain value.
116	Sucker State	b	Ill.	1890	" 17	" 23	July 11	12	69	Popular in Illinois.
117	Thompson, No. 1		Ohio	1890	" 25	" 23	June 25	12	23	Needs farther trial.
118	Thompson, No. 4	b	Ohio	1890	" 14	" 23	" 23	10	14	Apparently worthless.
119	Thompson, No. 5	b	Ohio	1890	" 11	" 23	" 23	11	23	Not promising.
120	Thompson, No. 7	p	Ohio	1890	" 17	" 23	July 1	12	92	Try farther.

STRAWBERRIES.—*Fragaria.*—*Concluded.*

Number.	Name.	Sexuality.	Origin.	Received.	First bloom.	First picking.	Last picking.	Hardiness.	Productiveness of 1891.	Remarks.
121	Thompson, No. 8	p	Ohio	1890	May 11.	June 20	July 7	12	23	Try farther.
122	Thompson, No. 9	b	Ohio	1890	" 14.	" 20	June 29	11	79	Of doubtful value.
123	Thompson, No. 17	p	Ohio	1890	" 18.	" 23	" 23	11	22	Valueless.
124	Thompson, No. 25	b	Ohio	1890	" 18.	" 23	" 29	11	50	Farther trial.
125	Thompson, No. 26	p	Ohio	1890	" 17.	" 23	July 11	12	61	Farther trial.
126	Thompson, No. 31	p	Ohio	1890	" 18.	" 23	" 11	12	97	Try farther.
127	Thompson, No. 34	....	Ohio	1891	" 20.	.....	.....	..	...	Not yet fully tested.
128	Tippecanoe	b	Ind.	1890	" 18.	June 23	July 11	11	55	Of foreign parentage.
129	Townsend, No. 2	b	Ohio	1888	" 21.	" 27	" 13	11	46	Needs farther trial.
130	Townsend, No. 3	p	Ohio	1888	" 18.	" 27	June 29	12	113	Promising for market.
131	Townsend, No. 19	p	Ohio	1888	" 11.	" 25	July 11	12	123	Very promising.
132	Townsend, No. 20	p	Ohio	1888	" 25.	" 25	" 11	12	94	Of uncertain value.
133	Triomphe de Gand	b	Belg.	1876	" 17.	" 25	" 11	12	26	Old; nearly superseded.
134	Unnamed (Nehring)	b	Ill.	1890	" 17.	" 27	" 5	11	34	Of doubtful value.
135	Victor Hugo	....	.....	1891	.....	.....	.....	..	....	But partially tested.
136	Vick	b	Mo.	1878	May 28	June 23	July 13	12	100	Small; hardy; productive.
137	Viola	b	Ohio	1890	" 17.	" 23	" 11	11	65	Give it farther trial.
138	Waldron	....	.....	1891	.....	.....	.....	..	....	Not yet fruited.
139	Walton	p	N. J.	1890	May 11.	June 27	July 11	11	42	So far not promising.
140	Warfield, No. 1	b	Ill.	1889	" 14.	" 23	June 29	12	64	New; lacks promise.
141	Warfield, No. 2	p	Ill.	1890	" 18.	" 23	July 5	12	105	Well known and valued.
142	Westbrook	p	.....	1891	" 14.	.....	.....	..	....	Partially tested.
143	Weston (Blue Vine, No. 28)	....	Wis.	1891	.....	.....	.....	..	....	But imperfectly tested.
144	White Novelty	b	N. J.	1891	May 20.	.....	.....	..	....	An amateur variety.
145	Wilson	b	N. Y.	1876	" 2	June 20	June 29	12	78	Old; well known.
146	Windsor	p	Mich.	1880	" 17.	" 20	July 13	12	71	Same as Champion.
147	Wonderful	b	N. J.	1885	" 18	" 23	" 9	12	82	Not valuable.
148	Woodruff, No. 1	b	Mich.	1878	" 13.	" 23	" 9	12	49	Not valuable.
149	Woolverton	b	Ont.	1891	.....	.....	.....	..	....	Promising.
150	Yale	b	Conn.	1890	May 23.	June 23	July 9	12	49	Of doubtful value.

The purpose was to institute a comparison of results from the first and second years' crops from the same plantation, both as grown in hills and in matted rows. In pursuance of such purpose the planting of a new plat was omitted, and the existing plantation prepared for another season's crop, and mulched on the approach of winter.

There had been obviously more or less enfeeblement of the plants, doubtless the result of the protracted drouth, accompanied, as it was, by unusually warm weather during the first two months of autumn. Consequent upon this, together with the wet and cold during the season of blooming in the following spring, the present year's crop has proved so nearly a failure that the attempt to institute the proposed comparison has been abandoned, and instead thereof the comparative hardiness of the several varieties is indicated by noting the number of plants of each of the dozens grown in hills, which have retained sufficient vitality to produce fruit this year.

This strawberry plat had been planted between the trees in a young apple orchard, which has obviously been very unfavorably affected by such combined occupancy, notwithstanding the thorough cultivation and manuring which it has received.

The following varieties are, or promise to be, among the most desirable of those included in the foregoing table; primary reference being had to their promise for market purposes.

Eclipse (Barton) is but partially tested; but, so far, promises well. Another season may be expected to pretty fully determine its value.

Beder Wood (first disseminated as Racster) proves to be valuable as an attractive and profitable market berry.

Bubach is large, showy, and productive, though rather soft for transportation. This was originally disseminated with a number appended to the originator's name; and not less than three others have now been more or less disseminated under the name of this originator with other numbers appended; none of which so far give indications of comparative value. The number is therefore eliminated, in compliance with the resolution of the convention of Agricultural College and Experiment Station managers held at Champaign, several months since.

Crescent, though by no means a new variety, still holds a high position as a market variety; more perhaps on account of the hardiness of the plant and its ability to bear neglect, than from the superior quality of the fruit.

Enhance has, so far, proved vigorous, and highly productive; and promises to assume a high position as a market berry, especially with growers who will give it high culture.

Florence (Clara) though not large, possesses qualities of both plant and fruit which can scarcely fail to commend it to the favor of discriminating market growers.

Gem is a variety received from W. F. Nehring of Illinois. It has proved a very strong grower and a heavy bearer of very large fruit. On account of the name it may be liable to be confounded with the Shuster Gem of New Jersey, from which it is distinct.

Governor Hoard (Loudon's 15) is vigorous and productive; and possesses other valuable characteristics as a market fruit; but it has scarcely yet won an assured status as such. It comes from the originator of the Jessie.

Great Pacific is an Illinois variety. Here it proves vigorous and quite productive; though condemned in some localities. In these days of deceptive or misleading names, this would quite possibly have been more readily accepted with a less pretentious title.

Haverland still maintains its standing as larger, more productive, and of better flavor than the Crescent, which in several respects it much resembles.

Manchester has excellent qualities as a market berry. Its chief failing is the tendency of the plant to ruin its health and vigor by over production.

Mrs. Cleveland possesses valuable qualities for the market and is commended in various localities. Here, we fear, it may prove not quite productive enough. It seems to be very nearly on the dividing line betwixt success and failure in this particular.

Michel Early is a vigorous plant, with scarcely medium-size fruit, which is mild and pleasant in flavor. It can not be commended except as an early family berry.

Parker Earle proves will nigh universally successful. Here it has constantly produced crops largely in excess of any other variety whether new or old. It is very vigorous and a good producer of plants; although in certain other localities it is said to lack in this particular.

Warfield has been very generally commended as a valuable market variety; but here, as well as in at least a few other localities, it seems to have proved less successful. Its status may therefore be considered as not fully determined. The name is open to the same objection as that of the

Bubach—that there are two Warfields with separate numbers; but since the later introduction shows little evidence of value we apply the name minus the number to the variety first and more generally introduced.

Wolverton is a new variety, originated by John Little of Ontario, to which he has given the name of the editor of the Canadian Horticulturist. It has fruited here this season, and, though not sufficiently tested, may be considered as decidedly promising.

LIST FOR A FAMILY PLANTATION.

Alpha, Beder Wood, Cumberland, Parker Earle, Gandy.

FOR MARKET.

Crescent, Enhance, Bubach, Parker Earle, Warfield.

In making up the list of varieties for the plat planted last spring, a large number of the older or better tested varieties were omitted; but the recent introductions added have not only compensated for such omissions, but have increased the number of varieties from 128 in the former list, to 176 in the plantation of the past spring.

RASPBERRIES—*Rubus.*

A new plat of raspberries was expected to be in condition for a comparison of the several varieties the present year. The plants came safely through the past winter and remained in a generally satisfactory condition till the occurrence of the protracted rains of April and May last, which kept the soil thoroughly saturated for a considerable period. The occurrence of a period of quite warm weather, while the soil remained in this condition, resulted in the serious injury and ultimate death of many plants, while the enfeeblement of the remainder has rendered a comparison of results of little or no practical value, so far as productiveness is concerned. The plants have been nearly or quite free from the depredations of insects.

Anthracnose has appeared in the new plantation, though the disease has been less severe than formerly, as have been the fungous attacks upon the foliage.

Although several of the fully tested varieties have been dropped, the number is very considerably increased by the addition of novelties for trial, the increase being almost wholly in the *occidentalis* class.

1. *Rubus Idæus.*—Of European origin. (?)

Number.	Name.	Planted.	Origin.	First bloom.	First picking.	Last picking.	Productiveness. Scale 1 to 1.	Insects, 1 to 10. Leaf miner.	Fungus, 1 to 10. Anthracnose.	Remarks.
1	Herstine	1888	Penn.	June 13	July 13	Aug. 11	4	....	5	Tender.
2	Superb*	1888	N. J.	June 13	July 8	Aug. 18	6	....	2	Hardy.

*This variety has been (upon the statement of the originator) understood to be a seedling of the Philadelphia; but more recent botanical authority assigns it to this class. It has suffered but slightly from anthracnose.

2. *Rubus Neglectus.*

Botanists include in this class, several varieties, by many persons, assumed to be hybrids between Occidentalis and other species.

Number.	Name.	Planted.	Origin.	First bloom.	First picking.	Last picking.	Productiveness, 1 to 10.	Insects, 1 to 10. Leaf miner.	Fungus, 1 to 10. Anthracnose.	Remarks.
1	Caroline	1888.	N. Y.	June 6	July 13.	Aug, 17.	10	....	2	Yellow, tip-rooting.
2	Griesa	1890.	Kan.	" 16.	" 18.	" 15.	3	....	1	New,red, tip-rooting.
3	Muskingum	1890.	Ohio	" 18.	" 18.	" 17.	4	....	5	Dark purple.
4	New Rochelle	1888.	N. Y.	" 11.	.....	.....	....	....	....	Purple, tip-rooting.
5	Philadelphia	1888.	Penn.	" 12.	July 13.	Aug. 18.	9	....	....	Dark red, hardy.
6	Reliance	1888.	N. J.	" 13.	" 8.	" 5.	4	....	10	" " "
7	Shaffer	1888.	N. Y.	" 17.	" 18.	" 15.	6	....	2	Purple, tip-rooting.

3. *Rubus Occidentalis.*

Including the black and yellow tip-rooting varieties.

Number.	Name.	Planted.	Origin.	First bloom.	First picking.	Last picking.	Productiveness, 1 to 10.	Insects, 1 to 10. Leaf miner.	Fungus, 1 to 10. Anthracnose.	Remarks.
1	Ada	1888.	Ohio	June 16.	July 15.	Aug. 13.	3	....	1	Is not popular.
2	Beebe	1888.	N. Y.	" 10.	" 13.	" 11.	9	....	5	Yellow, undesirable.
3	Canada	1891.	Ont.	" 19.	" 5.	" 1.	1	2	2	Not productive.
4	Carman	1888.	Ct.	" 6.	" 7.	" 7.	8	....	....	Of doubtful value.
5	Centennial	1888.	.....	" 13.	" 13.	" 12.	10	....	5	" " "
6	Conrath's Early	1891.	Mich.	" 14.	.....	.....	....	....	....	New, much injury.
7	Cromwell	1888.	Ct.	" 9.	July 13.	Aug. 17.	6	....	....	Early, promising.
8	Doolittle	1888.	N. Y.	" 11.	" 13.	" 1.	3	....	5	Old, early.
9	Doomore	1888.	Ohio	" 9.	" 9.	" 15.	7	....	5	Of doubtful value.
10	Earhart	1888.	Ill.	" 11.	" 13.	Oct.	4	....	2	Everbearing.
11	Farnsworth	1891.	Ohio	.....	.....	.....	....	....	....	New, not fruited.
12	Gregg	1888.	Ind.	June 15.	July 14.	Aug. 18.	10	....	3	Large market.
13	Hathaway, No. 1	1891.	Mich.	.....	.....	.....	....	....	....	New, not fruited.
14	Hathaway, No. 2	1891.	Mich.	.....	.....	.....	....	....	....	" " "
15	Hilborn	1888.	Ont.	June 13.	.....	.....	....	....	2	Excellent.
16	Hopkins	1888.	Mo.	" 13	July 8.	Aug. 11.	9	....	5	Good market sort.
17	Idaho	1889.	Ohio(?)	" 10.	" 5.	" 8.	8	....	....	Not tested. [ive.
18	Indiana	1888.	Ind.	" 9	" 13.	" 7.	5	....	3	Moderately product-
19	Jackson May King	1890.	.....	.....	.....	.....	....	....	9	Feeble grower so far.
20	Johnston Sweet	1888.	N. Y.	June 4	July 9.	Aug. 7.	2	....	1	Mild flavor.
21	Kansas	1889.	Kan.	.....	.....	.....	....	....	2	Very vigorous.
22	Lotta	1889.	Kan.	.....	.....	.....	3	....	2	A Kansas variety.
23	Mammoth Cluster	1888.	N. Y.	June 13.	July 15.	Aug. 5.	2	....	2	Old, superseded.
24	Nemaha	1888.	Neb.	" 14	" 9.	" 9	1	1	1	Very hardy.
25	Norfolk	1888.	Ohio	" 13.	" 15.	" 12.	1	1	....	Try farther.
26	Ohio	1888.	N. Y.	" 11.	" 12.	" 13	6	....	....	Productive, seedy.
27	Older	1891.	N. J.	.....	.....	.....	....	....	....	Not yet fruited.
28	Palmer	1890.	Ohio	June 6.	July 12.	Aug. 5	9	....	5	Very vigorous.
29	Progress	1890.	N. J.	" 10.	" 15.	" 5	5	....	5	Farther trial.
30	Rundall	1890.	Mich.	" 11.	" 16.	" 5	2	....	....	A yellow cap.
31	Smith Giant	1889.	Ont.	" 14	" 15.	" 15	5	....	2	Try farther.
32	Souhegan	1888.	N. E.	" 12.	" 12.	" 1	5	....	1	Early, valuable.
33	Surrey	1889.	Ohio	" 14.	.....	.....	....	....	....	Not fruited.
34	Sweet Home	1890.	Ohio	" 13.	July 12.	Aug. 1	4	....	2	" "
35	Tyler	1888.	.....	" 6.	" 8.	" 1	7	....	2	Like Souhegan.
36	Virginia	1888.	Ohio	" 6.	" 15.	" 11	5	....	....	Try farther.
37	Wade	1889.	Ohio	" 13.	.....	.....	....	....	....	" "
38	Winona	1891.	Ohio	" 13	.....	.....	....	....	....	" "

4. *Rubus strigosus.*

Indigenous American varieties, and their seedlings.

Number.	Name.	Planted.	Origin.	First bloom.	First picking.	Last picking.	Productiveness.	Insects, leaf miner.	Fungus, Anthracnose.	
1	Brandywine	1888.	Penn.(?)	June 18.	July 18.	Aug. 31.	9	....	2	Good for market.
2	Cuthbert	1888	N. Y.	" 17.	" 16.	" 18.	10	....	2	Best market red.
3	Eastern King	1888.	N. E.	" 10.	" 13.	" 7.	3	....	5	Of doubtful value.
4	Gladstone	1892.	N. Y.	.....	.....	.....	.....	.....	.....	Not yet fruited.
5	Golden Queen	1888.	N. J.	June 18.	July 15.	Aug. 21.	10	....	1	Best yellow.
6	Hansell	1888.	N. J.	" 9.	" 8.	" 9.	9	....	2	Early red.
7	Marlboro	1888.	N. Y.	" 16.	" 18.	" 9.	10	....	1	For early market.
8	Reder	1888.	Mich.	" 11.	" 9.	" 8.	8	....	2	For home use.
9	Scarlet Gem	1888.	.....	" 10.	" 7.	" 3.	6	....	9	Not valuable.
10	Thompson	1888	Ohio	" 10	.....	.....	.....	.....	2	Of doubtful value.
11	Turner	1888.	Ill.	" 16.	July 14.	Aug. 17.	8	....	1	Very hardy.

The figures in the column headed *Productiveness* possess little value beyond the indication of results under the combined influence of the extremely wet weather of last spring, and the subsequent development of anthracnose and, in some cases, of other fungi upon the foliage.

5. *Rubus phœnicolasius*—Japanese Wineberry—was imported from Japan several years since, and has more recently been forced into notoriety by inflated advertising. Its foliage and bloom are attractive and the growth is vigorous. It spreads and increases rapidly by suckers, so much so as to preclude its use as an ornamental plant, as has sometimes been recommended. The rather large, showy flowers are produced in large clusters at the tips of the branches. The fruit is of no practical value.

LIST OF SUITABLE VARIETIES FOR A FAMILY GARDEN.

Red and yellow varieties—Hansell, Herstine (requires winter protection), Cuthbert, Golden Queen.

Black Caps—Palmer, Hilborn, with Earhart for an autumn crop of fruit, and Shaffer or Muskingum for canning.

MARKET VARIETIES.

Red—Marlboro, Cuthbert.

Caps—Palmer, Gregg (or Nemaha) and Shaffer, for canning.

BLACKBERRIES—*Rubus villosus.*

Of the blackberry there are thirty varieties now on trial, of which six varieties were received last spring, also two varieties of dewberry.

To avoid the mixing of varieties from their tendency to produce suckers, raspberries and blackberries are planted alternately, and have therefore been similarly subjected to injury from the excessively wet weather of last

spring, which proved fatal to many plants, while many others were more or less enfeebled, and yet others killed outright.

Since the comparatively recent introduction of this fruit to cultivation, improvement seems to have been confined to the discovery and introduction of seedlings from the wild type. So far we are aware, there have been no attempts at improvement by artificial cross-fertilization. At the west, especially, the effort appears to be for the discovery of a variety hardy enough to withstand the occasional crucial winters. Some advancement has been realized in such direction, although, as yet, improvement in this particular has been at the expense of size. Since the habit of the plant is to produce its fruit only upon the tips of its branches, which are necessarily the most exposed; and considering the fact that naturally the plant is an undergrowth, accustomed to sheltered situations, there is obvious occasion to doubt the possibility of arriving at a condition of absolute hardiness, and upon such assumption, whether with the needful artificial protection, it were not wiser to direct our efforts rather to the combination of quality with size and productiveness.

The foliage this season, as well as last, has suffered somewhat from the depredations of the leaf roller, for which, so far as we are aware, no remedy has yet been devised.

The base of the young canes of this, as well as the raspberry, just below the surface, is occasionally attacked by an insect, which partially or wholly girdles, and so weakens, them that they break away and perish with the swaying of a moderate wind.

With the exception of anthracnose (the prevalence of which is given in the column of remarks) no fungous diseases of either plants or fruit have been observed this season.

It is so difficult and often impracticable to obtain reliable information respecting the origin and history of varieties that the place of origin in many cases is omitted, and the date of planting only is given.

As in the case of raspberries, the very unequal influences of soils and locality, combined with the effects of the excessive wet of last spring, renders a statement of comparative products of little value, for which reason their relative productiveness for this season is estimated upon a scale of one to ten, as follows:

BLACKBERRIES.—*Rubus villosus.*

Number.	Name.	Planted.	Origin.	First bloom.	First picking.	Last picking.	Productiveness, 1 to 10.	Fungi.
1	Agawam	1874	N. E.	June 6	July 23	Aug. 20	5	Anthracnose slight.
2	Ancient Briton	1875	Mo.	" 11	Aug. 1	Sep. 12	4	" "
3	Bonanza	1880		" 13	" 1	" 15	10	" "
4	Early Cluster	1878	N. J.	" 13	July 26	" 24	9	" "
5	Early Harvest	1882	Ill.	" 16	" 21	Aug. 26	5	Healthy.
6	Early King	1891	N. J.	" 13	" 23	" 26	6	Anthracnose bad.
7	Early Mammoth	1891		" 13			8	" slight.
8	El Dorado	1892	Agr. C.					" bad.
9	Erie	1886	N. J.	June 13	Aug. 7	Sept. 17	8	" slight.
10	Fruitland	1892						Healthy.
11	Hoosac	1891	N. E.					"
12	Kittatinny	1850	N. J.	June 15	Aug. 9	Sep. 15	7	Anthracnose slight.
13	Knox	1880		" 13	" 7	" 15	8	" "
14	Lawton	1845	N. Y.	" 7	July 26	" 24	9	" "
15	Lincoln	1891	Ohio	" 13				" "
16	Minnewaski	1886	N. Y.	" 14	Aug. 7	Sept. 21	8	" "
17	Nevada	1887		" 13	" 7	" 12	8	" "
18	Ohmer	1892	Ohio					Healthy.
19	Oregon (Everbearing)	1892	Oreg'n					"
20	Smith (Prolific)	1892						"
21	Snyder	1876		June 7	Aug. 23	Sept. 24	10	"
22	Stone	1875	Wis.	" 11	" 12	" 12	10	Anthracnose slight.
23	Taylor	1876		" 13	" 1	" 24	5	" "
24	Thompson Early	1888	Ohio	" 13	" 1	" 15	10	Healthy.
25	Tree (Childs)	1892	N. Y.					"
26	Wachusett	1880	N. E.	June 6	July 29	Sept. 1	6	Anthancose slight.
27	Wallace	1874	Wis.	" 13	Aug. 5	" 24	10	" "
28	Western Triumph	1876		" 10	" 7	" 12	10	" very bad.
29	Wilson	1854	N. J.	July 1	" 1	" 12	9	Healthy.
30	Wilson Jr.	1878	N. J.	June 9	" 1	" 17	9	Anthracnose slight.

DEWBERRY.—*Rubus canadensis.*

Number.	Name.	Planted.	Origin.	First bloom.	First picking.	Last picking.	Productiveness, 1 to 10.	Fungi.
1	Lucretia	1880	Ohio	June 9	July 21	Aug. 17	8	Healthy.
2	Windom	1890	Minn.	" 9	" 21	" 17	5	"

The Lucretia dewberry ripens nearly with the early raspberries, and anticipates the Early Harvest blackberry (the earliest of the species), a few days.

Kittatinny, where exempt from fungous disease, and where it proves sufficiently hardy, has even yet no superior for family use, for the main crop.

The season of this fruit may be lengthened a few days by planting the Taylor for later fruiting.

For the market, if given winter protection, Wilson, Wilson Jr., or

Lawton, are yet among the most productive. But where extreme hardiness is necessary, resort may be had to Snyder and Taylor. Western Triumph, Ancient Briton, and Stone are quite too small to meet the popular requirement, except with high cultivation and judicious pruning to prevent overbearing and to improve the size.

CURRANTS.—*Ribes.*

Four varieties of this fruit have been added to the collection the present year, the present number of varieties being twenty-four.

The continuous rains of last spring also seriously affected the currant plantation, which is immediately adjacent to that of raspberries and blackberries, continuing so late that spraying proved impracticable until they had become badly affected with mildew of the foliage, which sadly affected both their growth and fruitfulness. The latter was also further reduced by cutting away more or less bearing wood for the purpose of destroying the borer, which has been and still is unusually troublesome throughout this region. The imported currant worm *Nematus Ventricosus*, was somewhat less troublesome than last year, and yielded readily to repeated sprayings with hellebore in water.

After the return of dry weather in June and July, two sprayings of potassium sulphide (liver of sulphur), were given the gooseberries; but the injury had already progressed too far for a satisfactory result.

CURRANTS.—*Ribes.*

1. *Ribes aureum.*—Missouri or yellow flowering currant.

Number.	Name.	Planted.	Origin.	First bloom.	Productiveness, 1 to 10.	Remarks.
1	Crandall	1889	Kan.	May 13	9	Proof against insects and fungi.

2. *Ribes nigrum.*—Black or Fetid currant.

Number.	Name.	Planted.	Origin.	First bloom.	Productiveness, 1 to 10.	Remarks.
1	Black Champion	1889	Enr.	May 15	5	Differs little from other black currants.
2	Black English	1892	"			Planted for comparison.
3	Black Naples	1888	"	May 7	8	The variety generally planted.
4	Lee	1888	"	" 13	7	An alleged improvement.
5	Saunders	1890	Ont.	" 14	6	New from Ontario.
6	Wales (Prince of	1890	"	" 12	6	A new variety.

3.—*Ribes rubrum.*—Red and White currants.

Number.	Name.	Planted.	Origin.	First bloom.	Productiveness, 1 to 10.	Remarks.
1	Cherry	1888	Eur.	May 7	8	Old, large, very acid.
2	Fay	1888	N. Y.	" 7	7	Like cherry; but less acid.
3	Holland (Long Bunched)	1889	Eur.	" 9	9	Plant vigorous, continues late.
4	Lakewood	1890	Ohio	" 7	5	New, but partly tested.
5	London Red	1890	Eur.	" 9	9	Best for jams and jellies.
6	Moore Ruby	1890	Am.	" 9	9	Mild. Best red variety.
7	Moore Select	1890	Mass.	" 9	7	Not yet fully tested.
8	North Star	1892	Minn.			New, claimed to be very hardy.
9	Red Dutch	1888	Eur.	May 7	4	Most valuable red currant.
10	Raby Castle	1892	"			Is it the old Raby Castle (Victoria)?
11	Versaillaise	1888	"	May 9	5	Resembles cherry.
12	Victoria	1888	"	" 7	6	Nearly proof against borers.
13	White Dutch	1888	"	" 7	6	Finest flavored currant.
14	White Gondoin	1890	"	" 9	9	Comparative value yet undetermined.
15	White Grape	1888	"	" 9	10	Most profitable white variety.
16	White Imperial	1892				May prove to be White Grape.
17	Wilder	1890	Am.	May 9	4	Requires further trial.

The peculiarities of a few of the foregoing varieties, and the uses to which they seem specially adapted, are noted as follows:

Crandall appears to be exempt from the insect attacks and fungous diseases to which the varieties of *rubrum* are so peculiarly liable; but although its flavor is at least tolerable when cooked, the thickness and toughness of the skin, even after cooking, is a well nigh fatal objection to its use.

Black English is planted to supply a known standard with which others of its class may be compared.

Lee, and the recent varieties, Saunders and Wales, have not so far developed any special superiority over the older varieties of the species.

Cherry, Fay, and Versaillaise are all of large size and quite similar in both plant and fruit. Neither of the others can fairly be said to be superior to the Cherry which is the oldest variety of the three.

Lakewood, a new variety received from Ohio, appears promising, but requires further trial.

London Red was received with the assurance that, while not of superior quality, it is specially desirable for jams and jellies. It is a vigorous grower and bears heavily.

Moore Ruby is reputed to be the finest of the red currants.

Moore Select needs further trial to develop its characteristics.

Victoria is specially popular in western Michigan as a market variety.

North star, White Gondoin, White Imperial, and Wilder, need further trial to develop their characteristics.

For family use the old Red and White Dutch have as yet no superiors.

White Grape, though a somewhat straggling grower, is the most popular market variety of its color.

GOOSEBERRIES.—*Ribes.*

The past season adds emphasis to the remark, in last year's report, that our native varieties (usually assumed to be such) can scarcely be said to be exempt from mildew, since even Houghton, which is the most distinctively native has lost more or less of its foliage, while Downing and Smith have suffered very seriously.

The currant worm, *Nematus ventricosus*, put in an appearance as usual; but was effectively squelched by the free use of hellebore.

The crumpling of the leaves at the tips of the branches of the Houghton (spoken of last year as the probable work of aphides) has been nearly absent this year.

There are now sixteen varieties of gooseberry upon the grounds, five additional ones having been received the past spring.

1. *Ribes cynosbati.*—Wild gooseberry.

Number.	Name.	Planted.	Origin.	First bloom.	Productiveness, 1 to 10.	Remarks.
1	Downing	1888	N. Y.	May 5	2	An unusually light yield.
2	Mountain	------	N. Y.	" 14	4	Uneven in size. Poor in quality.
3	Smith	------	N. E.	" 8	1	Very light crop, from loss of foliage.

2. *Ribus grossularia.*—European gooseberry.

Number.	Name.	Planted.	Origin.	First bloom.	Productiveness, 1 to 10.	Remarks.
1	Auburn	1890	N. Y.	May 8	---	The correct name is unknown.
2	Early Orange	1890	N. Y.	" 8	1	Mildew of foliage and fruit.
3	Golden Prolific	1890	N. Y.	" 14	----	Badly mildewed.
4	Industry	1889	Eur.	" 9	10	Has done much better than usual.
5	Lancaster Lad	1892	Eur.	----------	----	Has not yet fruited here.
6	Pearl	1890	Ont.	May 5	9	So far, very promising
7	Triumph	1890	N. J.	" 8	2	Promising. Name too sensational.

3. *Ribes hirtellum.*—Smooth gooseberry.

Number.	Name.	Planted.	Origin.	First bloom.	Productiveness, 1 to 10.	Remarks.
1	Champion	1888	Ohio	May 9	------	A fine grower. Unproductive.
2	Houghton	1888	N. E.	" 12	10	Hardy. Very productive.
3	Pale Red	1890	Am.	" 8	10	Almost identical with Houghton.

Varieties planted in the spring of 1892, species not determined: Columbus, Strubler No. 1, Tree.

Recent experiments indicate that the mildew heretofore generally considered an insuperable objection to the cultivation of the European varieties of the gooseberry in our climate, may be held in check by persistent spraying with a solution of potassium sulphide (liver of sulphur) and several of these varieties have been planted in limited quantity to test the efficacy of such applications.

Houghton and Pale Red are almost identical, and are of the strongly native type. For such planters as require such varieties as will best endure neglect, and will yield abundant crops even though of small size, these will doubtless prove the most satisfactory.

Downing is still the most popular, for market planting, of the so-called native varieties, although the Smith is decidedly its superior in both quality and size. It is, however, a more slender grower, though as productive as the Downing in proportion to the size of plant. Both are more thorny than are the unmistakable natives.

Experience, so far, indicates that varieties of wholly, or even partially, European parentage, should only be planted in exceptionally favorable localities, or where they are to receive thorough and intelligent pruning and cultivation, with the persistent use of fungicides for the prevention of mildew. The free use of insecticides will also prove indispensable in regions in which the currant worm is prevalent.

CHERRIES—*Prunus.*

Of this fruit forty-nine varieties were planted prior to last spring, and thirteen more added to the list at that time, making sixty-two varieties now in orchard.

Nearly all the varieties planted prior to 1890 showed more or less bloom last spring and promised to perfect more or less fruit. In despite of the injury resulting from the phenomenally unfavorable weather of last spring, a few varieties developed some fruit; but so few in number developed, and so widely were they scattered, that protection from birds proved impracticable, and all were taken as soon as they began to show much color.

Prior to last spring the trees had given few if any indications of disease of any kind, but the excessive and long continued reign of Jupiter Pluvius proved too severe a trial. so that in the case of several trees, especially of the Mazzard class, standing where water either in the subsoil or upon the surface, continued longest, there are indications of injury which may, quite possibly, prove ultimately fatal: although most of the older trees of the planting of 1888 and 1889, are now heavily set with fruit buds.

Several trees, apparently in consequence of enfeeblement, due to the cause already mentioned, have lost their foliage earlier than usual, and in such cases the formation of new wood has been less than normal.

The only troublesome insect has been the slug *Eriocampa cerasi*, of which, though repeatedly destroyed by the application of hellebore, repeated colonies appeared in their places, until nearly or quite November.

In the following tabulation the Heart and Bigarreau varieties are arranged together, as are also the Dukes and Morellos. In the absence of either description or history, several varieties not yet in fruit, are placed in the class to which, from habit of growth, they apparently belong, subject to correction as facts and experience shall warrant.

CHERRIES—*Prunus.*

1. *Prunus Avium.*—Hearts and Bigareaus.

Number.	Name.	Species.	Whence received.	Planted.	First bloom.	Remarks.
1	Black Eagle	Heart	N. Y.	1888	May 13	One of the best.
2	Black Tartarian	"	Mich.	1888	"	Very productive. Strong grower.
3	California Advance		Mo.	1892		New. Wholly untested.
4	Cleveland	Big.	Mich.	1890	May 17	An Ohio variety.
5	Coe Transparent	Heart	"	1888	" 13	Exceedingly beautiful. Excellent.
6	Downer	"	"	1888	" 13	Very hardy and prolific. Late.
7	Farly La Maurie		Mo.	1892		Little known.
8	Early Purple	Heart	N. Y.	1891	May 17	The earliest cherry.
9	Elton	Big.	"	1890	" 14	Of English origin.
10	Florence	"	Mich.	1891		Origin, Florence, Italy.
11	Governor Wood	Heart	"	1890	May 14	One of Dr. Kirtland's seedlings.
12	Kirtland Mary	Big.	N. Y.	1890	" 16	" " " "
13	Knight Early	Heart	"	1890	" 16	An old English variety.
14	Mezel	Big.	"	1890	" 16	An importation from France.
15	Napoleon	"	Mich.	1892		Large, very firm.
16	Ohio Beauty	Heart	N. Y.	1890	May 14	Origin, Ohio.
17	Purity		"	1891		Very little known.
18	Rockport	Big.	"	1890	May 16	Originated in Ohio.
19	Windsor	"	Mo.	1890	" 14	Originated at Windsor, Ontario.
20	Yellow Spanish	"	"	1890	" 13	An importation from Europe. Old.

2. *Prunus cerasus.*—Acid cherries.—Dukes, Morellos and others.

Number.	Name.	Species.	Whence received.	Planted.	First bloom.	Remarks.
1	Abbesse (Oignies)	Morello	Iowa	1888	May 16	A very slow grower. Russian.
2	Angouleme	Duke?	"	1885	" 16	A good grower. From Prof. Budd.
3	Baender	Morello	Ag. Col.	1892		Origin not known.
4	Bessarabian	"	Iowa	1888	May 13	Large, dark, acid, juicy, culinary.
5	Brusseler Braune	"	"	1888	" 17	From Bud's importations.
6	Carnation	"	N. Y.	1890	" 16	Old, but rare.
7	Choisy	Duke	Mich.	1888	" 13	Beautiful and excellent.
8	Dyehouse	Morello	N. Y.	1890	" 17	Origin, Kentucky.
9	Early Richmond	"	Mich.	1888	" 16	The most popular market cherry.
10	Eugenie	Duke	N. Y.	1888	" 13	New and not much disseminated.
11	Everbearing	Morello	Ag. Col.	1892		Very little known.
12	Frauendorfer Weichsel	"	Iowa	1888	May 13	From Prof. Budd of Iowa.
13	Galopin	"	Ag. Col.	1892		History unknown.
14	George Glass	"	Iowa	1888	May 17	From Prof. Budd of Iowa.
15	Griotte du Nord	"	"	1888	" 16	" " " " "
16	Hortense	Duke	Mich.	1888	" 16	Large and good
17	King Amarelle	Morillo	Ag. Col.	1892		Comes to us without a history.
18	Lake Duke	Duke	Mich.	1890	May 15	Originated in France.
19	Lithauer Weichsel	Morello	Ag. Col.	1892		History unkn'n. Probably Ger man
20	Louis Phillippe	"	Mich.	1888	May 13	Very late. A thin bearer.
21	Lntovka	"	Iowa	1888	" 16	Imported by Prof. Budd.
22	Magnifique	Duke	Mich.	1888	" 18	A good late cherry.
23	Mahaleb	Ma.	Ag. Col.	1892		Generally used as a stock.
24	May Duke	Duke	Mich.	1888	May 11	The type, and the best of its class.
25	Minnesota Ostheim	Morello	Ag. Col.	1892		A probable native of the northwest.
26	Montmorency	"	Mich	1888	May 16	Probably identical with the foll'ing.
27	Montmorency Large	"	N. Y.	1890	" 15	Of Frence origin.
28	Montmorency Ordinaire	"	"	1890	" 18	Smaller but more productive.
29	Montreil	Duke	"	1890	" 15	Recent and promising.
30	Northwest	Morello	Ag. Col.	1892		History not known.
31	Olivet	Duke	Mich.	1888	May 16	Recent and valuable.
32	Ostheim	Morello	Iowa	1888	" 16	Received from Prof. Budd.
33	Ostheimer	"	Ag. Col.	1892		History unknown.
34	Royal Duke	Duke	Mich.	1890	" 17	An old but rare variety.
35	Sklanka	Morello	Iowa	1888	" 16	Received from Prof. Budd.
36	Spate Amarelle	"	"	1888	" 16	" " " "
37	Strauss Weichsel	"	"	1888	" 16	" " " "
38	Suda	"	Ag. Col.	1892		Received without a history.
39	Twenty-Five Orel	"	" "	1892		" " " "
40	Twenty-Seven Orel	"	" "	1892		" " " "
41	Weir No. 2	"	" "	1892		One of D. B. Weir's Ill. seedlings.
42	Wragg	"	Iowa	1891	May 19	Probably an unrecognized old var.

For a plantation of sweet cherries (which to prevent bark burst and consequent disease) should always be branched low to shade the trunk and large branches, and only a moderate, regular and healthy growth encouraged. Early Purple, Coe Transparent, Elton, Black Eagle, Downer, and perhaps Windsor, will furnish a satisfactory succession, in latitude 43°, from June 1 to nearly the first of August.

Of the Dukes and Morellos—Choisy, which is one of the best as well as the most beautiful, but unfortunately lacking productiveness, may be planted to open the season about the middle of June, and by following this with Early Richmond, May Duke, Late Duke, Louis Phillippe (large but a light bearer) and Magnifique, the season may be extended well into August, if only the birds can be circumvented.

Of sweet cherries a good market list would be Black Tartarian, Napoleon,

and Downer. Yellow Spanish might well be included, but for its tendency to crack and decay when ripening.

For a market list of Dukes and Morellos, Early Richmond, May Duke, Louis Phillippe, and Magnifique, will supply a good sucession.

MULBERRIES—*Morus.*

Although in one of its forms indigenous in Michigan this species occurs in our forests but rarely, the varieties grown at this station being imported ones.

Downing is an American seedling of Multicaulis, (*M. alba*) which ripens its fruit in somewhat lengthy succession, proves scarcely hardy in southern Michigan.

Hicks and New American, with similar habit of fruiting, so far prove more hardy.

Russian (*M. Siberica* of nursery catalogues), so far, proves abundantly hardy, here, though of little apparent value.

Teas Weeping is a very pronounced "weeper," apparently worthy to supersede the somewhat coarse and less attractive Kilmarnock willow.

SERVICE BERRIES—*Amelanchier.*

The indigenous variety, often a tree fifteen or more feet in height, varies considerably in productiveness as well as in the size and quality of the fruit; but we are not aware of any attempt to bring it under cultivation.

The dwarf variety, planted here as early as 1876, is also deficient in productiveness, as compared with many of our indigenous huckleberries, which it resembles. It also lacks flavor as compared with them.

The variety introduced as Success, is, so far, slightly, if at all, an improvement upon the foregoing.

A variety received from an Indiana nursery and planted in the spring of 1891, is of slightly taller growth; and, so far, appears to be slightly more productive.

The fruits ripen in succession, and so attract the birds, that nearly or quite all are taken before fully ripe; still, if grown in sufficient quantity, they may take the place of the so far impracticable huckleberry, in regions where these do not occur.

PEACHES—*Prunus Persica. Amygdalus Persica, and Persica vulgaris* (of various botanists).

To the 149 varieties of peach already planted, sixty-one were added last spring, making a total of 210 varieties, lacking three or four of last spring's planting; which, for one cause or another, have failed to grow.

The trees planted prior to 1890 bloomed profusely last spring and those planted in the spring of 1890 and '91 also showed more or less bloom; and, at least upon the older ones, there was promise of an abundant crop, until the advent of the protracted rainy season already spoken of. Doubtless from the rain and accompanying cold, the partially developed foliage was almost wholly ruined by fungus (*Taphrina deformans*), and before new foliage developed in its place, the young fruits had blasted and

fallen. With the change to dryer weather new foliage was rapidly produced; and the trees, in nearly all cases, have nearly or quite resumed their pristine vigor; though with the total loss of the season's crop of fruit. The bloom and the leaf glands, however, have jointly, served to determine with tolerable certainty, the genuineness of the varieties; or rather their correctness to name, in all cases in which these particulars are known.

No other fungous diseases of this class of trees have been observed, except in the case of a serrate-leaved variety, received from Allegan county, named Champion; which was attacked by the fungus peculiar to serrate-leaved trees, and which was so severe as to almost wholly prevent the growth of both wood and foliage.

With the loss of the crop of fruit, the necessity to jar or spray for the curculio ceased. The only other insect that has proved troublesome is the borer (*Ægeria exitiosa*), to remove which the trees were "wormed," in the spring, and again in September, finding only an occasional larva.

The trees have held their foliage, this fall, with unusual persistence; still the season has been favorable for maturing the young wood; and both wood and fruit buds are apparently in well ripened condition.

Although a tabulation would give the characters of foliage and blossoms in convenient form for consultation, this would not prove an aid in determining the character of the fruit, or the value of the variety; it is therefore deemed preferable to delay their presentation till they shall occur in connection with notices of the fruits.

PLUMS.—*Prunus.*

With those planted the past spring, there are now growing upon the station grounds, eighty-four varieties of plum; nineteen of which are of the present year's planting.

Forty of these have shown more or less bloom the present season; which, however, was rendered abortive by the same cause which has proved fatal to nearly all tree fruits of this locality. A tree of Cheney plum (*Americana*) began to develop a few fruits; which, however, developed the fungus known as Plum Pockets (*Taphrina pruni*), leaving none to mature. Other than this, no important indications of fungous disease have been observed.

Among insects the rose chafer (*Macrodactylus subspinosus*) made its appearance as usual, though in somewhat diminished numbers. Several applications of insecticides proved but slightly effective, and were followed up by hand picking, until the enemy was subdued, or perchance merely vacated for the season.

The slug (*Eriocampa cerasi*) has again proved troublesome; continuing its attacks to a later date than heretofore, owing very possibly to longer continued mild weather.

The recently introduced Japan plums, for a time, received the specific designation *orientalis* with apparent propriety; but, more recently the name *Hattan* has taken precedence; and has now been adopted in the revised list of the American Pomological Society.

With a wider acquaintance with the native varieties of the plum, there appears to be a conviction, in certain botanical quarters, that there may be occasion for further subdivisions of the specific classes of the plum, known as Americana and chicasa— a conviction to which the diverse char-

acteristics occurring in even our limited collection of these species, afford more or less occasion.

The indications of the correctness to name of variety, drawn from the foliage and bloom, in advance of fruiting, are necessarily very uncertain. For this reason the tabulation of varieties is deferred, till they can be given with notices of the fruit.

GRAPES—*Vitis.*

To the one hundred and thirty-four varieties of grape previously planted, twelve were added last spring, making one hundred and forty-six varieties in the collection.

Down to near the last of March, the season was favorable. The purpose had been to give the entire plantation a thorough spraying before growth commenced. The material for the purpose was received at so late a date, that only a portion of the grapes had been treated, when the process was stopped by the occurrence of rain, which continued till the season of bloom, and deferred the work still further, leaving the plants exposed to the attacks of fungi, rendered still more effective by continuous wet.

As soon as the grapes were out of bloom, they received a thorough spray of Bordeaux mixture, which was repeated a couple of weeks later, with the apparent result of checking the disease—a result which may have been rather due to the recurrence of dry weather.

The mildew (*poronospora*) has been chiefly noticeable upon varieties partially or wholly of *vinifera* origin; such as the Rogers hybrids, Brighton, and Empire State. A notable exception, however, occurs in the case of the Downing, the foliage of which shows strongly marked indications of European parentage; notwithstanding which it has, both this year and last, been entirely exempt from the disease.

Several varieties, also, have been seriously affected by anthracnose; among which Vergennes, and several of the Rogers grapes may be mentioned.

A few rose chafers were discovered attacking the clusters when in bloom. With this exception, both plants and fruit have been mainly exempt from the depredations of insects.

In the following tabulation, these abbreviations only are used—E, Æstivalis; H, Hybrid; L, Labrusca; R, Riparia; X, cross.

The column headed "Productiveness," applies only to the crop of the present year. Fungous diseases are specified under the head of "Remarks."

GRAPES.—*Vitis.*

Number.	Name.	Planted.	Species.	Vigor, 1 to 10.	Hardiness, 1 to 10.	Productiveness, 1 to 10.	Bloomed.	Ripened.	Quality, 1 to 10.	Remarks.
1	Adirondac	1890	L	5	4	4	July 3	Sept. 30	5	Usually this is very early.
2	Agawam	1888	H	10	8	5	June 24	Oct. 5	7	Slight anthracnose.
3	Aminia	1888	H	8	8	3	" 28	" 3	8	Slightly mildewed.
4	Augnst Giant	1889	H	10	10	1	" 28	" 7	6	" "
5	Bell	1889	H	7	9	1	" 24	" 3		Healthy—from Texas.
6	Black Eagle	1890	H	9	9	1	" 30	Sept. 30		No disease.
7	Brighton	1888	H	10	8	4	" 30	Oct. 1	10	Mildew and anthracnose, slight.
8	Brilliant	1889	H	8	10	3	" 30	" 25		Badly mildewed.
9	Cambridge	1890	L				" 28			Antracnose, slight.
10	Campbell	1890	H	7	8		" 24			Healthy.
11	Catawba	1888	L	9	8	8	" 24	Oct. 10	8	Anthracnose slight.
12	Cayuga	1889	L	6	10	9	July 2	Sept. 25		Healthy.
13	Centennial	1890	E X	4	6			Oct. 3		"
14	Challenge	1890	L X				June 28			"
15	Champion	1889	L	8	10	1		Oct. 22	2	Anthracnose slight.
16	Chidester 1	1888	L	8	10	5	June 24	Sept. 23	8	Healthy.
17	Chidester 2	1888	L	8	10	6	" 28	" 19	7	"
18	Concord	1888	L	10	10	10	" 24	" 30	6	"
19	Cortland	1890	L				" 24			"
20	Cottage	1890	L	8	10		" 24			Anthracnose slight.
21	Delaware	1888	H	6	8	10	" 28	Sept. 23	10	Slight mildew.
22	Diamond	1889	L	9	10	8	" 28	" 13	9	Healthy.
23	Diana	1888	L	9	10	7	" 24	Oct. 10	7	"
24	Downing	1889	H	6	8	8	July 5	" 5	5	"
25	Dracut Amber	1890	L	9	9	2	June 24	Sept. 18	6	Mildew, slight.
26	Duchess	1888	H	7	7	5	July 2	" 9	9	Very badly mildewed.
27	Early Market	1889	L X	7	8	1	June 24	" 15		Mildewed, slightly.
28	Early Victor	1888	L	6	8	10	" 28	" 19	7	" "
29	Eaton	1888	L	10	10	9	" 28	" 18	5	Healthy.
30	Elaine	1889	H				" 28			"
31	El Dorado	1889	H X	8	7		" 30			"
32	Elvira	1890	R X	9	9	1		Oct. 18	4	"
33	Empire State	1888	L X	10	8	10	June 28	" 5	8	Slight mildew and anthracnose.
34	Essex	1889	H	8			" 28			Healthy.
35	Etta	1890	R X	8	10	1	" 24	Oct. 13		"
36	Eumelan	1888	E	8	10	2	" 28	" 3	9	Slight mildew and anthrocnose.
37	Eva	1889	L	7	10		" 28	" 5		Slight anthracnose.
38	Excelsior	1889	H	8			July 11			" "
39	Gaertner	1889	H	8	5		" 15			Slight mildew and anthracnose.
40	Goethe	1889	H	6	7		" 2			Slight mildew.
41	Golden drop	1889	L X	3	7		June 28			Healthy.
42	Hartford	1889	L	10	10	4	" 24	Sept. 24	4	Black Rot—slight.
43	Hayes	1888	L	6	10	4	" 28	" 19	8	Slight mildew.
44	Herbert	1889	H	8	7	5	" 24	" 27	7	Slight anthracnose.
45	Highland	1889	H	8	9	10	" 28	Oct. 31		Yet unripe—slight mildew.
46	Iona	1888	L	7	7	4	" 30	" 5	10	Mildew and anthracnose.
47	Isabella	1888	L	9	6	10	" 24	" 25	9	Mildewed.
48	Ives	1890	L	9	9		" 24	" 17		Healthy.
49	Janesville	1889	L R	10	10	8	" 22	Sept. 15	5	"
50	Jefferson	1888	L X	8	10	10	July 5	Oct. 20	10	Slight mildew.
51	Jessica	1888	H?	5	10	10	June 24	Sept. 15	8	Badly mildewed.
52	Jewell	1889	L	5	8	1		" 16		Healthy.
53	Lady	1888	L	4	8	4	June 10	" 19	8	"
54	Lady Washington	1888	H	8	6	6	July 5	Oct. 3	7	Slight mildew and anthracnose.
55	Leader	1890				3	" 5	Sept. 30		Healthy.
56	Lindley	1889	H	8	5		June 30			"
57	Lutie	1890	L	9	9		" 30			"
58	Martha	1889	L	7	10		" 24			"
59	Massasoit	1888	H	9	9	1	" 28	Oct.	8	Slight mildew and anthracnose.
60	Merrimac	1888	H	9	9	2	" 24	"	10	Slgt anthracnose.

GRAPES—*Vitis*.—CONTINUED.

Number.	Name.	Planted.	Species.	Vigor, 1 to 10.	Hardiness, 1 to 10.	Productiveness, 1 to 10.	Bloomed.	Ripened.	Quality, 1 to 10.	Remarks.
61	Mills	1888		7	9	4	June 20	Oct. 5	7	Healthy.
62	Monroe	1889	L	7	10	1	" 28	" 3	8	"
63	Moore Early	1888	L	6	10	8	" 28	Sept. 15	6	"
64	Moyer	1888		7	8	4	" 28	" 15	7	Slight black rot.
65	Naomi	1889	H	8	6	1	" 28	Oct. 28		Slight mildew.
66	Nectar	1888	H	4	7		July 5			Foliage small and poor.
67	Niagara	1888	L X	10	10	10	June 24	Sept. 30	6	Healthy.
68	Northern Light	1890		6	10		" 30			"
69	Oneida	1890	H				" 30			"
70	Owosso	1890	L	8	9	4	" 28	Sept. 21	7	"
71	Peabody	1889	R X	6	7	5	" 30	" 30	6	Slight anthracnose.
72	Perkins	1889	L	10	10	6	" 24	" 13	6	Healthy.
73	Pocklington	1888	L	7	10	7	" 28	Oct. 7	7	Slight mildew.
74	Poughkeepsie	1888	H X	3	7	1	" 30	Sept. 23	9	Slight mildew and anthracnose.
75	Prentiss	1888	L	6	7	1	" 28	Oct. 20	7	Healthy.
76	Purity	1889	H X	6	7		" 24	" 5		"
77	Rentz	1889	L	10	10		" 28			Slight anthracnose.
78	Requa	1890	H	6	8		" 28	Sept. 30		Slight mildew.
79	Rochester	1890	L	10	10	5	" 28	" 19	7	Healthy.
80	Rommell	1889	H	6	7	1	" 28	Oct. 18		Slight mildew.
81	Rogers, 5	1889	H	7	10		July 5	Sept. 30		Healthy.
82	Rogers, 8	1889	H	9	9	4	" 28	Oct. 3		Slight mildew and anthracnose.
83	Rogers, 24	1889	H			4	June 24	" 3		Healthy.
84	Rogers, 30	1889	H			4	" 28	" 5		"
85	Salem	1888	H	10	8	5	" 28	" 5	8	Slight mildew and black rot.
86	Secretary	1890	H	6	8		" 30			Slight anthracnose.
87	Telegraph	1890	L	8	10	8	" 23	Sept. 17		Healthy.
88	Triumph	1890	H	9	8		July 5			"
89	Ulster	1888	L X	6	9	8	June 23	Oct. 3	10	"
90	Vergennes	1890	L	4	4		" 24	" 5	8	Mildew, black rot, anthracnose.
91	Victoria	1890	L							Slight mildew.
92	Wells	1890				2	June 28	Sept. 30	5	Healthy.
93	Wilder	1888	H	7	9	6	" 24	Oct. 5	6	Slight anthracnose, black rot.
94	Winchell	1889	L	7	9	5	" 28	Sept. 16	9	Slight mildew and anthracnose.
95	Witt	1889					" 28			Healthy.
96	Woodruff	1888	L X	10	10	4	" 24	Oct. 3	5	"
97	Worden	1888	L	9	10	9	" 24	" 15	8	"
98	Wyoming	1888	L	8	9	4	" 24	Sept. 28	6	Slight mildew.

Nearly all the varieties included in the foregoing tables have shown more or less fruit the present season.

Aminia is by many persons considered to be the best of the Rogers hybrids.

Brighton, when planted apart from other varieties, fails to perfectly fertilize its bloom. When associated with others it produces abundantly. In quality, as well as in beauty, it has few if any superiors.

Brilliant (a cross of Lindley and Delaware, by T. V. Munson of Texas), has now produced its second crop. It maintains its home reputation for fine quality, although the fruit has mildewed more or less both this year and last.

Cayuga, received for trial from central New York, has borne a first crop here this season. So far, it is a rather slow grower. The fruit is of fine flavor. Bunch and berry scarcely of medium size.

A plant received from C. P. Chidester as No. 1 which had been awarded a first premium as a seedling and named President Lyon, has now borne its

second crop here and proves to be of medium size, and of fine quality; but so far the bunches are small and the plant comparatively unproductive.

Another seedling received as No. 2, is much more productive, but of comparatively lower quality.

Diamond has this season produced a fine crop, large in both bunch and berry and of excellent quality. The plant is healthy and vigorous.

Downing betrays *vinifera* parentage in its foliage, and yet has so far entirely escaped mildew. It has now borne two moderate crops. Bunch large, berry medium; but too late in maturing to acquire its full quality in this locality.

Dracut Amber, productive and beautiful, but low in quality.

Duchess set a fine crop which was ruined by mildew.

Early Market, an Elvira cross by T. V. Munson, is of only tolerable quality, but may prove profitable for early marketing. Early Victor is rather small in both bunch and berry; but its earliness, productiveness, good quality, and hardiness, seem likely to render it valuable.

Eaton, though large in bunch and berry, as well as vigorous and healthy, is scarcely as good as Concord, and can scarcely equal it in value for the market.

Empire State has produced a moderate crop of beautiful fruit, but can not stand at the head with Brighton and Diamond as rivals.

Eumelan, though a poor setter, improves in this particular with good company. Quality good.

Hayes is valuable only as an amateur or family grape.

Highland requires a longer season than ours.

Iona is still one of the best when it succeeds.

Janesville is desirable where special hardiness is requisite.

Jefferson is an excellant late crop. It has this year produced a heavy crop, while adjacent varieties have been nearly or quite ruined by mildew.

Jessica, very early, sweet, and good, but very seedy.

Lady, as a family grape may well assume the place so long held by Martha, as compared with which it is a marked improvement at least in quality.

Lady Washington possesses some desirable characteristics, but with some serious drawbacks, fatal, perhaps, to its usefulness.

Mills, Monroe, and Moyer have each more or less valuable qualities; but with so many strong competitors, they can scarcely gain prominence.

Nectar (Black Delaware) is of fine quality, but its foliage is poor, and doubtless for that reason the plant lacks vigor.

Owosso is much like Catawba, though much earlier. The plant is healthy, vigorous, and productive, and the fruit of attractive appearance and good quality.

Peabody, with some good qualities of both plant and fruit, is yet in flavor unpleasant to most tastes.

Poughkeepsie is much like Delaware in appearance and quality, but the plant is a very feeble grower.

Rogers 8 is large and showy, but of moderate quality. It will probably prove to be a good keeper.

Rogers 24 is better in quality than the preceding, but probably not as good a keeper.

Ulster is a superior family grape. It ripened late this year. The plant lacks vigor.

Winchell is said to be identical with Green Mountain. The former being

the earlier name, is entitled to precedence. It has now yielded two successive crops of excellent, very early fruit, of fine quality. It is apparently worthy of extensive planting as a home or family grape.

Woodruff has disappointed us this year. It has made a very vigorous growth; but the fruit has been very sparse, the bunches small, and the flavor indifferent.

Worden is too well and favorably known to require extended notice. It may safely be planted, even for market, instead of Concord. At the north this should always be done.

Wyoming is a good grower and productive: but of only moderate quality.

For a family vineyard, with succession, the following will afford both variety and high quality. If not so many are wanted, a selection can be made. Varieties are named nearly in the order of ripening:

Early Victor, Winchell. Worden, Lady, Delaware, Diamond, Brighton, Ulster, Jefferson.

For a market vineyard with succession:

Moore Early, Worden, Concord, Niagara, and at the south or in favorable localities, Isabella or Catawba.

PEARS—*Pyrus communis.*

To the sixty-seven varieties of pear in orchard at the date of my last report, fourteen were added last spring, making a total of eighty-one varieties now growing on the premises. Of these six have shown bloom this season, viz.: Sterling, which bloomed May 19, and the fruit matured about September 5 to 10; Winter Nelis bloomed May 18, matured in November; Bloodgood, bloomed May 19; Gray Doyenne, May 16; Ansault, May 19, and Mount Vernon, May 16. The last four failed to set fruit.

The unusually unfavorable weather of last spring, which so severely injured the foliage of most classes of fruits, had little apparent effect upon the foliage of the pear, which in most cases continued as healthy as in previous years. The trees were twice sprayed with Bordeaux mixture, during the season; as were also the cherries and apples in adjacent rows. There is no means of determining how far, if at all, their more healthy condition may be attributed to such application.

The blight which last season attacked three or four trees, ruining three of them and badly disfiguring a fourth one, has not reappeared this season.

Two or three trees of Seedless (Bessemianka) and Gakovsk, Russian varieties, received from Prof. J. L. Budd of Iowa, are this season seriously affected with canker of the bark of their trunks and older branches. So far it has not been observed upon other varieties. This disease is not supposed to be contagious. It has, for years, been observed to attack varieties of feeble habit, generally foreign, and evidently not at home in our climate. We know of no remedy short of cutting away the diseased wood.

The slug (*Eriocampa cerasi*) has been the only troublesome insect this year. Its attacks have continued later than usual this season; but have yielded readily to spraying with poisons.

So few varieties have bloomed and fruited this season that tabulation is omitted to await fruiting and identification.

There being no apparent occasion for modifying the lists for planting recommended last year they are reproduced as follows:

For a succesion of varieties of high quality, named as nearly as possible in the order of their ripening: Summer Doyenne, Giffard, Bloodgood, Tyson, Rostiezer, Clapp Favorite, Howell, Bosc, Anjou, Winter Nelis, Dana, Hovey, and Pound; the last for culinary use only.

For smaller plantations, the following will afford a partial succession of vigorous, productive varieties of fair quality: Summer Doyenne, Clapp Favorite, Bartlett, Sheldon, Howell, Onondaga, Bosc, Anjou, and Lawrence.

For a market list, with succession: Summer Doyenne, Tyson, Sterling, Clapp Favorite, Bartlett, Howell, Onondaga, Bosc, Anjou, Lawrence.

These varieties have all been so long before the public, that descriptions are not deemed necessary.

APPLES.—*Pyrus malus.*

To the one hundred and forty varieties of apple, previously in orchard, forty-eight varieties were added the past spring; making one hundred and eighty-eight varieties now upon the place; aside from which, there are in orchard, twenty-two young trees, intended to be topworked, with such varieties as shall be received in the scion.

Prior to last spring's season of almost continuous rain, apple trees were apparently in excellent condition. How far the continuous saturation of the soil with water may have affected their health it may be difficult to determine; but between this and the rapid development of fungi, under the then existing conditions, the foliage was nearly ruined; and growth so effectually stopped that, in most cases, no considerable renewal occurred during the season; rendering it possible, not to say probable, that with trees of bearing age, the lack of vigor may, in more or less cases, have prevented the development of the fruit buds, needful as the preparation for a next year's crop.

Of insects, the destruction of the foliage has left the *Aphis mali* so nearly destitute of feeding ground, that its depredations have scarely been noticeable.

Nine varieties showed more or lesss bloom last spring, of which one only, the Keswick, produced fruit; though this was ruined by curculio or the larva of the codling moth, before maturity.

Until the fruiting, identification and characterization or varieties, tabulation is of little apparent use, and is therefore omitted.

Select lists of apples for orchard planting have in former reports been based upon previous knowledge of the varieties named; and seeing no good reason to modify those of last year, they are reproduced here.

For a family orchard, to supply dessert, culinary, and sweet apples, throughout the usual season of this fruit:

Early Harvest (or Yellow Transparent), Early Strawberry, Primate, Chenango, Sweet Bough, Garden Royal, Jersey Sweet, Jefferis, Keswick, St. Lawrence, Rhode Island Greening, Jonathan, Munson Sweet, Dyer, Shiawassee, Hubbardston, Talman Sweet, Northern Spy, Lady Sweet, Golden Russet (N. Y.), Roxbury Russet.

For a local market, for a similar period:

Early Harvest, Red Astrachan, Oldenburg, Maiden Blush, Lowell, Shiawassee, Hubbardston, Jonathan, Rhode Island Greening, Baldwin, Red Canada (topgrafted), Roxbury Russet.

QUINCES—*Cydonia.*

Of the quince there are nine varieties now upon the grounds; none having been added during the present year.

The plants were sprayed before they were in leaf, prior to the heavy and continuous rains already spoken of. Whether from this, or some other cause, the foliage, which, in previous years, had been badly spotted by the leaf blight (*Morthiera Mespili*), has been wholly exempt throughout the season; and, doubtless for this reason, the plants have made better growths than usual.

The red rust (*Roestelia aurantiace*), has apparently wholly disappeared; no cases of it having been observed this season.

The following varieties have bloomed and fruited this season:

Missouri Mammoth, bloomed June 3, no fruit.
Rea, bloomed June 5, fruit gathered October 19.
Meech, bloomed June 8, fruit gathered October 19.
Champion, bloomed June 5, fruit gathered October 19.
Orange, bloomed June 5, fruit gathered October 19.

The Champion has heretofore on a different soil ripened so late as to occasion doubt respecting its adaptability to our climate; but during the last two seasons, on a rather strong sandy loam, it has matured very nearly with Meech, Rea, and Orange.

NUTS.

CHESTNUTS—*Castanea vesca.*

Seeds from the large native chestnut, originating with B. Hathaway of Little Prairie Ronde, Michigan, have now grown to be fine vigorous trees. Two root-grafts from the parent tree were received from Mr. Hathaway, both of which failed after a struggle of a year or two.

Five or six alleged distinct varieties from Japan have been planted within two or three years past, as well as trees of the European variety, usually known as Spanish.

Paragon, an alleged specially hardy seedling of Spanish, has now shown fruit for three years; though so far the nuts have been destitute of germs, a failure which perchance may be remedied with increased age, or possibly when others shall come into condition to supply pollen for cross fertilization.

CHINQUAPIN—*Castanea pumilia* (Dwarf chestnut).

The trees of this transplant with much difficulty, for which reason two attempts have been made to grow specimens from seed; but both have failed, none of the nuts have having vegetated.

PECAN—*Hickoria olivæformis.*

The trees of this being also impatient of removal, after a single trial seeds were planted, which have now stood without protection through the last three winters, uninjured; and have made fine growths the past season.

Through the courtesy of assistant national pomologist, W. A. Taylor, a

former resident of Allegan county, nuts of a large, thin-shelled pecan, from Texas, were received last fall, and planted last spring, a few of which vegetated, and will be planted permanently if they can be brought safely through the coming winter.

From the same source we are just now in receipt of a few nuts of Stuart pecan, of very large size, which variety is so highly valued that the nuts are selling for $1.50 per pound for seed. These are bedded in damp sand to be planted next spring.

ENGLISH WALNUT, OR MADERIA NUT—*Juglans regia.*

The two trees of this came through the last winter uninjured, but neither has made a vigorous growth the past season.

Two trees of the dwarf variety, *præparturiens*, have safely passed through the past two winters, and are making more or less growth.

Whether either of the above will be found adapted to the climate of Michigan, is a matter for grave doubt.

JAPAN WALNUT—*Juglans Seiboldi.*

Trees of this walnut planted in 1890 remain perfectly sound, and are growing very vigorously. The same is also true of two additional trees planted last spring.

ALMONDS—*Amygdalus communis.*

A single tree was received from Missouri, labeled "Snelling Almond," doubtless of the hardy class of hard-shelled varieties. This was planted last spring, and has made very satisfactory growth.

Two trees, labeled "Soft-Shelled Almond," were also received from the Agricultural College, and planted out last spring. One of them was apparently dead at the root when received, and failed to grow. The other has made satisfactory growth.

FILBERT AND HAZLENUT—*Corylus.*

Plants of the Kentish Cob Filbert were received from the Agricultural College, and planted last spring, and are now in good condition.

Plants of an unnamed hazlenut were received from the Division of Pomology at Washington, which were temporarily planted last spring and are now bedded in cellar, preparatory to permanent planting next spring.

Plants of an unnamed hazlenut, indigenous at Puget Sound, are just received from the Division of Pomology at Washington, and have been bedded in damp earth in cellar, to be planted out next spring.

FIGS—*Ficus carica.*

Cuttings of Brunswick Fig were received last spring from H. E. Van-Deman, Pomologist of the National Division of Pomology, which were duly planted, and have now become plants from two to three feet in height, some of them already bearing fruits, nearly or quite half grown. These have now been bedded in earth in cellar, to be replanted next spring.

RHUBARB—*Rheum Rhaponticum.*

As was the case last year, so the present one: the alleged early varieties have grown to usable size no earlier than has the Linnæus, which, judging from experience, may very profitably fill the place of any and all other varieties, whether for the home plantation or for market; whether early or late.

ASPARAGUS—*Asparagus officinalis.*

Of the six varieties of asparagus planted in the spring of 1890, the Palmetto has steadily maintained its superior size and productiveness. The plant being diœcious, and therefore every seed a cross, the necessary inference would seem to be, that the variety may have acquired its apparent fixity, through the process of selection. Be this as it may, its obvious superiority in size, renders it worthy of a leading position as a profitable variety.

Results from the planting of crowns from old plantations, have not, so far, been satisfactory, many having failed to grow, and yet others dying, after a more or less feeble start, leaving the plat weak and thin as compared with one of the same variety, planted at the same time, and under the same treatment, but of young plants.

T. T. LYON.

VEGETABLE TESTS.

Bulletin No. 90. February, 1893.

During the past season we have grown many of the novelties offered by the seedsmen in their catalogues of 1892. Many of the high priced "novelties" are inferior to the older and well-known sorts, although some are of real merit. In this bulletin we have endeavored to give the results gained from the experience of one season. Perhaps another year's trial might change our opinion in some instances. Some of the best of the older kinds have been grown with the new, for comparison. The summary at the end of each class may aid the grower in selecting varieties for planting.

BUSH BEANS.

The beans were planted in drills two and one half feet apart, June 10 and 11. Ten feet of drill were given to each variety. In this space one hundred beans were planted; from the number coming up the per cent. of germination was computed. After all the beans had germinated that would do so, each section was thinned to thirty plants; these thirty plants were divided in two parts of fifteen each; with one section the pods were picked and weighed when in edible condition. In this way the comparative productiveness of the several varieties was determined. The other lot of

fifteen plants was allowed to ripen the pods, and the beans were shelled and kept for seed. Owing to the continued rains in the spring, the beans were not planted until late in the season; the differences in time of edible maturity of the varieties are therefore slight.

The following table shows the results obtained with the bush varieties:

TABLE No. 1.

Number.	Variety.	Seedsman.	Days to vegetation.	Per cent of vegetation.	Days to bloom.	Days to edible maturity.	Weight of green pods.—Ounces.	Days to ripening.
1	Aroostook	Jerrard	5	80	35	51	30	110
2	Best Dwarf	Burpee	5	78	38	50	70½	113
3	Bismarck	Landreth	6	52	38	51	28½	94
4	Blue Podded Butter	Burpee	5	89	37	50	28	94
5	Boston Market	Salzer	5	93	34	50	26½	116
6	Burlingame	Maule	5	86	40	51	64	.....
7	Butter Wax	Maule	10	8	38	50	72½	116
8	Challenge	Ferry	5	80	33	49	15	92
9	Champion	Ely	7	98	40	52	34½	94
10	Cylinder Black Wax	Henderson	5	88	38	52	65	109
11	Dakota Soup	Manle	5	95	37	50	35	98
12	Date Wax	Dreer	10	75	38	52	49½	110
13	Detroit Wax	Ferry	11	65	38	52	24½	94
15	Earliest	Maule	5	88	34	51	40	104
16	First Market	Landreth	7	77	35	52	39	100
17	Flageolet Wax	Henderson	6	90	37	49	9½	98
18	Gold Dot	Hicks	5	90	38	52	40	94
21	Gold-eye Wax	Salzer	10	5	35	51	49½	94
23	Mammoth Wax	Henderson	7	66	38	52	54	98
24	Mont d' Or	Ely	5	87	34	52	57	98
25	Ne Plus Ultra	Ely	4	98	34	57	29	98
26	Newtown	Thorburn	7	90	37	51	55	98
27	No. 1½	Hatt	4	94	42	50	27	118
28	No. 2	Hatt	4	96	39	50	83	110
29	No. 2½	Hatt	5	84	40	51	70½	118
30	No. 3	Hatt	6	81	41	52	32	110
31	Osborn Forcing	Henderson	5	96	38	51	33½	84
32	Perfection Wax	Dreer	6	96	38	52	37½	90
33	Pink-eye	Landreth	7	22	35	51	31½	90
34	Plymouth Rock	Gregory	6	86	34	52	22½	90
35	Red Valentine	Henderson	6	74	38	52	35	84
36	Refugee	Henderson	5	50	38	51	67½	84
37	Ruby Dwarf Horticultural	Rawson	8	93	42	52	28	84
38	Rust-proof	Vaughan	5	92	35	51	27½	84
39	Saddle-back	Landreth	5	59	35	52	36	100
40	Shah	Thorburn	5	91	40	53	22½	88
41	Snowflake	Gregory	4	92	40	52	80	100
42	Speckled Wax	Ferry	7	85	38	51	30	88
43	Violet Flageolet	Ferry	6	94	38	52	47½	84
44	Wardwell	Salzer	5	94	38	51	41	100
45	Warwick	Henderson	5	99	38	51	48½	84
47	White Valentine	Henderson	5	81	37	52	63½	90
48	William	Vaughan	5	90	34	49	46	90
49	Yellow-eye Wax	Leonard	10	11	39	51	10	116
50	Yosemite	Gregory	7	78	38	52	57½	.....
51	Queen Wax	Hicks	5	88	38	51	51	90
55	Shipper's Favorite	Buist	6	99	39	53	52	116
57	Horticultural (strain No. 14)	Hicks	9	100	32	66	29	100
58	New Field Bean No. 6	Hicks	9	100	33	50	51	100
59	Early Dwarf Bush No. 3	Hicks	9	99	32	48	31	90

DESCRIPTION OF VARIETIES.

The following notes apply to the new varieties grown in 1892. Notes on the other varieties will be found in Bulletins 70 and 79.

Boston Market—Salzer. Plants 9 to 12 inches high, spread 8 to 12 inches; leaflets small to medium in size; pods round, green, 2½ to 3½ inches long, curved, apex long; flesh solid, tender. Bean small in diameter, long, purplish red in color with lighter dots. The plant does not grow large enough to be very productive.

Butter Wax—Maule. Plants of medium growth; foliage medium in size, dark green color; pods 4 to 5½ inches long, round, rich golden yellow color and of excellent quality. Pods remain some time in edible condition. Bean large, white with a brownish-red eye. Very productive. A good variety.

Plymouth Rock—Gregory. Plants strong and vigorous, 10 to 12 inches high; spread 12 to 15 inches; leaflets medium to large, dark green; pods green, straight, flattened, 5 to 6 inches long; flesh tender and of best quality. Bean small in diameter, long, round, kidney-shape; color white with reddish-brown dots around eye. An excellent variety, but not remarkably early this year.

Shipper's Favorite—Buist. Plants strong and vigorous, closely resemble Plymouth Rock in plant and pod, though the pods are longer and not so wide. Bean small in diameter, long, purplish-red in color with lighter dots. A good variety and productive.

Horticultural (Strain No. 14)—Hicks. Plants of moderate growth; foliage medium in size, dark green in color; pods 4 to 5 inches long, light yellow with dark purple patches; quality good. Moderately productive. Bean thick, nearly round, creamy yellow in color with reddish patches.

New Field Bean, No. 6—Hicks. Plants strong and vigorous; foliage large, light green in color; pods 5 to 6 inches long, yellowish-green. Bean large, white, round. Productive. Promises to be an excellent field bean.

Early Dwarf Bush, No. 3—Hicks. Plants of small growth; foliage small, dark green color; pods dark green, more or less covered with purplish-black spots; quality good. Bean small to medium in size, creamy-yellow, dotted with blue-black spots. Moderately productive.

Though the recent introductions have many points of excellence, not one is so superior to the older sorts as to supersede them for field or garden use. Our list of varieties for planting would be little changed from those recommended last year.

Wax beans—Cylinder Black Wax, Saddleback, Mammoth Wax, and Butter Wax.

Green podded varieties—Osborn Forcing, Shipper's Favorite, Dakota Soup, and Shah.

For field culture—Burlingame, Snowflake, Hatt No. 2½ and No. 6 Hicks.

POLE BEANS.

The pole beans were planted June 14 in rows 6 feet apart, with 4 feet space between the hills. The poles were placed in position at the time of planting the beans.

The following table shows the comparative data obtained:

TABLE No. 2.

No.	Variety.	Seedsman.	Days to vegetation.	Per cent of vegetation.	Days to bloom.	Days to edible maturity.
1	Black Lima	Burpee	13	86	53	.....
2	Challenger	Thorburn	13	12	55	.....
3	Golden Champion	Hend.	13	70	53	102
4	" Cluster	"	13	61	65	119
5	Hort. Lima	Childs	13	90	35	93
6	" "	Hicks	13	98	38	93
7	Jersey	Hend.	13	24	47	.....
8	Old Homestead	"	13	80	42	97
9	Scarlet Runner	Dreer	13	84	35	.....
10	Seek-no-further	Land.	13	76	47	97
11	Sunshine Wax	Burpee	13	64	62	121
12	White Zulu	Burpee	13	98	38	100
13	Willow-leaf	Burpee	13	60	56	.....
14	Giant Horticultural	H. N. Smith	13	60	63	139
15	Washington Market	Leonard	13	30	47	.....
16	Ford's Mammoth	Hend.	13	52	47	.....

DESCRIPTION OF VARIETIES.

Golden Champion—Hend. This variety, as last year, was the earliest of the wax pole-beans to form edible pods. The pods are nearly white, 4 to 5 inches long and of good quality. A valuable variety.

Golden Cluster—Hend. None of the newer sorts equal this variety as a wax-podded pole bean for general garden culture. The plants are of strong and vigorous growth and very productive. The pods are 6 to 8 inches long; flesh thick, solid, and of best quality. It is not so early as Golden Champion, but on the whole was the best bean of its class grown.

Horticultural Lima—Childs. Plant vigorous; foliage dark green; pods 5 to 6 inches long, and 1 inch broad, they contain 4 to 6 beans of large size. This is a Lima, and the beans are edible long before the broad-podded Limas or the bush varieties. It is productive and a valuable acquisition.

Horticultural Lima—Hicks. This variety is identical with the above. We think that Childs was the original introducer.

Old Homestead—Hend. Plants are strong and moderately productive. Pods long, curved and twisted, green, tender and of best quality. A good green-podded variety.

Seek-no-further—Landreth. Identical with Old Homestead.

Sunshine Wax—Burpee. Identical with Golden Cluster.

White Zulu—Burpee. An introduction of 1891. As grown last year the type was not well fixed. Plants vigorous, pods 6 to 10 inches long, usually twisted sidewise, light green in color, and of best quality. Productive. A good variety.

Willow Leaf—Burpee. Interesting as a novelty. Does not mature beans here.

Giant Horticultural—Smith. Plants are moderately vigorous. The pods are borne near the ground, and are five to six inches long, one inch broad, light yellowish-green in color, more or less streaked with purple. Bean large, thick, medium in shape between a kidney bean and a Lima; excellent in quality. Rather late in maturing and moderately productive.

Evidently a cross between the Dwarf Horticultural and a pole Lima. A valuable addition to the list of varieties.

Golden Champion is valuable for its comparative earliness. As a snap bean of the best quality, and wonderfully productive, the Golden Cluster can not be too strongly recommended. As a Lima bean the Horticultural Lima has no superior for this section.

BUSH LIMAS.

Of late, the bush Limas have attracted considerable attention. Their season of maturity is usually too late to make their culture successful in this latitude.

TABLE No. 3.

No.	Variety.	Seedsman.	Days to vegetation.	Per cent of vegetation.	Days to bloom.	Days to edible maturity.
1	Burpee's Bush Lima	Burpee	12	66	42	102
2	Dreer's Bush Lima	Dreer	11	36	52	102
3	Hend. Bush Lima	Hend.	12	30	42	88
4	Bush Lima	Barteldes	11	80	39	106?

DESCRIPTION OF VARIETIES.

Burpee's Bush Lima—Burpee. Plants are strong and vigorous. Pods 4½ to 5 inches long, 1½ inches broad, and curved, usually contain 3 to 4 beans, which are 1 inch long and 1 inch broad, kidney-shape. The plants are moderately productive.

Dreer's Bush Lima—Dreer. Plants are of smaller and more spreading growth than the preceding. Pods are borne in clusters near the ground; 2½ to 3½ inches long, 1½ inches broad, straight. The beans are smaller than Burpee's Bush Lima andthe plants are more productive.

Henderson's Bush Lima—Hend. Plants are strong and of vigorous growth; pods 3 to 4 inches long, straight, borne on all parts of the plant, beans medium in size, and of best quality. The earliest of the bush Limas and perhaps the best.

Barteldes' Bush Lima—Barteldes. Plants very strong-growing, inclined to climb, pods 4 to 6 inches long, somewhat flattened, outer surface rough, borne in clusters on a long stem. The plant is very productive, but matures beans too late for this section.

CABBAGES.

Thirty varieties were tested this year. The seed was sown on March 10 and the plants were pricked out in flats about the 1st of April. On May 8 twenty-five plants of each variety were transplanted in the field. They were badly affected by the maggot (*Anthomyia brassica*), which resulted in much irregularity in heading. The very wet weather, during June, was largely instrumental in preventing a failure of the crop from the ravages of the maggot. The following table gives the results of the test.

TABLE No. 4.

No.	Variety.	Seedsman.	Per cent germinated. Tester.	Per cent germinated. Soil.	Per cent of planted that headed.	Average size of head in inches.	Condition of head.	Days to market maturity from planting.
1	Acme	Burpee	99	89	92	8x10	Solid	90
2	All Head	Burpee	96	86	64	6x4	Fair	84
3	All Seasons	Ferry	85	89	84	8x5	Solid	90
4	American Savoy	Ferry	100	90	80	6x4	Loose	95
5	Autumn King	Henderson	98	35	100	6x10	Solid	100
6	Bridgeport	Vaughan	97	85	84	12x8	Solid	105
7	Burpee's World Beater	Burpee	98	87	96	8x5	Solid	100
8	Dwarf Flat Dutch	Ferry	100	74	100	6x6	Solid	65
9	Earliest of All	Faust	96	93	64	4x7	Solid	50
10	Etampes	Faust	93	73	84	4x8	Solid	60
11	Express	Ferry	99	93	68	4x7	Solid	70
12	Fottler's Drumhead	Ferry	100	95	80	8x5	Solid	85
13	Giant Red Erfurt	Vaughan	91	81	84	5x5	Solid	90
14	Late Flat Dutch	Ferry	96	91	96	9x7	Solid	82
15	Lightning	Salzer	99	62	96	4x8	Solid	62
16	Luxemburg	Ferry	90	91	84	8x5	Solid	95
17	Main Crop	Burpee	100	91	44	8x5	Soft	95
18	Mammoth Rock Red	Ferry	98	97	76	5x5	Solid	95
19	Marblehead	Ferry	98	94	96	10x6	Fair	110
20	Marvin's Savoy	Vaughan	84	58	52	6x4	Soft	85
21	Reynold's	Gregory	83	60	88	8x5	Solid	85
22	Rothselburg	Gregory	89	68	56	8x5	Fair	85
23	Stone Mason	Ferry	99	100	32	7x4	Fair	90
24	Succession	Ferry	100	90	88	11x7	Solid	100
25	Vandergaw	Vaughan	99	100	80	5x8	Solid	90
26	Winnigstadt	Vaughan	97	78	88	5x8	Solid	70
27	Prize Head Flat Dutch	Faust	94	88	92	9x7	Solid	90
28	Late Drumhead	Buist	93	92	64	8x4	Fair	100

EARLY VARIETIES.

Earliest of All was the first to head. It had a tendency to form several heads, which is an unusual occurrence.

Lightning is a good strain of the Early Wakefield type, and is a very uniform header. Not as early as was advertised.

Etampes is known as a reliable early variety, but it headed somewhat unevenly this season. Quite desirable.

SECOND-EARLY VARIETIES.

Dwarf Flat Dutch follows very closely the early varieties. It is a sure header and a compact grower. Its increased size and solid heads cause it to supersede the earlier varieties as soon as it appears in the market.

Winnigstadt is an old favorite, and is a very reliable header. A valuable variety where a conical head is desired, on account of its sureness of heading.

Fottler's Drumhead was somewhat uneven this season. It is a desirable cabbage for general purpose. Planted late it makes a good winter variety, although early planting brings its season in August.

MEDIUM SEASON.

There seems to be but little choice between the *Acme*, *Vandergaw* and *Prize Head Flat Dutch*, which are the three best of the varieties maturing in three months after transplanting.

LATE VARIETIES.

Bridgeport forms very large heads, and most of them are quite solid. One of the best.

Succession is very much like the preceding variety.

Burpee's World Beater, is the best of the acquisitions of this season. Its uniform and solid heads make it desirable. and judging from its appearance in the field, it ranks high.

Autumn King formed uniformly large, solid heads. The type is not fixed. Some of the heads were flat, others oval.

Giant Red Erfurt and *Mammoth Rock Red* are very similar in size. Both form round, solid heads. They are distinguished by a slight difference in the color of the leaves, those of the latter having more of a purple tinge. They are valuable because of their keeping qualities.

SWEET CORN.

Twenty-eight varieties were used in the test. The hills were four feet apart each way. Five kernels were planted in each hill. and twenty hills of each variety were used in the test.

The planting was done on May 20.

The dry hot weather, during the latter half of August, hastened the date of maturity of all except the early varieties.

The following table gives the principle data of the test. The last column shows the comparative productiveness of the varieties.

TABLE NO. 5.

Number.	Variety.	Seedsman.	Days to edible maturity.	Days to market maturity.	Length of stalk in feet.	No. of stalks bearing ears.	Number ears.	Av. No. ears per stalk.
1	Bonanza	Vaughan	79	88	5¾	68	97	1.42
2	Burlington Hybrid	Faust	75	79	5	79	89	1.13
3	Concord	Ferry	81	87	4½	68	78	1.15
4	Cory	Ferry	75	78	3¼	43	48	1.12
5	Country Gentleman	Henderson	96	99	5¾	63	111	1.76
6	Crosby	Ferry	74	77	3	49	50	1.02
7	Egyptian	Ferry	91	93	6¾	77	101	1.30
8	Excelsior	Landreth	92	96	4¾	66	106	1.41
9	First of All	Burpee	67	70	3¾	35	42	1.20
10	Ford's Early	Vaughan	77	80	3¾	42	50	1.19
11	Gold Coin	Vaughan	96	99	7	60	90	1.50
12	Golden Nugget	Vick	77	81	4¾	38	52	1.36
13	Henderson	Henderson	89	53	7	76	101	1.41
14	Leet's Early	Ferry	74	77	4½	61	65	1.06
15	Mexican	Ferry	78	82	5½	68	98	1.44
16	Minnesota	Ferry	82	93	4½	58	79	1.36
17	None-such	Maule	81	88	6¼	82	122	1.49
18	Northern Pedigree	Ferry	75	78	3¾	50	55	1.10
19	Old Colony	Ferry	82	93	6	43	72	1.67
20	Pee & Kay	Ferry	77	81	4¼	48	54	1.12
21	Perry's Hybrid	Ferry	77	80	4¾	65	71	1.09
22	Red Cob	Henderson	87	93	6	63	80	1.26
23	Red Evergreen	Childs	90	93	7	38	44	1.15
24	Stowell's Evergreen	Ferry	90	93	6½	66	80	1.21
25	White Cob Cory	Ferry	72	77	2½	55	58	1.05
29	Ne Plus Ultra	Henderson	92	96	5¼	38	71	1.86
30	Early Marblehead	Henderson	77	81	2¾	40	51	1.27
31	Shaker's Early	Henderson	81	88	5	61	79	1.30

The following are new varieties:

First of All—Burpee. This was the first variety to reach edible maturity. It also proved to be the most productive of the early sorts.

Burlington Hybrid—Faust. This is a cross between Adams' Extra Early and Early Mammoth, and is a flint corn. It has a very small amount of leaves, and stands drought. It can be planted close. Season the same as the Cory. It is desirable as it is a sure cropper. Quality fair.

Country Gentleman—Henderson. This was the latest variety to mature, and was this year one of the most productive. It originated by selection from the Ne Plus Ultra which it resembles, although the ears are larger.

Golden Nugget—Vick. A variety of medium season, and is of fair productiveness. Ears are of good length. Color orange.

VARIETIES TO PLANT.

For succession First of All for early; Golden Nugget or (Black) Mexican for medium season, and for late season Ne Plus Ultra or Country Gentleman where numerous but medium-size ears are desired. For varieties with larger ears Stowell's Evergreen, Old Colony, or Henderson are the most prominent, particularly for market.

CUCUMBERS.

The cucumbers were planted in rows 6 ft. apart, the hills 4 ft. apart in the rows. Various remedies were tried for the cucumber beetle. None proved entirely effectual, though a teaspoonful of turpentine thoroughly mixed with a pailful of ashes prevented their ravages until the plants were strong enough to resist attack.

The varieties grown for pickles were planted near each other, and as soon as the fruits were of suitable size, those from each sort were counted and weighed. It was found that the plants would produce a much larger yield during the season, if the fruits were closely picked and not allowed to grow beyond pickling size. The same method of picking and weighing the cucumbers was pursued with the table varieties.

In this way material was obtained for a comparative test of varieties.

PICKLING VARIETIES.

Chicago. Plants vigorous and productive; fruit small; spines large, black. Early. Excellent for pickling.

Chinese. Plants fairly vigorous, not so productive as Chicago; fruit small, slender; spines white, large.

Choice. Plants of moderate growth, producing a large number of small fruits. A good variety for small pickles.

Cluster. Plants healthy, strong-growing and very productive; fruit small to medium; spines large, numerous. Early. One of the best for pickling.

Jersey Pickle. New. Plants moderately healthy and fairly productive; fruit small; spines not numerous, black. Medium early.

Maule's Early. Plants vigorous and healthy; fruit small, triangular. Productive. Early. Excellent for pickles.

Parisian. This variety produces long, slender fruits. This season the plants lacked vigor and productiveness.

The following varieties may be grown both for table use and for pickles:

Bismarck. Plants are vigorous-growing and healthy; fruit 10 to 12 inches long and 2 to 2½ in diameter, tapering toward ends. Moderately productive.

Everbearing. Plants vigorous and very healthy; fruit 10 to 12 inches long, round; obtuse ends. Productive, bearing well to close of season.

Evergreen. Plants fairly vigorous and healthy; fruit shorter and larger in diameter than Everbearing. Excellent for pickling and for slicing. Moderately productive.

Short Green. Plants vigorous and healthy: fruit 4 to 5 inches long, 2 to 2½ inches in diameter. Fairly productive. Not so good for table use as some others.

TABLE VARIETIES.

Goliath. New. Plants of strong and healthy growth; fruit long, slender, crooked, and irregular; spines black, prominent. Productive.

Peerless. Plants strong, healthy, and productive; fruit large, covered with prominent white spines. One of the best for table use.

Perfection. An excellent variety for pickles when young. Form regular. Quality best. Productive.

Ivory Monarch. New. Plant a vigorous grower; fruit long, slender, white; core very small; quality good. Not very productive.

White Pearl. Plant a strong grower, but not healthy; fruit medium in size, smooth; quality good. Fairly productive.

The preceding notes are from observations of the past season's growth only, and are not to be taken as a decisive test of the several varieties.

LETTUCE.

About forty varieties have been grown during the year. For forcing purposes no variety has been found superior to Grand Rapids. Chicago, White Tennisball and Golden Queen are also good forcing varieties.

For hot-bed growing, Chicago, Hanson, Simpson, Golden Queen, Big Boston, and New York are good varieties.

As varieties for general garden culture, Hanson, Simpson, New York, Grand Rapids, Denver Market, White Star, and Chicago are all good.

The following table shows the comparison of the varieties grown out of doors. The plants were grown in the forcing-house and transplanted in the garden May 3.

TABLE NO. 6.

Number.	Variety.	Seedsman.	Days to vegetation.	Per cent of vegetation.	Days to edible maturity.	Days to starting of seed-stalk.
1	All Cream	Salzer	7	66	53	60
2	Bath Cos.	Rawson	5	55	54	61
3	Big Boston	Henderson	5	72	52	54
4	Blonde Beauty	Vaughan	5	63	56	61
5	Black Seeded Simpson	Vaughan	6	34	53	59
6	Black Seeded Tennisball	Rawson	5	76	45	54
7	Boston Curled	Rawson	6	65	49	57
8	Boston Market	Rawson	5	57	45	49
9	Chicago	Vaughan	5	81	50	57
10	Colossal	Salzer	7	57	53	57
11	Curled India	Landreth	6	36	59	63
12	Curled Simpson	Vaughan	5	79	53	59
13	Deacon	Rawson	5	81	49	59
14	Denver Market	Vaughan	5	78	59	63
15	Forcing	Landreth	4	84	53	58
16	French Blockhead	Thorburn	7	80	51	59
17	Golden Curled	Landreth	6	59	53	56
18	Golden Stonehead	Vaughan	5	71	51	57
19	Grand Rapids	Ferry	5	6	53	59
20	Green Fringed	Rawson	7	6	53	57
21	Hanson	Rawson	5	71	58	63
22	Hittinger's Belmont	Burpee	5	81	45	48
23	New York	Henderson	4	74	59	63
24	Prize Head	Ferry	5	70	53	59
26	Rudolph's Favorite	Vaughan	7	67	49	57
27	Self-folding Cos.	Ferry	5	41	51	55
28	Sunlight	Salzer	6	55	48	53
29	Stubborn Head	Vaughan	7	23	50	58
30	Thick-head Yellow	Burpee	4	69	51	57
31	Tilton's White Star	Ferry	6	77	53	59
32	Trianon	Dreer	5	57	56	60
33	Year Round	Rawson	4	39	52	57
35	Golden Queen	Henderson	6	51	46	50
40	Perfection	Buist	3	68	46	49
41	Yellow Market	Buist	4	56	51	58

The following varieties were grown here for the first time this season:

All Cream—Salzer. This variety is identical with the old Prize Head, an excellent garden sort.

Blonde Beauty—Vaughan. Heads large, loose, golden yellow in color, crisp and of best quality. An excellent summer sort. This variety appears identical with French Blockhead grown last year. *Sunset*—Hend, also is identical with above.

Colossal—Salzer. New. Heads large, loose, light green in color. Matures early and is of best quality.

Hittinger's Belmont—Burpee. Same as Big Boston.

Self-folding Cos—Ferry. New. Forms large head, nearly self-blanching. Leaves tender and of best quality. The best cos variety tested.

Sunlight—Salzer. Heads medium size, golden-yellow color; leaves wrinkled, curled. A good variety if better selected.

Stubborn Head—Vaughan. New. Forms a large, loose head, light golden-yellow color. A good grower; resists heat well and remains a long time in marketable condition. One of the best varieties grown.

Thick-head Yellow—Burpee. Heads large, solid, light greenish-yellow color; leaves waved. A good summer variety.

Perfection—Buist. Heads small. Soon runs to seed.

Yellow Market—Buist. New. Heads are small, solid, golden-yellow color, tender and of good quality. Lacks in size of head and soon runs to seed.

PEAS.

A comparative test of fifty-five varieties of pea was made, using two hundred seeds of each kind. The vines were supported by a woven wire trellis. The date of sowing was May 9. Cold, wet weather injured the germination somewhat, and the dry, hot winds of the latter half of July hastened the date of maturity of the mid-season and late sorts, and prevented the proper filling of the pods in many varieties; but at the same time, it showed more clearly the ability of certain varieties to withstand adverse conditions.

Below are the tabulated data of the varieties. The dates to maturity show that the early varieties required a few more days to reach maturity than they did during the previous year, and the later varieties a few days less.

The columns showing the average number of pods per vine, and the average number of peas per pod, illustrate the prolificness of the varieties. The columns giving the weights of fifty pods and the shelled peas will give an idea of the size of the pods and the proportion of shelled peas to the pods. The last column gives the weight of the pods of an average vine. It is obtained from the data in the second and fifth column and is a measure of the productiveness of the variety.

TABLE NO. 7.

Number.	Variety.	Seedsman.	No. days to edible maturity.	Av. No. pods vine.	Av. No. peas per pod.	Av. No. peas per vine.	Wt. of 50 pods in ounces.	Wt. of shelled peas from 50 pods in ozs.	Av. yield per vine in ounces.
1	Abundance	* Ferry	69	10.00	4.44	44	8.12	48.7	1.62
2	Admiral	* Henderson	66	7.87	5.94	45	6.12	4.5	.97
3	Advancer	* Ferry	63	9.83	5.60	55	8.12	5.4	1.6
4	Alpha	* Ferry	58	8.53	6.04	51	9.0	3.5	1.5
6	American Wonder	* Ferry	54	8.83	6.26	44	6.4	3.8	1.1
7	Bergen	* Burpee	50	5.72	4.88	28	9.0	3.5	1.0
8	Bergen+American Wonder	College	52	8.01	4.00	32	8.5	3.5	1.4
9	Bergen Fleetwing	Gregory	50	6.00	4.00	24	8.0	3.0	.96
10	Blue Beauty	* Henderson	50	8.00	5.00	40	9.0	4.6	1.4
11	Budlong	Leonard	52	6.80	5.01	34	9.55	3.5	1.3
12	Charmer	Vick	66	12.94	4.90	64	7.0	4.5	1.8
13	Chelsea	* Henderson	56	6.40	4.04	26	8.0	4.2	1.0
14	Clipper	Rawson	52	4.37	4.05	17	8.0	3.0	.7
15	Delicious	Gregory	72	5.30	5.45	29	8.25	4.0	.87
16	Don	* Henderson	66	5.08	5.41	22	10.5	6.0	1.1
17	Dwarf Sugar	* Henderson	69	5.20	5.50	28	8.5	4.0	.9
18	Earliest and Best	* Salzer	54	5.56	5.08	28	6.75	4.0	.75
20	Early Prize	Maule	54	7.78	4.50	35	8.4	4.0	1.3
21	Epicure	* Henderson	63	8.81	4.36	38	7.25	4.75	1.25
22	Everbearing	* Burpee	72	7.81	4.08	31	9.0	4.25	1.4
23	Favorite	* Gregory	69	5.30	4.64	25	7.0	3.75	.74
24	Fillbasket	* Henderson	63	9.20	5.50	51	6.0	4.75	1.1
25	First	* Henderson	50	5.60	5.12	29	9.1	5.14	1.02
26	First and Best	* Leonard	52	2.94	3.88	11	7.5	4.5	.43
27	Forty Fold	* Landreth	69	10.61	5.48	58	7.5	5.	1.6
28	French Canner	Landreth	58	8.40	6.32	53	8.0	4.25	1.35
29	Gladiator	Henderson	70	6.94	6.01	42	14.25	6.75	1.98
30	Hancock	* Gregory	50	4.78	5.78	26	8.5	3.75	.85
31	Heroine	Henderson	74	10.62	6.52	69	14.5	7.5	3.08
32	Kent	* Ferry	69	11.00	6.14	68	7.12	4.5	1.07
33	Kentish Invicta	Ferry	60	4.49	5.54	25	6.12	4.25	.55
34	Lightning	* Hallock	50	5.13	5.76	29	10.12	4.75	1.04
35	Major	* Henderson	75	8.14	4.52	35	13.75	7.5	2.24
36	Marblehead Marrowfat	Gregory	72	4.70	4.48	21	11.0	5.5	1.03
37	Market Garden	* Henderson	72	6.68	4.49	30	5.65	3.15	.75
38	Market Pride	* Burpee	70	5.61	3.58	19	8 0	4.25	.90
39	Marvel	* Burpee	70	7.36	4.56	33	7.9	4.9	1.16
40	McLean	* Henderson	69	7.21	4.92	36	8.2	5.0	1.18
41	Midsummer	* Henderson	68	5.63	3.56	19	7.5	5.0	.84
42	Morning Star	* Hallock	50	4.16	4.48	19	7.25	3.12	.65
43	Mummy	?	50	4.18	5.40	22	9.5	4.75	.80
44	Nott's Excelsior	Faust	54	4.03	5.20	21	9.25	5.5	.74
45	Prince of Wales	Gregory	70	9.58	4.16	40	9.25	5.25	1.77
46	Profusion	Salzer	69	5.60	5.42	30	9.75	4.25	1.09
47	Profusion	* Burpee	69	10.83	4.36	47	9.5	4.87	2.05
48	Quantity	* Burpee	67	11.63	4.26	49	9.25	4.75	2.15
49	Rural New Yorker	* Root	57	6.60	6.30	63	5.5	3.5	.73
50	Stanley	Burpee	70	10.07	5.32	54	9.75	5.25	1.96
51	Stratagem	* Gregory	66	14.75	4.62	68	12.5	6.75	3.69
52	Universal	Childs	67	6.42	5.20	33	8.4	4.0	1.07
53	Morning Star	Buist	48	3.00	5.66	17	7.0	3.25	.42
54	No. 4 Dwarf	Hicks	53	4.75	3.92	13	6.25	3.5	.60
55	Cable	Hicks	74	4.00	4.60	18	8.4	4.0	.67

*Grown from College seed.

Of the new varieties, the following are of some promise:

Budlong—Leonard. This is a strain of the First and Best or Extra Early sorts, of which it is the most productive, this season.

Charmer—Vick. Vines five feet high, and dark green. Pods rather short, broad, and somewhat curved. Peas white, smooth, and large. Season same as the Don and Admiral. It is very productive, but the pods are not very well filled, yet it is a very desirable pea.

Stanley—Burpee. Vines thirty inches high, with strong, stocky growth. Pods long, medium width and well filled. Peas white, wrinkled and large. Season same as the Abundance. It is a very promising variety.

Gladiator—Henderson. Vines forty-two inches high. Pods long and large. Peas are green, large, and smooth. Season the same as the above. Pods are extremely large and not always well filled, so the proportion of shelled peas is not large. A productive variety of the latest season.

No. 4 Dwarf and *Cable*—Hicks. These varieties were received too late in the season to be planted at the same time as the rest. The hot weather injured them too much to get an idea of their merits.

Quantity. Vines thirty inches high. Pods long, slim, numerous, and only moderately well filled. Season two days later than the Don.

Heroine has now for two years proved valuable. Season late. Vines three feet high. Pods long, numerous, and this year well filled.

VARIETIES RECOMMENDED FOR PLANTING.

Any of the early varieties will do for the first of the season, as there is very little difference between the strains.

Following these, in a few days, are the *Chelsea*, *Kent*, and *Blue Beauty*.

The *Chelsea* is quite dwarfed. Vines twelve inches high. Pods medium length, and only fairly well filled. Quality good. Rather unproductive.

Blue Beauty. Vines two feet high. It is more productive and the pods are better filled than the Chelsea.

Kent is about the same season, and very productive of peas of excellent quality, but the vines grow about four feet high, while the peas are very small size. Desirable for its quality.

Advancer is several days later than the preceding three varieties, and is more desirable. Vines thirty inches high. Pods of medium length, numerous, and well filled.

Stratagem. Vines thirty inches high. Pods three inches long, very abundant, and fairly well filled. Peas white, wrinkled, and medium large. Season the same as the Don. This comes at a season when varieties are scarce, and is the most prolific variety of any in the list.

PEPPERS.

Owing to the wet spring, the peppers were not transplanted until late in the season. Few varieties ripened fruit before time of frost. The table is therefore omitted. The following brief notes may be of use to those who wish to make a selection for garden planting.

Chili and *Coral Gem* bear small, tapering fruits of a bright red color. These varieties are the ones usually grown for use in condiments or sauces.

Cardinal and *Long Red* have larger and longer fruits of a less pungent flavor than the preceding and are largely used for pickles. *Large Bell*

and *Ruby King* have large, short fruits of dark red color; flesh thick and of mild flavor. The *Squash* pepper is very productive and free from rot. The fruits resemble a tomato in shape and color. A good variety to grow.

County Fair—Henderson. New. Plants medium in growth. Peppers $1\frac{1}{2}$ inches in diameter at base, 4 to 5 inches long, tapering to a blunt point, smooth, uniform in size. Plants very productive, but did not ripen fruit.

SQUASHES.

The squashes were planted June 13, in hills eight feet apart each way. The soil was a sandy loam and well manured. The following varieties have not been described in former bulletins:

Butman—Gregory. Vines are not of vigorous growth, or very productive. Squash small to medium in size; light green, mixed with white; flesh thick, lemon color and of best quality. Late. A good keeper.

Dunlap's Marrow—Gregory. Vines strong, vigorous, and productive. Squash dark orange-yellow, similar to Hubbard in shape. Matures early and of good quality. One of the best for fall use.

Marblehead—Gregory. Vine a vigorous grower, moderately productive. Fruit of medium size, similar to Hubbard, but apex shorter, straight; color bluish-gray; shell very hard; flesh dry and of best quality. One of the best winter squashes.

Sweet Nut—Dreer. Vine vigorous; fairly productive. Squash small to medium in size, creamy white color; flesh of fair quality. A good fall variety.

The following list which includes many well-known varieties is recommended for the purpose named:

For summer use—Strickler Summer and Bush Scallop.

For fall use—Dunlap's Marrow and American Turban.

For winter use—Hubbard, Marblehead, and Pike's Peak.

Cocoanut and Fordhook are excellent small squashes for fall and early winter use. The plants will produce a good crop, when the larger varieties fail.

TOMATOES.

The seed was sown in the forcing-house March 24. The plants were placed in the field June 7. Six plants of a variety were used for a test. From two plants in each set, the fruits were picked and weighed as they ripened. After the vines were killed by frost, the green tomatoes, remaining on the two plants mentioned, were counted and weighed. In this way the comparative productiveness of the several varieties was ascertained. In the table, not all the varieties grown are given. Only the new varieties, together with some of the older and better sorts, are tabulated.

EXPLANATIONS OF TABLE.

The first column gives the date when the first tomatoes of the variety ripened. The second column records the number and weight of ripe fruits picked from two plants during the season. In the third column the average weights of the ripe tomatoes are given. The next two columns con-

tain the number and weight of the green tomatoes picked from the two plants at time of frost. In the last two columns is given the total amount of fruit produced by the two plants.

TABLE No. 8.

Number.	Variety.	Seedsman.	Date first ripe fruits.	Number ripe.	Weight in lbs.	Average weight of ripe fruits.—oz.	Number green.	Weight in lbs.	Total number.	Total weight.
103	Acme	Gregory	Aug. 30	268	86	5+	84	13½	352	99½
107	Beauty	Rawson	Aug. 24	183	56	5—	264	47	447	103
109	Climax	Rawson	Aug. 30	314	73¼	4—	39	10⅛	353	83½
114	Optimus	Ferry	Aug. 30	159	17⅞	5—	162	32½	321	80⅜
124	Golden Queen	Rawson	Sept. 1	182	64	6—	200	41¼	382	105¼
154½	Ignotum	College	Aug. 27	152	52½	6—	219	58¼	371	110¾
161	Potato Leaf	Livingston	Sept. 12	165	68	7—	150	39¼	315	107⅛
188	Earliest	Vaughan	Aug. 19	383	83⅝	3+	14	1¼	397	85⅛
195	Turner	Maule	Aug. 29	136	61	7+	214	59¾	349	120¾
196	Volunteer	Dreer	Aug. 22	111	46	7—	170	44¾	281	87¾
197	Nichols Stone	N. & S.	Aug. 30	148	61¼	7—	171	46¾	319	108
198	Perfection	Livingston	Aug. 28	185	80½	7—	326	29½	511	110
201	Atlantic	J. & S.	Aug. 30	118	43½	6—	118	21	236	64½
203	Cumberland Red	J. & S.	Aug 29	176	67¼	6	115	25	291	92¼
212	Table Queen	Henderson	Sept. 2	119	60½	8+	89	27¾	208	88¼
217	Long-keeper	Thorburn	Aug. 30	255	94⅝	6—	275	42	530	136⅝
219	Mitchell	Gregory	Sept. 1	102	33¾	5+	330	59¼	432	93
222	Ponderosa	Henderson	Sept. 19	15	13¼	14+	167	55¾	182	69½
223	Early Ruby	Henderson	Aug. 30	256	93⅜	6—	73	16	329	109⅜
226	Nicholson	Nicholson	Sept. 2	220	49½	4—	106	10	326	59½
229	Cardinal	Vaughan	Sept. 9	71	26	6—	116	28¼	187	34¼
230	Balt. Prize Taker	Landreth	Aug. 30	78	27½	6+	66	15	144	42½
231	Money Maker	Landreth	Aug. 30	162	51	5+	38	7½	200	58½
232	Ten Ton	Landreth	Aug. 30	84	22¾	4+	142	27¾	226	50½
233	Earliest of All	Maule	Aug. 28	100	29¾	5—	65	15½	165	45¼
234	Mansfield Tree	Leonard	Sept. 12	17	13½	13—	98	38¾	115	52¼
235	Telegraph	Salzer	Aug. 30	202	55⅞	4+	55	9¼	257	65⅛
242	Golden Sunrise	Henderson	Sept. 12	114	42¼	6—	392	47	506	89¼
244	Dwarf Champion	Harris	Aug. 20	72	19¾	4+	175	28	247	47¾
246	Potomac	Harris	Sept. 3	250	84¼	7—	197	29¾	447	114
248	McCollum's Hybrid	Harris	Sept. 2	66	34½	8+	205	53¼	271	87¾
249	Potato-leaved Ignotum	College	Sept. 12	142	82¾	9+	90	26½	232	109¼
250	Picture Rock	Childs	Aug. 29	168	58½	6—	182	32½	350	91
251	Climbing	Childs	Sept. 2	78	37¼	8—	172	51⅝	250	88¾
252	Majestic	Buist	Sept. 12	150	55	6—	235	44¼	385	99¼
253	Prize Belle	Buist	Sept. 12	132	44½	6—	228	51½	360	96

As in former seasons, the *Earliest*, from Vaughan, was the first to ripen fruits. It is medium in size, slightly angular, quite firm, and of good quality. Nearly all of the fruits ripened before frost.

Volunteer and *Beauty* were next to ripen fruits, but only a few ripened early. The bulk of the crop was much later.

Early Ruby and *Cumberland Red* followed in a few days. The plants of Early Ruby are strong and very productive; fruits of medium size, somewhat angular, bright red color and of good quality. Valuable as an early variety. Cumberland Red is also a good variety.

Of the recent pink varieties, Long-keeper and Potomac confirmed the good report of last year.

The plants are productive, fruit of good size, regular form, and moderately firm. Of the older pink sorts, Beauty and Acme gave good satisfaction. Golden Queen is as good as any of the yellow-fruited varieties.

Ignotum still leads among the red varieties, but some of the pink sorts exceed it in productiveness.

Perfection is one of the best red sorts.

Ponderosa. The season is very late. From a patch of over one hundred plants we did not get a single fruit which ripened thoroughly on the vines. The tomatoes would crack and rot before ripening. To get good specimens it was necessary to pick them green, and ripen in the house. The fruit when well ripened is of good quality.

Dwarf Champion ripened a few fruits early, but the larger part of the crop did not mature before frost. The fruit is very attractive in appearance, but its fault of not ripening earlier is a serious one.

The following are sorts of recent introduction:

Cardinal—Vaughan. This is not a new variety, but has not been grown at the college for several years. Plants strong and vigorous; fruit large, smooth, somewhat flattened; flesh firm. A good shipper, but not of first quality.

Baltimore Prize Taker—Landreth. Plants of strong, spreading growth; foliage large, dark green; fruit large, spherical, slightly ribbed, light red with purple tint; flesh solid and of fair quality.

Money Maker—Landreth. Plants of medium growth, somewhat lacking in foliage; fruit large, angular in shape, somewhat flattened, bright red color, many celled and seeds numerous; flesh lacking in solidity but of good quality.

Maule's Earliest—Maule. Plants are of small growth; foliage small. The type of the fruit varies, some fruits are nearly spherical in shape, others are angular. The angular type is early, 2½ to 3½ inches in diameter, irregular in shape around the stem, but smooth enough to sell; bright red in color; flesh solid and of fair quality. Does not come up to description in catalogue. Later by ten days than Earliest from Vaughan.

Mansfield Tree—Leonard. Plants strong and vigorous; leaflets rather large, dark green; fruit 4 to 5 inches in diameter; usually ovate and irregular in shape; flesh walls very thick; cells small and contain few seeds. The fruit ripens very slowly and seldom colors all over. The plant has a tendency to upright growth, but it can not be called a tree tomato. Closely resembles Ponderosa, but the plant is of more upright growth, fruit smaller, more regular in form, and ripens better.

Telegraph—Salzer. Plants of medium growth, lacking in foliage; fruit 2½ to 3½ inches in diameter, somewhat flattened, often quite angular and

irregular in shape, still it will sell well. The plants ripened nearly all the fruit before frost. Resembles Earliest, from Maule.

Potato-leaved Ignotum—College. Plants low-growing, but vigorous; foliage potato-leaf; fruits resembles Ignotum in color and shape, but are larger. Ripens later than Ignotum.

Climbing—Childs. Plants very strong-growing and healthy, showing a tendency to climb; fruit large, somewhat irregular at stem end, pinkish-purple in color, resembling closely the fruit of Potato-leaf.

The following sorts differ but slightly from Ignotum:

Majestic—Buist. The fruit is darker and brighter red than Ignotum, and ripens later.

Prize Belle—Buist. Closely resembles preceding, but plants are not so strong-growing.

Ten Ton Tomato—Landreth. The plants are not so strong-growing as Ignotum, and the fruit has a yellowish tinge.

Picture Rock—Childs. Very closely resembles the Ten Ton, differing slightly in growth and color of fruit.

We received seeds of some of the leading varieties of tomato from Berthoud of Australia, also from Joseph Harris of Moreton Farm, N. Y.; these were planted near the same varieties grown from seeds of our own selection.

The tomatoes grown from the Australian seed were more uniform and regular in shape, and the plants slightly more productive than the same varieties grown from American seed. Between those grown from seed obtained from Harris, and our own seed, no difference was noted.

POTATOES.

TEST OF VARIETIES.

The manner of carrying on this test was the same this year as in previous years, two pounds of seed being used to thirty-three feet of row. The rows are three feet apart and the hills one foot apart in the row.

The planting was done on May 20. The soil was of fair fertility. The previous year the land was in millet. The tubers were partially grown when the drought and hot winds of August stopped further growth and the crop ripened. Those varieties that set few potatoes yielded a larger per cent. of merchantable tubers, and the varieties that set many tubers and are usually the better yielders were generally unable to mature the crop, hence a large per cent. were undersize. For this reason, only the total yield is given.

Some of the varieties have been on trial for several years, and for comparison the average yield is included for the number of years that they have been on trial.

All varieties of which the average yield is less than 100 bushels are dropped from the list.

Those seedsmen whose name is marked with a * furnished the seed to us previous to the past year, and the crop of 1892 was grown from the college seed.

The abbreviations used in the description of the tubers are as follows:

Color.
b. buff.
d. dark.
l. light.
p. pink.
pur. purple
r. red.
w. white.

Form.
f. flattened.
i. irregular.
l. long.
ob. oblong.
ov. oval.

Eyes.
d. deep.
m. medium.
n. numerous.
s. shallow.

Curtain.
(The ridge over the eyes.)
i. indistinct.
l. long.
m. medium.
s. short.

Varieties.	Seedsmen.	Growth of vines.	Date of ripening.	Yield, 1893.	Average yield.	No. of years for which the av. yield is taken.	Description of the tubers.			
							Color.	Form.	Eyes.	Curtain.
Alaska	* Alexander	17, sp.	Aug. 16	53.	166	4	w	r	s	i
Albino	* Vaughan	20, sp.	" 12	121.9	135	3	w	i ob	s	i
American Wonder	Vick	19, sp.	" 26	103.7	103	1	w	ob	m	m
Arizona	* Vaughan	18, up.	" 25	64.7	107	3	r	l f	s	l
Bannock	* Herrington	20, up.	" 30	50.2	210	4	r	l	s	m
Barstow	* Markham	17, sp.	" 12	120.	160	2	l p	ob	m	m
Beauty of Hebron	* Jerrard	18, sp.	" 10	185.	157	4	l p	ob	m	m
Ben Harrison	* Crawford	16, up.	" 12	76.	106	3	l p	l	m	m
Bliss No. 12	* College	17, sp.	" 16	43.6	112	3	l p	ob	m	d
Boley's Northern Spy	* Vaughan	19, sp.	" 20	96.	117	2	r	ob	d	l
Bonanza	* Markham	20, up.	" 16	74.8	100	2	d r	l	d	l
Boston	Salzer	18, up.	" 18	137.1	187	1	l p	ob	m	m
Brownell's Best	* Vt. Ex. Sta.	18, up.	" 20	115.9	162	4	w	ob	s	l
Brownell's Winner	* Burpee	22, sp.	" 24	88.	157	3				
Burpee's Ex. E'y	* Burpee	12, up.	" 12	95.5	125	3	l p	l	m	d
Chantauqua	* Presley	19, sp.	" 20	125.	193	2	r	l	d	l
Clark's No. 1	* Vt. Ex. Sta.	18, up.	" 18	125.9	190	5	b	ob	m	m
Copper Mine	* Herrington	18, sp.	" 24	104.8	203	4	p	ob	m	l
Cream of the Field	* Markham	16, sp.	" 24	160.3	124	2	b	ob	m	m
Cream City	Frogner	15, sp.	" 15	129.8	130	1	w	ob	s	m
Crown Jewell	* Markham	19, sp.	" 15	151.7	180	2	w	ob f	m	d
Dakota Red	* Vt. Ex. Sta.	17, up.	" 28	88.	226	4	d r	ob	d	m
Delaware	* Crawford	18, sp.	" 22	78.8	129	2	l p	ob	m	m
Dictator	* Vt. Ex. Sta.	17, sp.	" 19	55.	172	4	w	ov f	m	l
Early Harvest	* Crawford	19, sp.	" 15	97.1	183	4	p	ov	s	i
Early Maine	* Jerrard	18, sp.	" 15	111.3	131	4	p	ov	s	i
Early Mayflower	* Henderson	14, sp.	" 25	69.6	111	2	p	ov	m	l
Early Minnesota	* Presley	17, sp.	" 18	109.9	174	2	p	ov	m	s
Early Oxford	* Gregory	17, sp.	" 15	115.	221	4	l p	ob	m	m
Early Pearl	* Markham	17, sp.	" 20	221.3	208	2	p	ov	m	l
Early Puritan	* Jerrard	19, up.	" 18	180.4	173	2	p	ob	m	l
Early Rose	* Jerrard	19, up.	" 18	180.4	190	3	p	ov	m	s
E'y 6 Weeks Market	* Presley	17, up.	" 7	140.	153	2	p	r	m	m
Early Vermont	* Jerrard	20, sp.	" 28	188.	233	3	p	ob	d	l
Empire State	* Jerrard	22, up,	" 28	121.	180	4	p	ob	m	m
Everitt	* Vt. Ex. Sta.	22, sp.	" 20	120.4	201	3	d r	l	s	l
Excelsior	* Vt. Ex. Sta.	18, sp.	" 10	97.7	196	4	l p	l	m	m
Farina	* Markham	17, sp.	" 22	95.7	114	2	b	v l	s	i
Farmer's Alliance	Landreth	18, sp.	" 22	128.	128	1	p	ob	m	m
Faust's 1889	* Faust	18, sp.	" 18	95.9	184	2	p	ov	m	l
Fearnaught	* Markham	19, up.	" 18	128.8	152	2	p	ob	m	m
Feek's Ex. E'y	* Vaughan	17, sp.	" 8	104.5	152	3	l p	l	m	i
Fillbasket	Gregory	17, sp.	" 22	106.	106	1	l p	ob	s	l
Freeman	* Maule	18, up,	" 22	105.2	209	2	r	ob	d	m
Ft. Collins No. 83	* Col. Ex. Sta.	17, sp.	" 16	163.6	186	3	l p	ob	d	m
Gardner's Early	* Gardner	18, sp.	" 5	50.2	145	4	p	ov	l	s
Genesee Co. King	Jewett	17, up.	" 23	109.6	110	1	w	ov	m	m
Gov. Rusk	Salzer	18, sp.	" 24	121.7	122	1	p	ob	s	i
Green Mountain	* Vaughan	17, sp.	" 28	90.	109	3	r	o b f	m	s
Gregory No. 1	* Vt. Ex. Sta.	14, sp.	" 16	89.2	204	4	l p	l	m	m

POTATOES.—*Continued.*

Varieties.	Seedsman.	Growth of vines.	Date of ripening.	Yield, 1893.	Average yield.	No. of years for which the av. yield is taken.	Description of the tuber.			
							Color.	Form.	Eyes.	Curtain.
Gregory No. 2	* Vt. Ex. Sta.	17, sp.	Aug. 22	116.	141	3	l p	ov	m	m
Halo of Dakota	* Presley	20, up.	" 30	156.1	209	2	b	ob f	m	s
Hampden Beauty	* Markham	13, sp.	" 21	128.9	122	2	l p	ob	m	m
Hick's No. 9	D. C. Hicks	17, up.	" 15	109.	109	1	w	r	s	i
Hick's No. 12	* D. C. Hicks	17, sp.	" 12	217.8	184	2	l p	ob	s	m
Hick's No. 81	* D. C. Hicks	15, sp.	" 25	117.3	143	2	p	ob	d	d
Hick's No. 101	* D. C. Hicks	15, sp.	" 20	94.5	133	2	w	l f	s	i
Howe's Premium	* Howe	17, sp.	" 7	169.5	135	3	p	r	s	i
Ideal	* Crawford	18, up.	" 20	115.	164	3	r	r f	s	l
Imperator	* Crawford	23, up.	" 26	88.4	135	3	p	ob	m	m
Iowa Beauty	* Presley	19, sp.	" 15	226.8	191	2	l p	l	m n	m
Iron Clad	Salzer	17, sp.	" 16	108.9	109	1	p	ob	d	s
Jewell	Bessmer	19, sp.	" 19	125.	125	1				
June Eating	* A. Crane	16, sp.	" 16	136.	203	3	p	ov	m	s
Koshkonong	Leonard	19, sp.	" 19	125.	125	1	w	l f	s	l
Lazell's Seedling	* Presley	19, sp.	" 20	163.9	229	2	r	ob f	d	l
Leather Coat	* College	17, up.	" 17	88.	194	3	p	ob	m	s
Lee's Favorite	* Vt. Ex. Sta.	15, sp.	" 13	156.5	223	4	p	ob	d	s
Matchless	* Presley	18, sp.	" 22	60.5	124	4				
Mc Fadden's Earliest	* Presley	20, sp.	" 14	134.1	186	2	p	r f	d	l
Minnesota Seed No. 50	Frogner	18, sp.	" 18	176.	176	1	p	ov	d	l
Minnesota Seed No. 189	Frogner	16, up.	" 16	128.2	128	1				
Minnesota Seed No. 190	Frogner	16, sp.	" 20	145.	145	1				
Mitchell's Seedling	* Markham	17, up.	" 26	104.5	142	2	pur	ov f	s	i
Monroe's Seedling	* Farm Dept.	20, up.	" 19	164.2	204	2	l p	l	s	m
Mrs. Cleveland	* Vt. Ex. Sta.	16, sp.	" 16	166.3	238	2	p	ov	s	m
Nameless No. 1	* Farm Dept.	16, sp.	" 18	117.2	131	2	p	ov	s	m
New Queen	* Gregory	19, sp.	" 14	149.4	194	2	l p	ob	m	m
Nott's Victor	* Presley	22, up.	" 20	157.1	166	2	p	ob	m	m
Ohio Junior	* Crawford	18, sp.	" 16	121.	107	2	r	r	s	i
O. K. Mammoth	* Vt. Ex. Sta.	17, up.	" 20	92.2	130	2	w	ov f	m	l
Osceola Mammoth	Osceola Co.	16, up.	" 10	108.6	109	1	l p	ob	s	m
Paris Rose	Frogner	15, sp.	" 22	101.1	101	1	p	l	s	i
Park Region	Frogner	16, up.	" 20	108.2	108	1	l p	ob	d	l
Pearl of Savoy	* Markham	20, sp.	" 14	143.	144	1	p	ob	m	s
Peoples	* Hicks	15, up.	" 20	117.	141	2	l p	ov	m	m
Perfection	* Markham	18, sp.	" 20	109.2	173	2	l p	ob	m	m
Polaris	* Farm Dept.	18, sp.	" 20	127.6	139	5	l p	ob	s	m
Pres. Lincoln	* Gardner	17, sp.	" 17	74.5	222	4	r	r	m	l
Putnam's Early	* Vt. Ex. Sta.	20, sp.	" 12	163.	217	4	p	ov	m	l
Putnam's Select	* Vt. Ex. Sta.	18, sp.	" 19	82.5	160	4				
Queen of Paris	* Presley	18, sp.	" 15	225.0	281	2	l p	ob	s	d
Queen of the Valley	* Presley	11, sp.	" 17	76.8	134	3	p	ob	m	l
Randall's Beauty	* Vt. Ex. Sta.	18, sp.	" 19	71.	169	4	w	ob	s	i
Red Star	* T. B. Main	19, sp.	" 14	84.	116	3	p	ob	s	i
Rochester Favorite	* College	17, sp.	" 15	96.	196	4	p	ob	m	m
Rochester Rose	Henderson	8, up.	" 8	128.1	128	1	p	ob	s	m
Roger's Seedling	* Hicks	17, sp.	" 15	227.	209	2	p	ob	d	s
Rose's 74	* Markham	16, sp.	" 24	26.2	105	2	p	ob f	d	l
Rural Blush	Vt. Ex. Sta.	18, sp.	" 19	128.2	246	4	p	ov	m	l
Rural New Yorker No. 2	* Thorburn	20, sp.	" 24	97.8	112	3	r	r i	m	m
Salzer's Earliest	Salzer	19, sp.	" 15	137.6	138	1	r	r f	s	i
Signal	* Presley	16, sp.	" 22	195.5	228	2	l p	ob	m	m
Snow Drop	Henderson	18, sp.	" 19	224.7	225	1	l p	ob	m	l
Snow Queen	* Markham	18, sp.	" 20	147.	111	2	p	ov	m	l
Star Russet	* Presley	20, sp.	" 28	986.	139	2	p	ov	m	l
Storr's Seedling	* Markham	18, sp.	Sept. 4	185.6	150	2	p	r f	m	m
St. Patrick	Henderson	18, sp.	Aug. 10	108.9	109	1	p	ob	s	i

POTATOES.—*Continued.*

Varieties.	Seedsman.	Growth of vines.	Date of ripening.	Yield, 1893.	Average yield.	No. of years for which the av. yield is taken.	Description of the tuber.			
							Color.	Form.	Eyes.	Curtain.
Stray Beauty	* Jerrard	18, sp.	Aug. 10	108.9	102	3	r	r	s	i
Summit	* E. E. Stine	15, sp.	" 22	55.	256	4	r	ob	s	i
Sunlit Star	* Markham	15, sp.	" 15	145.2	159	2	r	ob	m	m
Superior	* Burpee	22, up.	" 15	92.	159	4				
Supplanter	* Presley	20, sp.	" 15	135.6	221	2	p	ob	s	s
Sylvan	* Markham	20, sp.	" 17	143.	106	2	p	ob f	m	l
Thorburn	* College	16, sp.	" 14	103.6	205	4	lp	l	m	m
Timpe's No. 2	J. T. Timpe	17, up.	" 30	131.3	124	2	p	ob	m	m
Timpe's No. 4	J. T. Timpe	17, sp.	" 16	234.9	197	2	p	l	m	m
Timpe's No. 5	J. T. Timpe	19, up.	" 31	170.	130	2	p	ob	m	l
Timpe's No. 6	J. T. Timpe	14, sp.	" 16	138.9	153	2	p	ov	m	m
Tonhocks	* Markham	17, sp.	" 20	174.	194	2	r	r	m	l
Triumph	Henderson	16, sp.	" 12	181.5	182	1				
Umpire	* Presley	15, sp.	" 30	107.7	198	2	l p	ob	d	m
Wall's Orange	* Farm Dept.	14, sp.	" 20	57.8	108	2	r	r f	m	m
Watson's Seedling	* Farm Dept.	16, sp.	" 20	164.8	159	2	p	ob	m	l
Way	* Presley	21, up.	" 22	121.9	153	2	w	ob	s	i
West's No. 1	* W. E. West	16, sp.	" 11	143.5	168	2	p	ob	m	l
West's No. 2	* W. E. West	14, sp.	" 10	98.9	111	2	l p	ob	m	m
West's No. 3	* W. E. West	15, sp.	" 18	133.5	199	2	p	ob	m	l
White Elephant	* Jerrard	20, up.	" 20	120.	164	2	l p	ob	m	m
White Flower	* Markham	17, up.	" 20	126.9	148	2	l p	ob	m	m
White E'y Ohio	* Presley	16, sp.	" 14	140.	175	2	w	ob f	s	m
White Star	* Farm Dept.	21, up.	" 20	113.	139	2	w	ob	s	i
Wixom's Seedling	*VanBenschot'n	15, sp.	" 18	62.3	117	3	l p	ob	s	l
Vick's Champion	Vick	18, sp.	" 25	132.	132	1	w	ob	m	l

The following are brief descriptions of the new varieties:

American Wonder. Strong, vigorous, upright grower. Season late. Unproductive this year. Tubers slightly longer than broad, somewhat flattened. Eyes and curtain medium. Flesh rich cream.

Boston. Strong, upright growth. Season medium, fairly productive. The tubers resemble the White Elephant. Flesh light cream.

Cream City. A spreading, medium grower. It sets many tubers, but the yield is only fair. Tubers kidney-shape to oblong. Eyes shallow. Flesh medium cream.

Farmer's Alliance. Top large, spreading. Season late. Fairly productive. Tubers many, small, oblong. Eyes shallow. Color pink.

Fillbasket. A medium, spreading grower. Season late. Vines blighted August 15 and the yield was reduced. Tubers oblong, regular. Skin rough. Eyes shallow. Curtain long, arched. Flesh light cream.

Genesee Co. King. A fairly upright grower. Suffered from the blight. Tubers white, oval, and of fine appearance.

Gov. Rusk. A good, spreading grower. Productiveness only fair.

Hicks No. 9. A good, upright grower, foliage tough and shunned by the beetles. Yield only fair. Tubers of good appearance, white. Skin smooth. Eyes indistinct.

Iron Clad. Growth spreading; season medium. Only fairly productive.

Koshkonong. Vigorous, spreading grower. Only fairly productive. Tubers rather long and somewhat flattened. Color white. It is of good appearance.

Minnesota Seedling No. 50. A spreading grower of medium vigor. Season medium. A good yielder of desirable quality. From S. Frogner, Herman, Minn.

Minnesota Seedling Nos. 189 and 190 are seedlings from the same source, but not so productive.

Osceola Mammoth. A variety from Osceola county. Something like the Early Rose, but it is a week earlier. The vines set but few tubers, all of which were of good size.

Park Region. Vines of medium growth. Sets many potatoes, but the yield was hurt much by the drought. Tubers somewhat like the Beauty of Hebron, only the eyes are much deeper. Season medium to late.

Rochester Rose. Vines made a very poor growth. Season very early. Vines killed by the heat, and potatoes all small. In a more favorable season it would probably be a good yielder. Tubers similar to the Early Rose.

Salzer's Earliest. Vines thrifty. Season, early to medium. It set many tubers, and all were even-size, but small this season.

Tubers round, flattened and red in color, which is an objection in an early potato.

Snow Drop. Poor growth of vines. Season, medium. Very productive. Tubers oval, even in size, and somewhat like the Beauty of Hebron.

Triumph. Medium strong grower, spreading habit. Season nearly a week earlier than the Early Rose. Quite productive.

Vick's Champion. A medium strong, spreading grower. Season late; only fairly productive. Tubers class with the White Elephant.

The following are varieties tried by us for the first time this year that have done poorly, the trial of which will be continued:

Bill Nye,	Hicks No. 60,	Pride of the West,
Blue Mayflower,	Hoffman,	Prize Taker,
Carpenter's Seedling,	Home Comfort,	Restaurant.
Chas. Downing,	Late Puritan,	Stanley,
Charter Oak,	Minnesota Seedling No. 18,	White Chief,
Early Wisconsin,	Minnesota Seedling No. 64,	Vanguard.
Geo. H. Price,	Negro,	
Hicks No. 22,	Ontop.	

WHAT VARIETIES TO PLANT.

Extra Early.

Howe's Premium is among the earliest varieties to ripen and is the best one of this season.

Early Six Weeks Market is equally as good, but generally a few days later than the first variety named.

Early.

Queen of Paris is the most productive variety of the list at this station for the two years that it has been raised. *Lee's Favorite, Early Oxford, Putnam's Early, Iowa Beauty, McFadden's Earliest,* and *Thorburn* are valuable.

Medium Season.

Mrs. Cleveland, formerly known as *Nott's No. 8, Snow Drop, Pres. Lincoln, Supplanter, Early Pearl, Gregory No. 1* and *June Eating* are the best of this class.

Late.

Summit is especially recommended; *Signal, Lazell's Seedling, Dakota Red, Bannock,* and *Halo of Dakota* are the best late sorts.

FERTILIZER TESTS.

The tests of fertilizers upon potatoes were the same as in the season of 1891, using the same plots and the same fertilizers for the first twenty plots.

Each plot is one rod wide and four rods long and contains four rows of potatoes. The rows are three feet apart, thus leaving seven and one half feet space between the nearest rows of adjacent plots. This space is occupied by young pear trees.

Plots twenty-one to twenty-four were in potatoes in 1891, but did not have any special treatment.

Four plots are in a row, thus—plot two is alongside of plot six, etc.

The fertilizers were applied in the row both above and below the seed.

The planting was done on May 27, and the digging and weighing was commenced on September 8.

TABLE NO. 10.—*Fertilizer Tests.*

Plot.	Fertilizer.		Yield per acre.—Bushels.					
			O. K. Mammoth.	Rochester Favorite.	Timpe's No. 2.	Watson's Seedling.	Average 1892.	Average 1891.
I.	Mulch between rows		234.6	124.2	89.5	178.1	156.6	262.6
II.	Nothing		145.4	67.8	51.3	146.0	102.6	166.9
III.	4 lbs. sulphate ammonia 10 lbs. ground bone 6 lbs. muriate potash	Under seed	144.1	93.5	98.9	183.3	130.0	221.2
IV.		Over seed	171.3	136.3	95.7	127.3	132.6	196.3
V.	Manure	Under seed	234.0	201.0	126.7	130.8	173.2	219.1
VI.	Nothing		103.0	49.5	61.0	79.0	73.1	170.6
VII.	4 lbs. sulphate ammonia 10 lbs. ground bone	Under seed	206.2	167.2	107.1	145.7	156.5	216.2
VIII.	6 lbs. sulphate potash	Over seed	108.2	128.5	74.1	64.6	93.8	171.9
IX.	1 bushel wood ashes	Under seed	57.9	57.0	116.2	91.0	80.5	163.0
X.	Nothing		46.2	35.4	45.8	91.8	54.8	172.2
XI.	6 lbs. nitrate soda 10 lbs. ground bone	Under seed	115.0	80.7	96.5	91.9	96.0	184.9
XII.	6 lbs. sulphate potash	Over seed	114.0	78.4	80.6	112.6	96.5	143.1
XIII.	Manure	Over seed	129.3	103.5	58.0	132.7	105.9	188.8
XIV.	Nothing		78.2	47.6	20.0	59.5	51.3	128.9
XV.	10 lbs. ground bone	Under seed	205.9	161.3	70.1	165.7	150.0	231.0
XVI.	6 lbs. sulphate potash	Over seed	186.2	139.2	95.5	183.1	156.0	199.3
XVII.	Nothing		39.0	58.5	13.1	71.5	45.5	115.4
XVIII.	6 lbs. sulphate potash	Under seed	68.9	49.5	25.1	115.5	64.7	194.4
XIX.	6 lbs. sulphate potash	Over seed	27.4	69.3	17.5	77.5	47.9	190.4
XX.	6 lbs. nitrate soda 10 lbs. ground bone 6 lbs. muriate potash	Under seed	162.2	140.2	40.4	113.7	114.1	186.0
XXI.	4 lbs. sulphate ammonia 10 lbs. dissolved bone-black 6 lbs. muriate potash	Under seed	125.8	115.8	52.2	116.4	102.5	178.2
XXII.	4 lbs. sulphate ammonia 10 lbs. dissolved bone-black	Under seed	165.6	109.7	55.3	159.7	122.4	198.2
XXIII.	10 lbs. dissolved bone-black 6 lbs. muriate potash	Under seed	139.6	148.0	31.7	102.3	105.4	147.2
XXIV.	Nothing		100.8	107.5	27.0	99.6	83.7	.....

The yields on all of the plots are less this year than last year. This is due more to the season than to the exhaustion due to the raising the same crop on the same ground two years in succession, although some of the plots show that certain elements are partially exhausted.

Fertilizers under the seed produced the best results in 1891, and in 1892 fertilizers over the seed did the best. The different conditions of the two years explain the difference. This past season was very wet, and the plant food was carried down to the roots, and as the plots had the same fertilizers applied the previous year, the food elements remaining unused in the soil were not all above or all below the seed, but thoroughly mixed with the whole body of the soil. So the plots with the fertilizers applied above or below the seed do not represent this one condition exactly, but from the position of the feeding roots of this potato, we advise using the fertilizer under the seed.

The yields of the different plots compared with each other is about the same this past season as in 1891; so for convenience of further study the yields of the two years are united in the following table.

TABLE No. 11.—*Yields of fertilizer plots, bushels per acre—Average for two years.*

Plot.	Yield.	Yield illustrated. 50 100 150 200	Treatment.
I.	209.6		Mulch.
II.	134.7		Nothing.
III.	175.6		4 lbs. sulphate ammonia. 10 lbs. ground bone.
IV.	164.4		6 lbs. muriate potash.
V.	196.1		Manure.
VI.	121.8		Nothing.
VII.	186.3		4 lbs. sulphate ammonia. 10 lbs. ground bone.
VIII.	132.8		6 lbs. sulphate potash.
IX.	121.7		1 bu. wood ashes.
X.	113.5		Nothing.
XI.	140.4		6 lbs. nitrate soda. 10 lbs. ground bone.
XII.	119.8		6 lbs. sulphate potash.
XIII.	147.3		Manure.
XIV.	90.1		Nothing.
XV.	190.5		10 lbs. ground bone.
XVI.	177.6		6 lbs. sulphate potash.
XVII.	80.4		Nothing.
XVIII.	129.5		6 lbs. sulphate potash.
XIX.	119.1		
XX.	150.		6 lbs. nitrate soda. 10 lbs. ground bone. 6 lbs. muriate potash.
XXI.	140.3		4 lbs. sulphate ammonia. 10 lbs. dis. bone-black. 6 lbs. muriate potash.
XXII.	160.3		4 lbs. sulphate ammonia. 10 lbs. dis. bone-black.
XXIII.	126.3		10 lbs. dis. bone-black.

In examining the yields in detail, attention is called to the fact that each row contains a nothing plot. Observe that the yields of these nothing plots decrease gradually from the first until the last. The soil in each row seems to be very uniform, and the nothing plot of that row should be used as a base of comparison for the plots of that row, and to compare the plots of different rows it should be done by comparing the gains of the plots over the nothing plots of those rows. The following table shows the gain of the fertilized plots over the nothing plots.

TABLE No. 12.—*Gain per acre in bushels of fertilizer plots over nothing plots.*

Plot.	Gain.	Gain illustrated. 25 50 75 100	Treatment.
I.	74.9		Manure.
V.	74.3		
XIII.	57.2		
III.	40.9		Complete fertilizer.
IV.	29.7		
VII.	64.5		
VIII.	11.0		
XI.	26.9		
XII.	6.3		
XX.	79.6		Ground bone and potash.
XV	100.4		
XVI.	87.5		
IX.	8.2		Ashes.
XVIII.	49.1		Potash.
XIX.	38.5		

The action of the mulch was not as beneficial this season as in 1891. It held the moisture when the ground was too wet already. The plots treated with manure presented a very thrifty appearance during the whole season. They seemed to rid themselves of the surplus water in June, and they stood the drought well in August. The yield of plot XIII was not so large as the appearance of the vines would indicate.

The difference between the treatment of plots III and IV from that of plots VII and VIII is that the former contain muriate of potash and the latter sulphate of potash. The latter two average 2.4 bu. per acre more than the former, which is not enough difference to form a definite conclusion, but as the sulphate is cheaper than the muriate, its use would be more economical. Plots VII and VIII differ from plots XI and XII in regard to treatment, in that the former contained sulphate of ammonia, and the latter nitrate of soda. The gain of the former two over the latter two is 21.1 bu. per acre, which tends to prove the superiority of sulphate of ammonia over nitrate of soda. Plot XX has the nitrate of soda combined with the muriate of potash instead of the sulphate of potash, as in plot XI (plot XX has the fertilizer applied under the seed hence it can be compared only with plots that have the fertilizer applied likewise). It has been previously shown that muriate and sulphate of potash produce nearly similar results. If this is true plots XI and XX should show the same gain, but there is 52.7 bu. per acre difference in

their gain over their nothing plot which shows that the trials are not carried far enough yet to draw definite conclusions. Plots XV and XVI treated to ground bone and sulphate of potash have produced better results than the same fertilizers with nitrate of soda added, as in plots XI and XII, or with sulphate of ammonia added, as in plots VII and VIII, which seems to show that a fertilizer rich in nitrogen is an injury to the potato crop. This point should be more thoroughly investigated.

Our experiments and those of others[1] have led to the following conclusion, *that on fairly rich soil the addition of nitrate of soda or sulphate of ammonia to bone and potash is done at a financial loss if not at a reduction in yield.*

Plots XVIII and XIX with potash alone gave a very profitable increase over the nothing plot in 1891, but it had much less effect in 1892, although there was still an increase. Comparing these two plots with plots XV and XVI in the first table of fertilizer tests, it will be seen that potash alone increased the yield to within 9.6 bu. per acre, as much as the potash and bone combined, the latter giving an average increase of 86.6 bu. over the nothing plot of that row, the former an increase of 77 bu. This shows that potash was the element largely needed in the soil. The yield of 1892 shows that the phosphoric acid in plots in XVIII and XIX has become largely exhausted, as the gain of the potash and bone plots had increased over the previous year, and the gain of the potash plots had largely decreased.

Plot IX, to which was applied one bushel of wood ashes, produced less than the nothing plot in 1891 and a gain of 25.7 bu. in 1892, which may seem at a variance to plots XV and XVI, for ashes contain potash and phosphoric acid, the two substances that seem essential on our soil; but ashes have a tendency to *harden* and *compact* the soil, which on our clay loam counteracted the beneficial action that it might otherwise have effected.

The conclusions are summarized as follows:

1. Considering the cost, manure is more profitable than commercial fertilizers.
2. Coarse manure is best used as a mulch.
3. Ground bone and potash furnish all the elements needed on the average farming land.
4. Nitrate of soda or sulphate of ammonia is added to the above at a loss.
5. Sulphate of potash will give as large an increase as muriate, and as its cost is one third less, it is to be preferred as a fertilizer.
6. Fertilizers unless especially prepared for potatoes, are applied at a loss, as they contain too much nitrogen.
7. Fertilizers prepared for potatoes should consist largely of potash and phosphoric acid, with from three to four times as much of the former as the latter.

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[1] The report of the R. I. experiment station for 1890, p. 25, shows a reduction in yield from 144.66 bu. to 55 bu. per acre by the addition of sulphate of ammonia to ground bone and muriate of potash.

N. J. bulletin No. 80 shows that the addition of nitrate of soda to bone-black and muriate of potash increased the yield 2.6 bu. per acre in one case, and reduced it 1.7 bu. in another, and 6.1 bu. in the third case.

POTATO SCAB.

This is the name applied to a diseased condition of the tubers in which the skin has a distended appearance similar to a scab, or where the skin and a part of the tuber is destroyed leaving a cavity in the tuber.

Wire-worms, grubs, mites, etc., have been found eating the decaying matter in the cavities, or it may be possible they add to the injury, but it is not true that they are the cause of the disease.

The disease is caused by a parasite.[1] There may be more than one form of the disease; one forming the deep scab or the cavities, and the other the surface scab, although this point is not settled at present. Prof. Bolley, from his experiments of 1891, made the following summary:[1]

"1. Scabby or disease-bearing seed tubers can and will under ordinary circumstances produce a diseased crop.

"2. Seed tubers free from the disease germs will in any soil—sand, clay, or muck—raise an undiseased product, provided only that the soils themselves are free from the disease.

"3. The seed germs can remain from crop to crop in the ground.

"4. By soaking the seed tubers before planting in certain chemical solutions I have been enabled to raise an undiseased product, whenever the ground was known to be free from disease."

From these conclusions, it is seen that, if the germs of this disease on the seed potatoes are destroyed and the potatoes are planted on soil free from the germs, the resulting crop will be free from the scab. Soils that contain the germs are those on which diseased potatoes have been raised, but the length of time that the germs will remain dormant in the soil is not known, so it is impossible yet to tell how long before the soil once affected is again free from the disease. The disease is carried by manure containing potato tops of affected tubers, or litter from around potato pits, and by tools in cultivating growing potatoes where one end of the rows is free from the disease and the other end affected.

The best method of destroying the germs of the disease is by soaking the seed in *corrosive sublimate* (bichloride of mercury). Purchase two ounces of this substance at a drug store, pour it into a vessel containing two gallons of hot water and stir frequently until it is dissolved; to this add thirteen gallons of water. After freeing the seed potatoes that are to to be treated, from the surplus dirt, plunge them into this solution and leave for one and one half hours.

If a person is to treat the seed very extensively, gasoline barrels sawed in two will make convenient receptacles. The seed can be immersed by setting wicker baskets containing the tubers in the solution; by using three of these receptacles a person can soak the seed as fast as the cutting is done. It is immaterial whether the seed is soaked before or after cutting. All seed soaked should be planted or destroyed. The solution should not be placed in metallic vessels.

Prof. Bolley's * experiments of 1892 have more than confirmed the value of this treatment. Treated seed gave a crop, of which 99.33 per cent. were free from the scab, while of the product from the untreated seed less than one per cent. were free from the scab. He says, "that not only are the tubers affected, but the base of the vine as well, which results in a

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[1] North Dakota bulletin No. 4, from which the material of this subject is largely gleaned.
* Science, Dec. 23, 1892, p. 355.

short-lived vine; a greater number of tubers set upon the vines than there would be under normal conditions, and the tubers will be much smaller." Potato growers should try this simple remedy. The yield will be increased and the product secured will be much more salable.

POTATO BLIGHT.

This is the name commonly applied to the disease that causes the potato rot (phytophthora infestans), for which the Bordeaux mixture sprayed upon the vines during the growing season is a remedy.

Another disease that has affected the potato vines at the college, during the past two seasons, resembles the true potato blight somewhat, but the Bordeaux mixture does not check it.

Persons, unacquainted with this new potato disease, seeing the vines dying, would think that his potatoes were struck with the blight, and knowing that the Bordeaux mixture prevents the blight, would apply it, probably without effect.

This new disease may attack the vines earlier in the season than the true blight. It may appear in June or not until July or August. The true potato blight does not make its appearance, generally, until after the middle of July, and the latter is much quicker in its action, the vines dying down in a very few days, while the former requires about ten days to complete its action. The leaves die first at the tips, working slowly back until the whole leaf finally becomes involved, the leaf withering and curling up as the disease progresses.

The most noticeable difference between the two diseases is that with the true potato blight the under side of the affected leaf is covered with a grayish mold, which is apparent to the naked eye; with the other disease, no such mold is found.

This department will be glad to receive specimens of diseased vines next season, from persons in doubt as to the nature of the diseases that may affect their potatoes, and will gladly inform inquirers as far as our knowledge will permit, as to the causes and remedies.

L. R. TAFT.
H. P. GLADDEN.
R. J. CORYELL.

AGRICULTURAL COLLEGE, MICH., *February 1, 1893.*

FRUIT NOTES.

Bulletin No. 92, March, 1893.

This station, with a sub-station in the Lake Shore fruit belt at South Haven, has excellent facilities for testing new varieties of fruit. The results of the past season's work at South Haven will be found in Bulletin No. 88, published in December, 1892.

This bulletin contains the notes on some of the small fruits grown in the college gardens the past year.

STRAWBERRIES.

The strawberries tested number about one hundred and seventy-five varieties. In the spring of 1892 eighty additional new sorts were set out. A large proportion of these were sent here by the originators for trial before placing upon the market. Many are unnamed seedlings. When obtainable the number of plants tested is twenty-four.

The following table includes the more promising of the varieties grown. None of the sorts planted last spring are given:

TABLE No. 1.—*Strawberries.*

ABBREVIATIONS.

Form.				Size.		Color.	
b. broad.	l. long.			s. small.		b. bright.	l. light.
c. conical.	o. ovate.			m. medium.		c. crimson.	r. red.
d. depressed.	r. round.			l. large.		d. dark.	s. scarlet.
i. irregular.							

Variety.	Sex.	Vigor (1—10).	Date of bloom.	First ripe fruits	Last fruits.	Productiveness (1—10).	Size.	Form.	Color.	Quality.	Firmness.
Alpha	b	7.3	May 24	June 13	July 6	9	m	c	l c	8	6
Amateur	b	7.5	" 28	" 20	" 12	7	m	b	s	7	8
Arlington	p	9	" 27	" 20	" 12	9	m	r c	s	8	8
Auburn	p	9.8	" 30	" 20	" 6	8	m	o c	l c	9	8
Augur No. 70	b	8	" 29	" 20	" 12	7	m	c	c	10	9
Banquet	p	7.5	" 25	" 14	" 1	6	m	c	d c	10	6
Barton's Eclipse	p	10	" 25	" 13	" 6	10	s to m	o	l c	8	8
Beder Wood	b	9.9	" 21	" 20	" 6	10	s to m	r	l c	7	8
Belle	b	9	" 22	" 23	" 8	9	m to l	l c	b s	8	9
Belmont	b	8.5	" 30	" 20	" 1	6	m	l o	b c	9	10
Boynton	p	10	" 20	" 16	" 6	9	s	o	l c	8	8
Bubach No. 5	p	9.8	" 25	" 16	" 6	8.5	l	d c	l c	9	8
Burt	b	7.8	" 28	" 14	" 6	6	m	r d c	l s	7	9
Charleston	p	2	" 30	" 20	" 1	4	m	r c	b r	8	8
Cling To	b	10	" 25	" 22	" 7	6	m	o c	l c	8	9
Clinton	b	9.5	" 25	" 23	" 6	9	m	b c	d s	8	8

TABLE No. 1.—CONTINUED.

Variety.	Sex.	Vigor (1–10).	Date of bloom.	First ripe fruits.	Last fruits.	Productiveness (1–10).	Size.	Form.	Color.	Quality.	Firmness.
Clond	p	9.5	May 27	June 23	July 6	9	m	r c	d r	8.5	9
Crawford	b	9	" 25	" 23	" 6	8	m	r c	s	9	9
Crescent×Glendale	p	9	" 30	" 23	" 6	8	m	r c	c	7	9
Crescent	p	9	" 17	" 13	" 6	9	m	r c	b	7	8
Cumberland	b	5	" 29	" 23	" 12	6	m	r c	l c	8.5	7
D. & D.	b	9	" 20	" 20	" 1	7	m	r c	d c	8	8
Daisy	b	8.8	" 29	" 20	" 6	9	m	r c	l s	8	7
Dew	b	7	" 2	" 20	" 6	8	l	i	d c	8	9
Dubois	b	7	" 25	" 23	" 1	4	m l	r	d r	8	8
Edgar Queen	b	8.5	" 28	" 20	" 6	9	m l	i r c	l c	6	8
Eureka	p	9.4	" 28	" 23	" 6	9	m	r c	d c	7	8
Felton	b	9.5	" 25	" 20	" 6	7	m	r c	b c	8	9
Florence	b	4	" 31	" 23	" 6	8	m	r c	b c	7	8.5
Gandy	p	9.8	" 28	" 20	" 12	9	m-l	r b c	l c	9	8
Gen. Putnam	b	9.9	" 21	" 20	" 12	10	m-l	r	l s	8	8
Gillespie	b	9.8	" 25	" 20	" 1	7	m	o c	l c	8	7
Great Pacific	p	10	" 25	" 20	" 6	9.5	s to m	d c	r	9	6
Hart's Minn	b	8.5	" 25	" 23	" 6	8	m-l	r b c	s	8	8
Haverland	p	8.9	" 21	" 14	" 6	9	m	l c	s	8	8
Hovey's Seedling	p	4	" 28	" 20	" 1	8	m	r c	c	9	8
Jessie	b	9	" 25	" 16	" 6	8	m-l	r c	d c	7	9
King No. 2	b	9.5	" 30	" 20	" 6	8	m	r c	l c	8	8
Lady Rusk	p	7	" 24	" 16	" 1	7	m	r c	d c	7	8
Lida	p	9	" 24	" 20	" 6	8	s to m	r c	b c	7	8
Little No. 5	b	10	" 25	" 20	" 6	7	l	l c	c	8	8
Little No. 6	b	9.5	" 28	" 20	" 12	9	m-l	r c	d c	7	7
Little No. 15	b	9.8	" 25	" 20	" 6	9	m	b c	c	9	8
Logan	p	7.5	Jnne 1	" 20	" 6	9	m	r d c	b c	8	7
Loudon No. 15	b	9	May 25	" 20	" 1	8	m-l	r c	l c	8	8
Lovett's Early	b	9	" 25	" 20	" 6	9	m	r c	b c	8	8
Lower	b	9.9	" 30	" 20	" 6	9	l	r c	s	8	8
Maggie	b	7	" 19	" 20	" 6	4	m	b c	b s	8	8.5
Martha	p	10	" 25	" 20	" 6	9	m	r d c	d r	7	7
Michels	b	10	" 17	" 13	" 28	5	s	c	b s	7	7
Miner	b	8.5	" 25	" 20	" 6	9	m to l	c	d s	8	7
Moore's Early	b	9.6	" 24	" 20	" 6	8	m to l	b c	b s	8	8
Mrs. Cleveland	p	10	" 25	" 20	" 6	10	m	r b c	b s	8	8
Muskingum	b	10	" 28	" 23	" 12	9	m to l	d c	d r	8.5	7
Oliver	b	10	" 29	" 23	" 12	6	m	r c	d c	6	9
Ohio	p	7	" 25	" 23	" 6	8	l	c	c	8	8
Parker Earle	b	9.8	" 24	" 23	" 6	9	m	l c	b s	8	8
Pearl	p	10	" 25	" 20	" 6	10	m	r c	c	8	9
Princess	p	8.8	" 29	" 19	" 6	8	m l	r	s	9	8
Price's Seedling	b	9.9	" 25	" 16	" 7	9	m	c	l c	9	8
Pride of Albany	b	3.5	" 30	" 23	" 6	8	m	r b c	d c	8	7
Sa ie	p	10	" 21	" 14	" 12	10	m	r c	d c	7	8
Saunders 10	b	9	" 30	" 23	" 12	7	m-l	l c	b s	7	8
Sharpless	b	9.7	" 25	" 16	" 6	8	m	b c	b c	8	6
Shaw	b	9	" 25	" 20	" 1	7	m	r b d	b c	9	8
Stayman No. 1	p	9.5	" 28	" 13	" 6	10	m	r o	l s	8	6
Stimmel No. 15	p	8	" 27	" 23	" 6	8	m	b c	l s	9	8
Stimmel No. 20	p	8	" 30	" 23	" 6	6	s m	l c	d c	9	8
Tippecanoe	b	5	" 30	" 22	" 1	7	m	r	b s	9	8
Townsend No. 3	p	8 7	" 21	" 23	" 6	8	s	r d	d c	7	8
Townsend No. 19	p	9	" 21	" 20	" 6	9	m	r d	b s	8	8
Van Deman	b	5	" 19	" 23	" 1	4	m	r c	l c	8	8
Viola	b	9.5	" 30	" 20	" 12	8	m	c	l c	6	8
Waldron	p	9	" 28	" 20	" 12	9	m	r c	b s	8	8
Walton	p	7.5	" 20	" 16	" 1	5	s	r	s	8	8
Warfield No. 2	p	7	" 21	" 16	" 1	5	m	r c	b c	8	7
Westbrook	p	9.5	" 25	" 14	" 1	8	m	c	d c	8	9
Woodruff No. 1	b	4	" 21	" 23	" 6	6	s m	l c	d c	6	8
Woolverton	b	5	" 28	" 23	" 6	5	m	l c	d c	8	9
Yale	b	6.5	" 28	" 23	" 6	7	m	r c	d c	8.5	9.5
Zanesfield	b	9.9	" 18	" 20	" 6	9	m	o r	l c	8	7

To test the comparative productiveness of some of the leading varieties, a row, twenty rods long, of each sort, was planted in the spring of 1891. The previous fall a row of Bubach, Haverland, and Pearl had been set out for comparison with spring-set plants. The fall-set plants make up the row first given in the table below. The plat was well manured before the plants were set out and given good cultivation afterward. When the ground was frozen the plants were covered with marsh hay. In the spring the covering was removed from the plants and allowed to remain in the rows as a mulch.

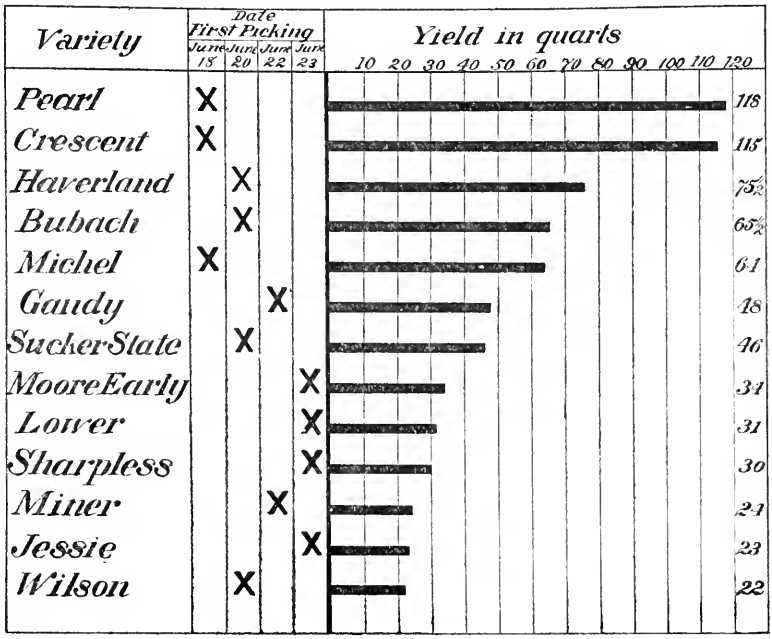
The following table gives the crop obtained:

TABLE No. 2—*Dates of picking.*

Variety.	June 18.	June 20.	June 22.	June 23.	June 24.	June 25.	June 28.	June 29.	July 1.	July 2.	July 5.	Total.
*Bubach, No. 5	.....	4	13	20	.....	8	15	.....	8	2	.....	70
Bubach, No. 5	.....	5	22	1½	4	7	15	.....	5	1	½	61
Crescent	12	14	8	29	.....	22	.....	24	.....	6	.....	115
Gandy	.....	.....	12	8	.....	8	8	.....	8	4	.....	48
*Haverland	.....	8	.....	36	.....	9	13	.....	9	.....	1	76
Haverland	.....	8	16	16	.....	14	.....	12	4	4	1	75
Jessie	.....	.....	.....	14	.....	4	.....	3	.....	2	.....	23
Lower	.....	.....	.....	4	.....	6	.....	12	4	4	1	31
Michel and Osceola	28	12	.....	6	16	.....	.....	2	.....	.....	.....	64
Miner	.....	.....	4	4	.....	.....	.....	14	.....	2	.....	24
Moore's Early	.....	.....	.....	8	16	.....	.....	8	.....	2	.....	34
*Pearl	.....	12	.....	44	.....	18	20	.....	16	5	3	118
Pearl	2	20	6	34	6	.....	24	20	.....	6	.....	118
Sucker State	.....	2	7	.....	.....	17	.....	16	.....	4	.....	46
Sharpless	.....	.....	.....	8	.....	5	.....	15	.....	2	.....	30
Wilson	.....	8	.....	.....	6	.....	.....	8	.....	.....	.....	22

* Fall set plants.

The following diagram shows at a glance the earliness and productiveness of the varieties in the preceding table:



A few of the more promising of the new varieties, together with some older sorts, were chosen to note productiveness. Twenty-five plants of each sort were taken, as this number usually comprises a variety test. The berries were picked as they ripened and the date and quantity gathered noted.

TABLE No. 4.—*Dates of picking.*

Varieties.	June 20.	June 22.	June 23.	June 25.	June 29.	July 1.	July 2.	July 5.	Total.
Barton Eclipse	1		2½	2	3				8½
Boynton	3¼	1	3	4	4			½	8
Cling To			¾	1	2½				4¼
Daisy	¼		1½	1½	2			½	5¾
Great Pacific	¾	1¼	1	2½	2				7½
Hart's Minnesota	1¼	1	½	1	3			½	7¼
King No. 2			¾		2	½		½	3¾
Lida	¾		1	1	2½			¼	5½
London No. 15			2	½	2	½		½	5½
Martha			2	1¼	5	2			10¼
Mrs. Cleveland	3½		3½	2	3				12
Muskingum	¾	1		2	3			1	7¾
Price's Seedling	2			2	2		1	¾	7¾
Princess	1		2¼		2				5¼
Sedie	3		4	3½	7	½		½	18½
Waldron		½	1½	1½	1½				5
Welch			2	1½	½		½		4½
Woolverton	1		4	1	4½		1	1	12¾
Zanesfield			1	2	1½			½	5

DESCRIPTION OF VARIETIES.

NEW. PROMISING.

Banquet was received from J. R. Hawkins, Mountainville, N. Y. The plants are not very vigorous, and but moderately productive. The fruit is of medium size, beautiful color, and regular form. Its appearance and high quality make it a very desirable home variety.

Little No. 6 and No. 15. From John Little, Granton, Ont. The plants of these varieties are of very strong and healthy growth. The fruit is large, of good color, regular form, firm, and quality good. They are worthy of trial as market varieties.

Loudon No. 15, from John Little. A variety promising well and worthy of a name.

Martha, from Matthew Crawford, Cuyahoga Falls, Ohio. Plants of strong, vigorous, and healthy growth. Fruit-stalk long, slender, and reclining. Fruit of medium size, rather small at close of season, dark crimson color, moderately firm, acid flavor. Very productive.

Princess. Plants vigorous and healthy. Fruit round, short, conical, sometimes irregular in form, bright scarlet color, and of excellent quality. Lacking in firmness. Productive.

Price's Seedling, from C. A. Green, Rochester, N. Y. Plants healthy, vigorous, and productive. Fruit long, conical, usually with a neck, bright scarlet color, excellent in quality and moderately firm. Regard it as a good berry.

Sadie, from Cleveland Nursery Co., Lakewood, Ohio. A great plant-producer. Plants vigorous and healthy. Fruit medium-size, round, coni-

cal, dark crimson color, of good quality, and moderately firm. Very productive. Valuable.

Thompson No. 23, from Cleveland Nursery Co. This variety was not in a favorable location for a thorough test. The fruit is of medium size, round, conical form, dark crimson color, and of good quality. It is a promising berry.

Westbrook. Plants received from L. J. Farmer, Pulaski, N. Y. Plants fairly vigorous, slightly attacked with fungus. Fruit medium size, conical, dark crimson color. firm. Valuable for earliness and handsome appearance.

Boynton, from Matthew Crawford. Plants quite vigorous but of slender growth. Fruit-stalk slender, reclining. Fruit medium in size, conical, regular form, crimson color, moderately firm, and of acid flavor. Productive, but the last of the crop is small in size.

The above mentioned varieties have been on trial for two or more years and have not been described in previous bulletins. They comprise the *few* among the *many* varieties on trial that are of special merit. The new varieties set out in the spring of 1892 will be given careful attention during the coming season and the results given in next year's bulletin.

VARIETIES REPORTED FAVORABLY IN 1892.

The following varieties were favorably reported upon in bulletin No. 81. published in March, 1892. The past season's trial warrants us in again placing their merits before the public. For an extended description of the varieties see Bulletin No. 81.

Arlington, Daisy, Lovett's Early, Mrs. Cleveland, and Townsend No. 19. Plants vigorous and productive. Promise well as early market sorts.

Belle, Crescent × Glendale, Florence, Muskingum, Saunders, Stimmel No. 15, and Woolverton are somewhat later than the sorts preceding, but are well worthy of trial as market varieties.

Lida, for hill culture, on rich, heavy soil, with good cultivation, is an excellent variety.

Cling To, Edgar Queen, Great Pacific, King No. 2, Stayman No. 1. Townsend No. 3, Waldron and Zanesfield possess many valuable qualities but require further trial.

VARIETIES OF DOUBTFUL VALUE.

Most of the following sorts have been on trial for several years. While each possesses some valuable qualities, there are so many *better* sorts that they have been placed in the doubtful list.

Lady Rusk, Tippecanoe, Woodruff No. 1, and Yale lack vigor of plant and fruitfulness.

The plants of the following varieties are vigorous and usually healthy. but they are not up to the standard in productiveness: *Acme, Auburn, Bubach No. 34, Clinton, Cloud, Dew, Loudon No. 34. Logan, Little No. 5, Ohio, Oliver, Shaw and Welch.*

Barton Eclipse. The plants blossomed very full and gave promise of a large crop of fruit, but soon they were badly attacked with fungus. The fruit lacks firmness and quality.

Beder Wood. The plants are vigorous and gave a large crop of fruit, but soft and of poor quality.

D. & D. Last year this variety was promising. The plants lacked in productiveness this season.

Dubois. Plants lack somewhat in vigor. Fruit large, rich, dark color, of excellent quality, but soft. Lack productiveness.

Eureka. Plants vigorous. Produced a fair crop, but fruit of light color and soft.

Gen. Putnam. Plants vigorous and fairly productive. Fruit of medium size, light color, and of poor quality.

Howard No. 6 and Prince of Berries. Plants vigorous. Fruit of good color and quality. Lack productiveness.

Van Deman. The plants the past season showed lack of vigor and fruitfulness.

VALUELESS.

The following sorts do not possess sufficient merit to warrant further trial: *Charleston, Everbearing, Gillespie, Loudon No. 29, Mammoth, Pioneer, and Porter's Seedling.*

NOTES ON MARKET VARIETIES.

The following notes on some of the better known market sorts are made up, partly from our own experience and partly from the opinions of growers in different sections of the state, and may be of value to the general planter.

Alpha. Hardy, vigorous, and fairly productive. A good early market berry.

Bubach No. 5. Plants vigorous. Fruit large, handsome appearance, but not of high quality. A good seller and profitable for near market.

Cumberland. An old berry, but still a favorite for home use and near market.

Crawford. A comparatively new sort. Fruit large, handsome, and firm. Lacks somewhat in productiveness. Needs further trial.

Crescent. Though lacking in quality, its vigor and productiveness place it at the head of the list for market.

Enhance. A good yielder, but on account of its irregular shape does not sell well. Particularly desirable on lands subject to late frosts.

Gandy. A moderate bearer. Valued for its large, handsome fruit and lateness in ripening.

Haverland. Productive. Fruit of handsome appearance and a good seller in a near market.

Jessie. Did not meet expectations and is now nearly superseded, though a good berry if given extra care.

Michel's Early. Very early. Yields about half a crop, but brings good prices because of its earliness. The crop is exhausted by two or three pickings, A good pollenizer.

Parker Earle. Rather late. Productive. A very promising market variety, destined to be largely planted. In some localities it is not so well spoken of.

Pearl. Plants hardy and vigorous. Productive. Fruit firm and of handsome appearance. Holds its size to end of the season. In some localities it is attacked with rust.

Sharpless. Still holds its place as a berry for home use and near market.

Warfield. By many regarded as the coming early market berry. It certainly promises well in most localities, but should be given further trial before fully determining its place.

Wilson. An old sort and still largely planted. In some seasons and localities almost a failure on account of rust.

LIST FOR HOME PLANTING.

Alpha, Cumberland, Sharpless, Parker Earle, Gandy.

LIST FOR MARKET.

Crescent, Pearl, Haverland, Bubach, Parker Earle, Warfield.

RASPBERRIES.

In the following table not all the varieties grown are given. A few of the well known sorts, together with such new varieties as have fruited for two or more years, are tabulated.

TABLE No. 5.—*Raspberries—Black and Hybrids.*

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. Scale (1-10).	Date bloom.	First ripe fruits.	Last fruits.	Productiveness. Scale (1-10).	Size.	Form.	Color.	Quality.
Ada	7	June 13	July 20	July 30	7	m	r	g b	8
Caroline	5	" 12	" 16	Aug. 1	8.5	m	r	l o	8
Conrath's Early	9	" 7	" 6	July 24	9	l	r	b	8
Cromwell	8.5	" 7	" 6	" 26	8.5	m	r	b	8
Centennial	5	" 10	" 5	" 20	9	m	r	g b	7
Gregg	8.5	" 13	" 18	Aug. 5	8	l	r	b pu	6
Hopkins	8	" 10	" 11	July 26	8.5	m	r	b pu	7
Kansas	9	" 8	" 5	" 24	9.5	l	r	g b	9
Kellogg	6	" 9	" 11	" 27	9	m	r	b pu	8
Lovett	9	" 10	" 5	" 22	8	m	r	b	9
Mammoth Cluster	8	" 11	" 18	Aug. 3	9	m	r	b pu	8
Nemaha	8.5	" 13	" 15	July 27	8.5	l	r	b pu	6
Ohio	9	" 12	" 14	Aug. 1	9	l	r	b	6
Older	9	" 11	" 11	July 28	8	l	r	b	7
Palmer	7	" 10	" 8	" 23	5	s m	r	b	8.5
Progress	8	" 11	" 11	" 23	5	m	r c	b	8.5
Surrey	7	" 13	" 10	" 24	4	m	r	b pu	7
Sweet Home	7	" 13	" 3	" 22	7	m	r	g b	7
Souhegan	7.5	" 11	" 7	" 23	9	m	r	b	8
Shaffer	9	" 16	" 16	Aug. 8	8.5	l	r o	p	9
Tyler	8	" 8	" 6	" 4	9	m	r	b	8
Virginia	9	" 7	" 6	" 25	8.5	l	r c	b	8.5

NEW VARIETIES.

Conrath's Early. Plants from Conrath Bros., Ann Arbor. Bush strong growth. Berry large, round, jet black, firm, has a sprightly acid flavor. Ripens early. Productive. A promising variety.

Kansas, from A. H. Griesa, Lawrence, Kansas. July 5 first fruits ripening. Bushes vigorous, healthy, and bearing a full crop. July 11 the crop is at its best. Berry large, glossy black, firm, and good in quality. This was the most productive black-cap grown this season. July 22 the last picking was made. Toward the close of the season many of the berries were small and imperfect. Seems to be worthy of general planting.

Lovett's Early. J. T. Lovett, Little Silver, N. J. July 6 first berries ripening. Bushes vigorous and give promise of a fair crop of fruit. The crop at its best July 11. Berries of medium size, black, of good quality; seeds small. The crop does not fulfill the promise given early in the season. The last pickings are under-size and imperfect. Moderately productive.

Cromwell. Plants from Hale Bros., South Glastonbury, Conn. July 6 the first picking was made. Bushes vigorous and fairly productive. July 12, crop at its best. Fruit round, conical, lacking in firmness, but of good quality; seeds small. July 20 the last fruit ripe. Nothing especial to recommend the variety.

Older, from J. T. Lovett. July 11, first picking. The most of the berries were ripe July 16. Bush vigorous, of low-spreading growth. Berry round, jet black, large, firm, has an acid flavor. Moderately productive.

Palmer. Plants from C. A. Green, Rochester, N. Y. The bushes made but little growth during the season and bore but few berries. Needs further trial.

Progress, from Lovett. The bushes made a good growth and are doing well. Needs further trial.

Surrey. Plants from Cleveland Nursery Co., Rio Vista, Va. First fruits ripening July 10. Bushes are small and made but slow growth during the season. July 16, most of the crop ripe. The bushes were not productive this season. Berries medium in size, resembling Gregg in form and color, firm.

Virginia. Cleveland Nursery Co. Bushes vigorous and healthy, bearing a fair crop of fruit. July 10, crop at its best. Fruit large, jet black, round, conical, moderately firm and of excellent quality. This variety holds out well to the end of the season. Promising.

SUMMARY.

For early black-caps Souhegan or Tyler are as good as any of the old sorts. Hopkins, Kellogg, and Mammoth Cluster follow soon, and are hardy and productive. Ohio is an excellent variety for the general grower. The berries are not of high quality, but the bushes usually bear a good crop of fruit. Shaffer is excellent for canning. The bush is a strong grower and very productive. The color of the fruit is somewhat against the variety, but when well known it is likely to be largely planted. Of the later kinds Gregg and Nemaha are among the best. Of the new varieties, Kansas, Conrath's Early, and Virginia are particularly promising.

TABLE NO. 6.—*Raspberries, red.*

ABBREVIATIONS.

Size.
s. small.
m. medium.
l. large.

Form.
r. round.
c. conical.
o. ovate.

Color.
d. dark.
r. red.
p. purple.
o. orange.
b. bright.

Variety.	Vigor. Scale (1-10).	Date bloom.	First ripe fruits.	Last fruits.	Productiveness. Scale (1-10).	Size.	Form.	Color.	Quality.
Brandywine	.....	June 16	July 15	July 28	7	m	rc	dr	8
Burlington	.....	" 12	" 8	" 21	4	l	rc	r	9
Cuthbert	.....	" 16	" 15	Aug. 6	9	l	rc	r	8
Gladstone	.....	" 13	" 15	July 27	8	l	rc	d pu	9
Hansell	.....	" 14	" 6	" 28	5	m	r	d r	9
Herstine	.....	" 14	" 13	Aug. 2	8	m	r	br	9.5
Henrietta	.....	" 17	" 19	July 29	8	m	r	r	8
Heebner	.....	" 16	" 18	Aug. 1	9	l	rc	r	9
Lost Rubies	.....	" 14	" 17	" 5	6	s-m	r	d c	8
Miller's Woodland	.....	" 14	" 18	" 3	9	m	r	r	8
Michigan Early	.....	" 11	" 4	July 27	9	s	r	r	9
Marlboro	.....	" 15	" 16	" 27	6	m	r	r	6
Philadelphia	.....	" 14	" 16	" 28	8	m	r	d p r	7
Red Cluster	.....	" 16	" 18	Aug. 5	7	m	rc	r	9
Reder	.....	" 14	" 16	" 5	5	m	r	r	9
Scarlet Gem	.....	" 13	" 14	July 29	5	m-l	r	br	5
Turner	.....	" 13	" 6	" 27	5	m-l	rc	r	9
Talcott	.....	" 13	" 3	" 30	8.5	m	o	r	9

In the above list Hansell and Michigan Early are to be recommended for early varieties. Hansell has not proved to be very productive with us. As a medium-season berry Cuthbert stands at the head of the list, and is the sort to be planted for the main crop. Turner is hardy and of best quality, and is valuable for these properties.

NEW VARIETIES.

Gladstone. Plants from C. A. Green, Rochester, N. Y. Bushes strong-growing, healthy. Fruit large, dark purple color, pubescent, excellent quality, and firmer than Shaffer. Promises well.

Royal Church, from Royal Church, Harrisville, Ohio. Bushes are hardy, vigorous, and of loose, spreading growth. Fruit very large, round, conical form, dark crimson color, and of a rich, aromatic flavor. The seeds are very large and so loosely joined that the berry falls to pieces easily—a serious fault. The bushes are as productive as any of the red sorts.

DEWBERRIES.

Lucretia. First fruits ripe July 19. The fruit is large and of excellent quality. The bushes are moderately productive. The vine requires training to a trellis to make the culture practicable. Dewberries are little grown and if valuable at all would be so on account of earliness in ripening, quality of the fruit, and ease of protection in winter.

WINEBERRY.

Japanese Wineberry. This fruit has received considerable advertising and the plants have been sold at high prices. The bushes are of vigorous growth and handsome appearance. The fruit is borne in clusters and the berries are enclosed in a mossy calyx. They are of medium size and have a sprightly, acid flavor. The fruit falls to pieces when picked from the bush. The bushes can scarcely be called productive, and the fruit, if valuable at all, is *only* so as a *curiosity*.

The above is one of the many examples of over-advertising, and shows the value of the test stations to the general public.

H. P. GLADDEN.

CURRANTS AND GOOSEBERRIES.

CURRANTS.

The plantation of currants is placed with that of the gooseberries, as the treatment and cultivation are the same. These fruits delight in a moist, rich, cool soil. These conditions are generally supplied by manuring annually and by placing the plantation on land that slopes to the north.

The pruning consists of removing the old wood and the surplus young shoots. In general, wood that has raised three crops of fruit should be cut out, and enough sprouts should be left to take its place.

The currant worm is kept in check mainly by the use of the arsenites. A thorough spraying at the time that the first eggs hatch is frequently sufficient for a whole season. Frequent rains at this time will make subsequent sprayings desirable. If it is necessary to spray at the time that the fruit is being picked, white hellebore is safer to use, as this is not poisonous to a human being. The arsenites in the hands of an experienced and careful person would not be dangerous, but their indiscriminate use should be avoided.

The yellow-lined currant bug was present this past season, but not in sufficient numbers to be a serious pest. It is found during the month of June sucking the juice from the youngest and most tender leaves. It is easily recognized by those not acquainted with it by its color, which is bright yellow, lined with black. It takes fright very easily and hides under the leaves. In large numbers, it seriously injures the tips of the new shoots. Kerosene emulsion is recommended where they become troublesome.

The following table gives most of the data of the varieties:

Ribes aureum—Yellow flowering currant.

Name.	First bloom.	Ripened.	Vigor (1 to 10).	Productiveness (1 to 10.)	Size (1 to 10).	Quality (1 to 10).	Remarks.
Crandall	May 8	July 20	10	8	10	8	No value here.

Ribes nigrum—Black currant.

Black Champion	May 8	July 14	9	5	10	8	Much like the Black Naples.
Black Naples	" 6	" 14	10	6	9	8	Vigorous.
Lee	" 7	" 15	8	5	10	8	Resembles the Black Naples.

Ribes rubrum—Red and white currant.

Cherry	May 7	July 10	8	7	10	7	Large, acid.
Fay	" 7	" 10	5	7	10	8	Affected badly by the borers.
Holland	" 7	" 12	9	4	7	6	Unproductive.
London Red							Not fruited.
Moore's Ruby							" "
Moore's Select							" "
North Star							" "
Prince Albert	May 8	" 20	10	9	9	9	Very late, hardy, desirable.
Red Dutch	" 6	" 8	9	10	8	9	Old, still the best.
Versaillaise	" 6	" 8	7	5	10	8	Unproductive.
Victoria	" 8	" 15	10	9	7	7	A popular market variety.
White Dutch	" 8	" 8	7	7	8	10	Best for dessert.
White Gondoin	" 6	" 8	7	7	8	9	Much like the White Dutch.
White Grape		" 8	7	6	9	9	Best white currant.
Wilder							Not fruited for market.

The *Red Dutch* and the *Victoria* are the popular varieties for general planting, both being hardy and productive. The latter is remarkably free from the attacks of the borer, for which reason it is largely used for market plantations. The currant fly will also pass it by if varieties of more tender foliage are planted near.

The *Fay* is a weak grower, of a sprawling habit, and it suffers much from the attacks of borers. These causes combined make it a failure here.

Prince Albert is much later than the Victoria; a rapid, upright grower; young shoots large and strong; bunch short, compact, and well filled; berries medium large and of good quality when fully ripe. It is quite free from the attacks of borers and its tough foliage is objectionable to the currant worm. It does not receive the attention that it seems to deserve. It is said that it is hard to propagate.

The *White Dutch* and the *White Grape* are the best of their class. The white currants are of less acidity than the red, and are very desirable for dessert purposes.

The black currants make a jelly that is highly prized by those who have once used it, and there is a market for a limited quantity of them. They are very little affected by insects and easily grown.

The *Crandall* is undesirable because the berries on the bunch ripen at different times and this makes the labor of picking excessive. The berries are more tart than those of the black currants and larger in size; bushes rampant growers. Unproductive.

GOOSEBERRIES.

What has been said about the general management of the currant applies equally as well to the gooseberry.

Name.	Origin.	First blossom.	Ripened.	Vigor (1 to 10).	Productiveness (1 to 10).	Size (1 to 10).	Quality (1 to 10).	Remarks.
Champion	America							Not yet fruited.
Cluster	"							" "
Columbus	"							" "
Crown Bob	"							Not fully tested.
Downing	"	May 3	July 5	10	8	9	9	A desirable variety.
Golden Prolific	Europe							Not yet fruited.
Houghton	America	May 3	July 8	8	10	6	10	Hardy, productive.
Industry	Europe	" 4	" 10	6	4	8	8	Inclined to mildew.
Lancashire	"							Not yet fruited.
Pale Red	America	May 4	July 10	10	10	7	10	Very productive, hardy.
Pearl	Europe							Not yet fruited.
Smith Improved	America	May 4	July 8	8	7	8	9	
Transparent	Europe	" 5	" 9	6	4	10	8	Mildews.
Triumph		" 5	" 8	6	4	10	9	"

The European varieties produce the largest and best fruit. The mildew to which they are subject, being on the surface, is readily held in check by the use of fungicides. In growing these varieties, especial attention should be given in selecting the location, so that protection is afforded against the heat and drouth. With a good location and suitable care, they are better than the American varieties. The Industry is the most favorably known of the English varieties.

The American varieties are recommended where the conditions are not favorable for the English kinds. Of these the Downing is the best. From the character of the plant it is suspected that this may be a hybrid with some of the Europeans. The bush is drooping, berries quite large, with a fleshy stem, color when ripe is greenish white.

For a market that is not partiular, the Houghton and Pale Red are profitable. Both are very hardy, productive, and very seldom affected by mildew.

Houghton is of very small size, bush upright and a medium grower; berry red when ripe. Pale Red is much like the Houghton, but more productive. The bush is of more slender growth and the berries are larger The bush sets a large number of shoots and needs careful pruning.

R. J. CORYELL.

THE SPRAYING OF FRUITS.

The necessity for the use of insecticides and fungicides seems to increase from year to year. Not only do new insects and diseases appear, to destroy the crops, but the injuries caused by old and well known pests are more noticeable.

For many of them, however, we have quite effective remedies, and, as much light has been given during the past year upon the best methods of applying them, these brief notes are submitted.

Most of the diseases of plants are due to the development of parasitic fungi. These are for the most part microscopic plants, that feed upon the tissues of their hosts, and finally develop spores that answer as seeds for their reproduction, and as they are light and are blown about by the wind, the dissemination of the disease may be very rapid.

These fungi may feed upon the roots, stems, leaves, or fruits of plants, and as they not only rob the plant of food designed for its development, but, by destroying its tissues, hinder the organs of the plants in the performance of their various functions, they exert a two-fold injury.

It has been found that various compounds of copper, zinc, sulphur, iron, etc., will destroy the spores of all fungi with which they may be brought in contact, and by thoroughly spraying the plants with these materials, the spread of the disease can be prevented in many cases. A large proportion of these fungi penetrate to the interior of the plants and there are safe from all applications, except when they push out the slender stalks upon which the spores are borne. It will therefore be seen that for such fungi all remedies must at best be preventive. Many fungi, however, are quite superficial in their workings and can be readily destroyed.

Most of the fungi pass the winter upon the stems, or the fallen leaves and fruit, and only await favorable conditions for germination. Careful experiments have shown that in order to hold the diseases in check, early applications of fungicides are desirable. Thoroughly spraying the trees early in the spring, before the leaves start, with some approved mixture, will destroy all of the spores that may have wintered upon the stem or branches, and all that may fall upon them for several weeks. For most fruits it it is well to repeat the operation as soon as the blossoms have fallen, and a third application at the end of four weeks will frequently be desirable.

Many plants have insects that prey upon them in the early spring, and, by adding a small quantity of some poison, all that eat the foliage can be destroyed, with no expense except for the material used as an insecticide.

From the experiments of the past two years, the following are regarded as among the most effective:

FUNGICIDES.

For all plants that are not injured by the application of lime to the foliage the Bordeaux mixture will be found the most reliable form. It can be used upon all kinds of plants without fear of burning the leaves, but, although the lime itself is of value in cementing the material upon the

plants, its presence is unsightly and not always desirable, particularly if any parts of the plants are to be used as food within four or five weeks.

As first made, the Bordeaux mixture contained 16 pounds of copper sulphate and 30 pounds of lime to 22 gallons of water. This made a thick wash that frequently clogged the pump and the nozzle, and was quite expensive. The formula has now been modified so that 4 pounds of copper sulphate and 3 pounds of lime added to 22 gallons of water is the most concentrated mixture made. This should be used for the first application, but it may be reduced for the later ones. Four pounds of copper sulphate and 3 pounds of lime for 32 gallons of water seem as efficacious as a stronger mixture for the second application, and if more than this is used the amount of water could, without the mixture losing any of its virtue, be increased to 50 gallons. For the powdery mildews of the grape, gooseberry, and rose, which live entirely upon the exterior of the plants, the weakest mixture seems entirely effectual.

Two other copper compounds are rather more expensive than the above and are less reliable, but as they are clear solutions they can be used, if necessary, when the fruit or other edible portions are reaching maturity. They are known as modified eau celeste and ammoniacal solution of copper carbonate.

The former is made by dissolving two pounds of copper sulphate in hot water, adding a solution of 1½ pounds of sal soda, and, after all action has ceased, pouring in one quart of ammonia water (26°) and diluting to 32 gallons.

The ammoniacal solution of copper carbonate is made by dissolving precipitated copper carbonate (3 oz.) in ammonia water (one quart) and diluting to 32 gallons with water.

It does not differ from the modified eau celeste, except that the former contains sulphate of soda in solution and is somewhat stronger. If, before adding the ammonia to the modified eau celeste, the copper carbonate formed by the addition of the sal soda to the copper sulphate had been allowed to settle, and, after pouring off the liquid, if the ammonia had then been added, it would be what is known as ammoniacal solution of copper carbonate.

The powdery mildews may be also kept in check by the use of liver of sulphur (potassium sulphide) dissolved in water, using 3 ounces to 10 gallons of water. For the gooseberry and similar mildews this is entirely effectual, and has the decided advantage of being in no way poisonous and of not staining the fruit; it can therefore be used at any time in the season.

The copper sulphate is sold at retail at about 15 cents per pound, but in a pulverized condition can be obtained at about 4 cents per pound f. o. b. New York or Baltimore in barrel lots, and at from 5 to 6 cents for smaller quantities.

One or two of the wholesale dealers expect to locate distributing depots in Michigan the present season, from which small lots can be sent to customers with little expense for freight.

Arrangements have also been made with C. Alsdorf & Son, Lansing, Mich., to supply granulated copper sulphate, with a guaranteed purity of 99 per cent., at the following prices, f. o. b., Lansing:

50 to 100 pounds	5 cents per pound
25 to 50 pounds	6 cents per pound
10 to 25 pounds	7½ cents per pound

Cash must accompany all orders.

INSECTICIDES.

For most purposes, particularly where the insects eat the exposed portions of plants, the chief reliance is still upon Paris green or London purple, although many persons use white arsenic and corrosive sublimate. The last two are very poisonous, and as they closely resemble many common household chemicals, they should be used with great care, if at all.

For many plants, the Paris green or London purple can be used at the rate of one pound to 200 gallons, but for the plum this should be somewhat reduced in strength, while for the peach, Paris green alone in water can hardly be used at any strength without burning the leaves. As a rule Paris green is less likely to burn the foliage than London purple and is rather more effective. It is, however, heavier and more difficult to keep in proper suspension in the water.

Either of these insecticides can be used in combination with Bordeaux mixture at the same strength as when used alone, but are hardly safe to be used in ammonia-containing mixtures, unless a small quantity of lime is added.

The use of lime at the rate of one pound to 32 gallons of water will also be of value when they are used only as insecticides, as it will allow of their application to the plum, cherry, and even the peach, with safety.

Although it may be desirable to use fungicides when there are no *eating* insects upon the plants, it will generally be well to add a small quantity of London purple, say one pound to 250 gallons, if there is any probability of their appearance before another application will be needed.

INSECTS AND DISEASES.

It is not the intention at this time to go into a lengthy description of the structure and life history of the different pests to which our agricultural plants are subject, but it may be of value to have a brief statement of the insects and diseases for which the spraying of our different plants will be remunerative.

THE STONE FRUITS.

The peach, plum, and cherry are extensively grown in this state, and suffer severely from the attack of the curculio and of rot, which destroy both fruit and leaves. The plum is frequently defoliated by the "shot hole" fungus and the peach by the "curl."

While accurate data are not at hand regarding the effect of fungicides upon the development of the "curl" of the peach leaves, it is quite certain that the disease can be, to some extent, kept in check by their use, and there can be no question but that combined Bordeaux mixture and Paris green will save the fruit from the curculio and rot, and will maintain the foliage in a healthy condition until autumn.

While the spraying may not save every plum from rot and curculio, the number lost, in average seasons, will be of advantage in aiding the proper thinning of the fruit. Particularly, if the season is a wet one, an additional spraying of the combined mixture about two weeks after the fruit has set will be of advantage.

POME FRUITS.

The most injurious insects of the apple and pear, for which spraying is of value, are the codlin moth, tent caterpillar, canker worm, and curculio.

The scab of the apple and pear, and the leaf blight of the pear and quince are the most destructive fungi for which fungicides are used, and all of them can be to a large degree controlled. Even if the three applications, as recommended, are not given, two can hardly fail to be of value, and with most varieties will pay in average seasons, if the trees are bearing even a light crop of fruit.

THE GRAPE.

In nearly all of the grape-growing sections, the injury either to foliage, fruit, or both, from the downy or powdery mildews, black rot, and anthracnose, is yearly on the increase and of all these diseases the use of the copper mixtures will prevent the spread.

During the past eight years many experiments with dozens of mixtures have been made, with the hope of ascertaining which was most effectual, and in nearly every case the best results were obtained with Bordeaux mixture, which has also the advantage of being inexpensive and easily prepared and applied.

SMALL FRUITS

The strawberry is frequently troubled by leaf blight and many otherwise valuable varieties are nearly ruined by it. Bordeaux mixture applied early in the spring and again in a diluted form just as the blossoms are falling will hold it in check until after the crop is gathered, when another application will be desirable if the plantation is to be kept for another year.

The raspberry anthracnose soon becomes deeply seated in the canes, and no fungicide can reach it. The spread of the disease can be retarded, however, if the old canes are sprayed just before the leaves start. It will also be well to cut out and burn all canes that are badly infected. The new canes should be sprayed when a half foot high, and should receive a second application at the expiration of two or three weeks.

The currant and gooseberry often lose their foliage from the workings of the currant worm and if this is kept in check the fungi may destroy them.

As soon as the leaves have formed, the combined mixture should be applied and can be repeated to advantage in two or three weeks. Later on, especially for European varieties of gooseberry, an occasional application of liver of sulphur will keep the foliage healthy.

The above are among the most injurious of the fungi and insects that work upon our fruits, but if other similar pests trouble these or any other crop, a judicious use of the remedies enumerated will keep them in check. Sometimes, however, the application of remedies is not feasible, owing to the nature either of the insect or fungus, or of the crop itself.

SPRAYING APPARATUS.

While very crude outfits will answer for the application of the fungicides and insecticides, a small bucket pump will at least be desirable. For use upon gooseberry, grape, and other small plants, a knapsack pump will be of great value, but a strong force pump mounted upon a barrel or tank will be indispensable for orchard spraying. For large orchards, a sprocket wheel and endless chain attachment for working the pump by horsepower will be desirable.

The nozzle used for the Bordeaux mixture should be so constructed that

it can be readily cleared in case it becomes clogged. The stream should be broken into a fine spray and for large trees few nozzles can give the necessary force, and at the same time the mistlike spray that is so desirable. The Vermorel nozzle works well upon low plants, and if the mixture has been carfully strained the graduating spray nozzles will do fair work upon large trees. In case they become clogged, however, it is some trouble to clear them. A nozzle is now sold at $2.00, by John J. McGowen, of Forest Home, N. Y., that seems to satisfy the required conditions, and after a thorough trial it is highly recommended by the officers of the Cornell experiment station.

In April, 1892, a bulletin upon insecticides and fungicides was issued. It contained descriptions and illustrations of many of the more injurious fungi, and formulæ for the preparation of a considerable number of insecticdes not mentioned here. A second edition of that bulletin, (No. 83) was printed several months ago and copies will be sent to all applicants who desire more extended information than is given here.

L. R. TAFT, *Horticulturist.*

See also this society's Report for 1891 for the contents of this bulletin No. 83.

BULLETINS OF CORNELL UNIVERSITY EXPERIMENT STATION.

THE CULTIVATED NATIVE PLUMS AND CHERRIES.

I. THE PLUMS.

Since the introduction of the Wild Goose plum, some forty years ago, there has been a steadily growing interest in the amelioration of our native plums. The native species possess certain advantages over the common plums of the *Prunus domestica* type,* and they are so widely distributed and are naturally so valuable that they have been easily brought into cultivation under a great number of forms. Over 150 varieties have been named and more or less disseminated, and the following pages record 140. There has been no attempt, so far as I know, to make a comprehensive study of these fruits, and as a consequence our knowledge of them is vague and confused. In fact, the native plums constitute probably the

* The common plums and the prunes belong to the European species *Prunus domestica*. In the following pages these fruits are often referred to as the *domestica* plums.

hardest knot in American pomology. The botanical status of the native plums is equally unsatisfactory, and the group is one of the most inextricably confused of any one of equal extent in our whole flora. There are a few botanical features which are reliable in the characterization of the species, and the specimens which are preserved in the leading herbaria are few and unsatisfactory. There is probably no group of American plants in which the characters of growing trees and fresh fruits are more essential in the distinguishing of species than in these plums. Yet there are the most remarkable variations in habit of tree, seasons of blooming and ripening, size, flavor and texture of fruit, and characters of stone, even among varieties coming presumably from the same species. Fully half of the varieties now in cultivation were picked up in woods and copses and transferred to the orchard, and the variations between these varieties are fully as great as between those of known or garden origin. There is evidence that hybridity is responsible for some of the variation of cultivated forms, but whether it takes place in nature is wholly a matter of conjecture. It is an unsafe principle to invoke the aid of hybridity, upon purely speculative grounds, to explain doubtful points; and I have therefore referred doubtful forms directly to the most closely allied species or type, so far as possible, leaving speculations as to their true affinities to future students. The native plums can be commended with confidence to any one who desires to study contemporary evolution.

In the following study, which has now extended through six years, I have had the co-operation of many botanists and horticulturists. I am under especial obligations to all those whose names are mentioned in this paper, particularly to J. W. KERR, Denton, Maryland, and T. V. MUNSON, Denison, Texas. Without the aid given by these last two persons the preparation of this monograph would have been impossible. Mr. KERR probably has the largest growing collection of native plums in existence, and I have had the advantage of a personal inspection of his orchards in the fruit season. I have had access to the herbarium collections at Harvard university, Columbia college, department of agriculture, and the ENGELMANN collection of the Missouri botanical gardens. Several botanists have favored me with material, especially Dr. C. E. BESSEY, university of Nebraska, Dr. T. C. PORTER, Easton, Penn., and H. N. PATTERSON, Oquawka, Illinois. And I have enjoyed the great advantage of having had the advice of Professor C. S. SARGENT, who has critically examined some two or three hundred of our specimens. In the following descriptions, those varieties marked C are in cultivation at Cornell.

§ 1. *Classification of the Cultivated Native Plums.*

A. THE AMERICANA GROUP. (*Prunus Americana*, Marshall, Arbustrum Americanum, 111, [1785]).

To this type belong the hardy, strong-growing varieties which have come from the northwest, and which are characterized by a firm, meaty, usually compressed, dull-colored late fruit, with thick and usually very tough, glaucous skin, and large, more or less flattened stone which is often nearly or quite free, and by large obovate, thick, veiny, jagged, dull leaves. *Prunus Americana* is generally distributed throughout the northern states from western New England to Kansas and Nebraska, and to the mountains of Montana and Colorado, in the middle longitudes reaching as far

north as Manitoba and as far south as Texas and even northern Mexico. Notwithstanding its wide range, most of its cultivated varieties have come from its northwestern limits, as northern Illinois, Wisconsin, Minnesota, Iowa, and Kansas. This fact is indication that the western plum may be a distinct species from the eastern and southwestern types, and I should not be surprised if we ultimately find this to be true. I have looked in vain, however, for characters with which to separate them. Professor SARGENT is of the opinion that the *Prunus nigra* of Aiton should be revived to designate those forms which are characterized by very flat and smooth stones, very broad leaves, glandular leaf-stalks and calyx lobes, and large flowers. To this species he would refer the Weaver, the stones of which, as shown in Fig. 1, are very large, flat, and smooth. After the most careful study, however, I am unable to find any constancy in these characters, especially in cultivated varieties. Even in wild specimens, the flat stone of *P. nigra* is often associated with the glandless leaf-stalks of *P. Americana* and *vice versa*; and there appears to be equal inconstancy in the characters of calyx lobes and sizes of flowers. In fact, the same cultivated variety, when grown in different places, has been referred to both species. I am obliged, therefore, for the purposes of this paper, to unite *Prunus nigra* with *P. Americana*. This I regret the more because it is undoubtedly true that there are two well marked wild varieties—possibly species—passing as *P. Americana*, and growing together in the east. One is a twiggy, virgate grower, with large and mostly earlier flowers; the other is a stout and stiff grower with small flowers. So far as I have been able to determine, the fruits and stones of these two forms, save possibly in time of ripening, are not characteristically distinct. These forms are certainly common in central New York and in Michigan, where I have often observed them. DUDLEY records them in Cayuga Flora. Some of these differences are detailed in the following letter from Professor CHARLES A. DAVIS of Alma, Michigan, accompanying specimens of the trees mentioned. The specimens were referred to Professor SARGENT, who places the first or large-flowered form with *P. nigra* and the small-flowered form with *P. Americana*. "The large-flowered form is the more common and blooms about a week or even ten days before the other, and usually before the leaves begin to appear. The small-flowered form I have never found until this spring, when I came upon a clump of it in full bloom, and at once became interested in it because of its decided differences from the other and common form. The trees were larger, more spreading, and with a much rougher bark than the large-flowered form; and a number of the trees bore flowers with a decidedly yellowish tint, which was very noticeable from a short distance. The fruit was late, maturing the middle of September, and was reddish, almost purple in very ripe specimens, with a whitish bloom, small and rather palatable." It is easy to place too great confidence in the seasons of blooming and ripening, for these characters are variable. This is well illustrated in the case of the Late Rollingstone plum, which is a seedling from the Rollingstone—itself a wildling—but which is three weeks later in ripening than its parent.

The fruits of wild forms of *Prunus Americana* vary widely in season, size, shape, flavor, and character of stone. Trees in the same clump often vary two weeks in season of ripening of fruit, which may vary from dull deep red to yellow. It should be said, however, that there is no true clear yellow fruit in this species. The yellow of *P. Americana* is always a more or less ill-defined under color, over which are laid blotches of red. The

fruits are more or less flattened, as is well shown in Fig. 1, usually oblong and truncate or somewhat flattened at the ends, and are commonly marked with a distinct suture. All the varieties have a light purple bloom.

The Texan form of *P. Americana*, known locally as the Hog plum, appears to differ somewhat from the northern forms, and it may be a distinct species. It has the glands, both of calyx and leaf-stalks, of the *P. nigra* form and the rounded stones of true *P. Americana*. The plant is not in cultivation, however, and need not be further discussed here.

Prunus Americana was founded over a century ago by Humphrey Marshall. His description, particularly of the leaves, is peculiarly characteristic of the wild plum of the north. It is as follows:

"Prunus Americana. Large Yellow Sweet Plum. This generally rises to the height of 12 or 15 feet, spreading into many stiff branches. The leaves are oblong, oval, acute pointed, sharply sawed on their edges and much veined. The flowers generally come out very thick round the branches, often upon thick short spurs; and are succeeded by large oval fruit with a sweet succulent pulp. We have a great variety of these growing naturally in a good moist soil, with reddish and yellowish fruit, but differing much in size, taste, and consistence."

West of the Mississippi there is a form of *Prunus Americana* with conspicuously pubescent and often glaucous leaves and shoots. This is the variety *mollis*, a plant which is commonly supposed to be confined to Texas and its northern borders. It certainly grows as far north as Iowa. The varieties known as Wolf and Van Buren belong here.

The following cultivated varieties belong to *Prunus Americana:*

1. *American Eagle.*—Fruit and flowers unknown to me. Leaves rather large, the stalks glandular. Introduced in fall of 1889 and spring of 1890 by Osceola Nursery Co., Osceola, Missouri. C.

2. *Beaty's Choice.*—Fruit large, round-oblong, red-purple or red-blue, skin medium thick: flesh firm, of high quality: cling, the stones broad, flat and smooth, like those of Weaver; flowers large, conspicuously stalked in large clusters, calyx lobes reflexed, glandless, smooth or nearly so on the inside. Late. Originated under cultivation in southern Texas by LEE BEATY. T. V. MUNSON says that it appears to be a hybrid between *Prunus Americana* and *P. domestica*. Ripens at Denison, Texas, from the first to the middle of August.

3. *Black Hawk.*—Known to me only from a record in Bulletin 4, Iowa experiment station, by R. P. SPEER (Feb., 1889), in which "a nameless variety found in Black Hawk county, and a very large and beautiful free-stone plum, which was furnished by Mr. SLATER of Story county," was tested as to culinary qualities in comparison with Miner, Weaver, Bassett, Rollingstone, Moreman, Wolf, De Soto and Maquoketa. "The decision of all who tasted the same was that the Maquoketa and Black Hawk plums were equally good and much better than any of the other kinds except the De Soto, which was marked good, but second in quality. The skins on the Maquoketa and Black Hawk plums were so thin that they disappeared almost entirely while being cooked." I do not know that the variety has been introduced. Presumably *P. Americana*.

4. *Brainerd*, in cultivation in Minnesota (O. M. LORD), probably belongs to this species.

5. *Cheney.*—Fruit large to very large, round-oblong, scarcely flattened, dull purplish red, skin thick; flesh firm and sweet, good to very good; cling, the stone very flat and smooth with rather rounded ends; flowers not large, the calyx lobes glandular, smooth inside; leaves medium, long-pointed, leaf-stalks glandular. Early for the group, ripening even in Minnesota by the middle of August. One of the best varieties. Found in Morman Ravine, a few miles below La Crosse, Wisconsin, and introduced by E. MARKLEY, La Crosse. C.

6. *Chippeway.*—Fruit small to medium, oblong, deep red, the skin medium thick; flesh firm and sweet; stone free, small, strongly convex on the sides and pointed,

roughish; leaves medium, rather strongly pubescent beneath, leaf-stalks glandular. Has gained no prominence so far as I know.

7. *Cottrell.*—Fruit large, round-oblong, red, skin thin; flesh rich and agreeable; cling; leaves large, comparatively thin and smooth, leaf-stalks glandular. Medium season. Seedling raised by R. L. COTTRELL, Dover, Olmsted Co., Minn., and introduced in 1888 by O. M. LORD of Minnesota City.

8. *Deep Creek.*—Medium size, round-oblong and prominently flattened and bearing a conspicuous suture, dull purple-red, very glaucous, skin thick; flesh firm, and very sweet and good; stone free, sides convex, long pointed, roughish; flowers rather small, short-stalked, the calyx lobes glandless and hairy inside; leaves medium, nearly smooth, stalks glandular. Medium season. A Kansas wild variety, introduced by ABNER ALLEN. C.

9. *De Soto.*—Large to very large, round-oblong, purple-red with moderate bloom, skin thick; flesh medium firm, good; stone cling, rather large, somewhat convex, rounded at the ends, slightly roughened; leaves medium, stalks glandular. Medium to late. One of the most popular varieties. Found wild on the Mississippi at De Soto, Wisconsin. Generally introduced by ELISHA HALE, Lansing, Iowa, 1863 or 1864. Figured by Professor S. B. GREEN in bulletin 5, Minnesota experiment station. See No. 3 above. C.

10. *Forest Garden.*—Large, round, orange overlaid with rose-purple, skin medium thick to thin; flesh medium firm to soft, good; stone cling, convex on the sides, rounded at the ends, slightly roughened; leaves medium, rather smooth, glands none or reduced to a single small one. Medium season, ripening in Minnesota the middle of September. A good sort for home use, but does not ship well unless picked before ripe. Tree grows forked and is apt to split. Said not to succeed well east of Illinois. Taken from the woods at Cedar Rapids, Iowa, by THOMAS HARE, and introduced by H. C. RAYMOND, of the Forest Garden nurseries, Council Bluffs, about 1862. Figured in bulletin 5, Minnesota experiment station, by Prof. S. B. GREEN.

11. *Gaylord.*—Fruit large, round-oblong and slightly flattened, deeply mottled red over a ground of orange, skin rather thick; flesh pulpy and sweet; stone moderate cling, broad and rather flat, pointed, sharp-edged on the back, somewhat roughened; leaves rather broad, somewhat pubescent below, glandular. Medium season. Introduced recently by EDSON GAYLORD, Nora Springs, Iowa.

12. *Harrison's Peach.*—Medium size, round-oblong, dull red, skin thick; stone free; leaves medium, rather thick and pubescent, the glands large. Medium season. Not widely disseminated apparently. Minnesota, a wild variety. C.

13. *Hawkeye.*—Large to very large, round-oblong, purple-red, skin thick; flesh firm and good; stone cling; leaves medium firm, very smooth for the species, stalks glandular. Medium season. Originated in Iowa under cultivation. Introduced by H. A. TERRY, Crescent City, Iowa, 1878. Specimens from the Michigan Agricultural College evidently belong to *prunus angustifolia*, the Chickasaw type. C.

14. *Ida.*—I know this only from a description submitted by D. B. WIER, the originator: "Medium size, round, yellow nearly covered with dull red; flesh firm, salmon-color, very sweet; free-stone; leaves very downy and leathery; tree thorny, exceedingly sprawling. The fruit is acid when cooked, but dries sweet." Said by Mr. WIER to be pure *P. Americana.* Illinois.

15. *Illinois Ironclad.*—Fruit very large, oblong, dark red, thick skin; flesh firm; cling; leaves medium, pubescent, glands small or absent. Medium season. Said to be one of the best native plums. Wild variety from Illinois, introduced in 1890 by STARK Bros., Louisiana, Mo. C.

16. *Iona.*—Known to me only from description of the originator, D. B. WIER: "Fruit large, oblong, dull yellow with red cheek, skin medium thick; flesh firm, yellow and sweet; stone free, long and much flattened, with a sharp border on the back; leaves very large; tree strong and upright, the growth smooth. Medium season." Said by Mr. WIER to be pure *P. Americana,* the seed coming from a wild bush in southwestern Wisconsin.

17. *Itaska.*—Fruit medium, oblong, dull purple-red, skin thick; flesh firm, of fair quality; cling; flowers small and sessile, pinkish, the calyx lobes somewhat glandular, and smooth within; leaves thick and broad, stalks either glandular or glandless; tree a very short, stocky and thick grower, the short joints giving the pinkish bloom a strikingly massed effect. Medium season. One of the most distinct in habit. Minnesota. Introduced by P. M. GIDEON, Excelsior, Minn., and by W. F. HEIKES.

18. *Kickapoo.*—Medium, round-oblong, blotched red, thick skin; flesh firm; stone cling, convex on the sides, long roughish: flowers small and sessile or nearly so, calyx lobes minutely glandular and smooth or nearly so within; leaves rather small, narrow, long-pointed, very sharply toothed, pubescent below, glandless or occasionally a leaf with small glands; tree a straggling grower, very prolific. Medium season. Appears to be much attacked by shot-hole fungus.

19. *Kopp*, introduced by O. M. LORD, Minnesota, is probably *P. Americana.*

20. *Late Rollingstone.*—Very like Rollingstone (No. 35) of which it is a seedling, but three weeks later, pulp not so firm, and skin thicker. O. M. LORD, Minnesota.

21. *Le Duc.*—Medium, round and flattened, orange spotted with red, skin thin; flesh pulpy and sweet; a moderate cling, the stone rather broad with convex sides, rounded at the ends, slightly roughened. Medium season. A wild variety from Hastings, Minn., introduded by W. G. LE DUC. C.

22. *Little Seedling.*—A small red plum with small convex roughish cherry-like stones, and narrow, rather finely serrate leaves, and glands very small or none. CHARLES LUEDLOFF, Carver, Minn.

23. *Louisa.*—Large to very large, round, deep red, skin thick; flesh firm and good; semi-cling, the stone broad and convex and smoother than is usual for this shape; leaves medium, long-pointed, pubescent below, glands small or none. Medium season. A wild plum found in Missouri and introduced by SAMUEL MILLER, Bluffton, Mo. "Very similar to Weaver."—*T. V. Munson.* Flowers upon Maryland specimens are small and nearly sessile, with glandless calyx; from Texas they are large and stalked, with calyx lobes reflected and glandular, and hairy within.

24. *Luedloff's Green.*—Medium to small, oblong and flattened; deep mottled red, skin thick; flesh firm, sweet and good; nearly free, the stone small, convex, pointed, rough; leaves rather small and smooth, glands very small or none. CHARLES LUEDLOFF, Minn.

25. *Luedloff's Red.*—Much like the last, but lighter red, skin thicker, pit freer, stone rather broader and leaves pubescent beneath.

26. *Maquoketa* (Fig. 11).—Medium to nearly large, round-oblong, red, skin thick; cling, the stone very convex, short-pointed, rough; leaves medium, rather smooth, glands none or small. Medium to late. Originated in Iowa under cultivation. See No. 3.

27. *Minnetonka.*—Medium in size, round-oblong, dull red, skin thick; cling; flowers medium; calyx lobes glandless, hairy inside; leaves medium, pubescent, glandless or nearly so. Medium season. Introduced by P. M. GIDEON, Minn.

28. *Mussey.*—Very large, round-oblong, yellow mottled with red, skin medium thick; flesh firm and excellent; semi-cling; leaves medium to large, pubescent, glands small or none. Very late. Wild, from Kansas. Introduced by ABNER ALLEN.

29. *Newtown Egg.*—Medium to rather large, oblong, red, skin thick; flesh firm; free, the stones long and rather flat, scarcely pointed, nearly or quite smooth; leaves medium, nearly smooth, glands none or small. Medium season. CHARLES LUEDLOFF. Minn.

30. *New Ulm.*—"Very large; round-oblong, dark red, skin medium; flesh firm and of best quality; cling. Medium to early. A Minnesota seedling introduced by C. W. HEIDEMAN, New Ulm, Minn.—*Professor S. B. Green, Minnesota experiment station.* Presumably P. *Americana.*

31. *Ocheeda.*—"Large, round, yellow and red, skin thin; flesh firm and of best quality; semi-cling. Medium season. Wild variety from Minnesota. Introduced by H. J. LUDLOW, Worthington, Minn."—*Prof. S. B. Green, Minnesota experiment station.* Presumably *P. Americana.*

32. *Peffer's Premium.*—Medium to nearly large, round, red, skin thick; flesh firm and good; cling, the stone nearly circular and flat, rather smooth; leaves medium with rather obtuse serratures, nearly smooth, stalks glandular. Medium season. Wisconsin seedling. Introduced by GEORGE P. PEFFER, Pewaukee, Wis.

33. *Purple Yosemite.*—Very large, round, red-purple, skin thick; flesh firm; cling, stone large and flat, blunt at the ends and on the margins, nearly or quite smooth; flowers medium, short-stalked, the calyx lobes glandless and hairy within; leaves medium, comparatively smooth, stalks glandless or glands small. Medium season. An

excellent plum in many places. C. M. STARK writes me that it has no value in Missouri. C.

34. *Quaker.*—Very large (1½ in. long), round-oblong and somewhat flattened, purple-red inclining to orange red on side opposite the son, very glaucous-blue, skin very thick and acerb; flesh very firm, sweet and juicy; moderate cling, the stone large and flat, prominently ridged and winged on the back, ends rather blunt, slightly pitted; flowers rather large, stalked, the calyx lobes large and becoming reflexed, hairy inside but scarcely if at all glandular; leaves rather large and firm, pubescent, the glands small or sometimes wanting. Medium season. One of the best varieties. Must have the best cultivation and not be allowed to overbear. Discovered wild by JOSEPH BUNDY, of Springville, Linn county, Iowa. Disseminated about 1862 by H. C. RAYMOND, Council Bluffs, and by him named Quaker in compliment to Mr. Bundy, who is a quaker. C.

35. *Rollingstone.*—Very large (often 1½ in. each diameter), round, flattened and truncate at the ends, mottled and spotted pink-purple, skin very thick; flesh firm, sweet and excellent; semi-cling, stone nearly circular, rather flat, sharp on the back edge, nearly smooth; flowers large, long-stalked, the calyx lobes large and rarely somewhat glandular, hairy on the inside; leaves large and firm, comparatively smooth, stalks either glandular or glandless. Medium season, coming in just before De Soto. One of the leading varieties. Found over 30 years ago on the cank of the Rollingstone Creek, Winona Co., Minn., by O. M. LORD, and by him introduced some ten years ago. Professor L. H. PAMMEL, of the Iowa Agricultural college, writes me that this variety is reported as a common plum along creeks at Dysart, Iowa. C.

Mr. LORD has raised many pure seedlings of the Rollingstone, of which the Late Rollingstone (see No. 20) is one. "Several years ago," he writes, "I cut out of my grounds all varieties of native plums except the Rollingstone. The object was to perpetuate the tree by seeds true to name by preventing all crossing. Some of the seedlings can not be distinguished by their foliage or flowers, but none of them bear so good fruit as the parent. Some are later and some earlier." The variety is figured by Professor S. B. GREEN in bulletin 10, Minnesota experiment station.

36. *Speer.*—Medium, oblong, mottled orange and red, skin medium; flesh firm and sweet; semi-cling, stone broad, convex, ends blunt, slightly roughened; leaves medium, nearly smooth, stalks glandular. Iowa seedling by J. A. SPEER.

37. *Van Buren* (*Prunus Americana* var. *mollis*).—Large, round-oblong, purple-red, skin thick; free; leaves medium, densely white pubescent beneath and on the stalks, as well as the young growth, stalks glandular. Medium season. The pubescence is most marked on young shoots. An Iowa wild variety, introduced by J. THATCHER.

38. *Wazata.*—Medium or even small, round, dull red, thich skin; cling; leaves medium pubescent beneath, the glands small or none. Medium to late. C. M. STARK writes that it has no value in Missouri. Wild Minnesota variety, introduced by Peter M. GIDEON and W. F. HEIKES.

39. *Weaver* (Fig. 1).—Large, round-oblong and flattened, suture prominent, orange densely overlaid with mottled red, skin thick; flesh firm, sweet and good; semi-cling, the stone large and flat, obscurely pointed, the wing or margin conspicuous, smooth; flowers large and prominently stalked, the calyx lobes usually conspicuously glandular and obscurely hairy inside; leaves large and firm, deeply toothed, slightly pubescent beneath, the glands rarely prominent and frequently entirely wanting; tree a strong free grower and prolific. Medium to late, ripening in Minnesota the last of September. A well marked variety and one of the best. A wild variety, found near Palo, Iowa, by Mr. WEAVER; introduced by Ennis & Patten in 1875. Ripens in northern Texas from the first to middle of August. O. M. LORD writes me that "the Weaver is wild in profusion on the St. Peter or Minnesota river." Figured by Professor S. B. GREEN in bulletin 5, Minnesota experiment station. C.

FIG. 1.—*Weaver.* Foliage and flowers one half natural size. Fruits and stones full size.

40. *Wier's Large Red.*—"A round plum as large as Wild Goose and better in quality, excellent for cooking; ripening last half of September."—*B. O. Curtis, Paris, Ill.* Leaves medium, firm, smooth or very nearly so, the stalk glandular. D. B. WIER, Illinois.

41. *Wild Rose.*—"Large, round, yellow-blush, skin medium; flesh firm; cling. Early. A Minnesota wild variety, not propagated for sale, but deserving to be."—*Sias.* Introduced in 1880 by A. W. SIAS. Presumably *P. Americana.*

42. *Wolf (Prunus Americana* var. *mollis).* Fig. 2.—Large round, yellow blotched with red, skin thick; flesh firm, meaty and good; perfectly free, the stone circular in outline with a tendency to taper towards the apex, rather flat, the wing or border pronounced, smooth; flowers medium, short-stalked, the calyx lobes glandular and hairy inside; leaves broad and thick, the blades and stalks, as well as the young shoots, prominently pubescent and often glaucose, especially on the young growth, the leaf stalks bearing no glands, or only small ones; tree a stout, good grower, prolific. Medium season. One of the best, both for home use and market. The illustration shows a medium sized specimen. Often known as Wolf Free. Originated on the farm of D. B. WOLF, Wapello county, Iowa, nearly forty years ago, from pits said to have been taken from wild trees in the woods. C.

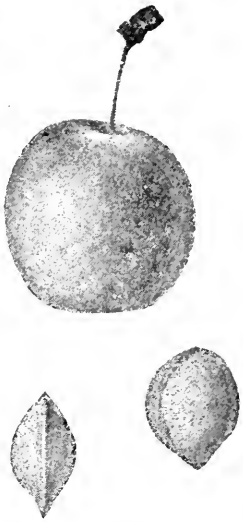


FIG. 2.—*Wolf.*

43. *Wyant.*—Large, round-oblong, purple-red, skin; thick; flesh firm; free; leaves medium, slightly pubescent, the glands small. Found wild in northern Iowa by Mr. WYANT; introduced by Professor J. L. BUDD. C.

44. *Yellow Sweet.*—Medium, round-oblong, and flattened, ground color orange, mottled and splashed with pink-purple; skin thin; free, the stone nearly circular, rather flat, and somewhat sharp on the back, rough. Minnesota? C.

45. *Yellow Yosemite.*—I am not acquainted with the fruit of this variety, but I am told by reliable growers that it is identical with Purple Yosemite.

The Americana group succeeds best, on the whole, in the northern states of the Mississippi valley, and it is the only one which is able to withstand the climates of the northernmost limits of the native plum belt, as Wisconsin, Minnesota, and Iowa. There are some varieties, however, which succeed so far south as Texas. In the Atlantic states the varieties are not grown far south. At Mr. KERR'S place, on the Chesapeake peninsula, the varieties are likely to be unproductive, or short lived, and are much injured by a mysterious blight; yet there are some kinds which grow well with him, among which I recall Wolf, Purple Yosemite, and Kickapoo. The greatest profitable range of the group, however, is confined somewhat closely to the two or three northernmost tiers of states. The varieties which are most highly prized are Cheney, Deep Creek, De Soto, Forest Garden, Itaska, Louisa, Purple Yosemite, Quaker, Rollingstone, Weaver, and Wolf.

B. THE WILD GOOSE GROUP.—(*Prunus hortulana,* L. H. BAILEY, Garden, and Forest, v. 90, [1892]). This, perhaps the most important group of native plums, includes varieties characterized by strong, wide-spreading growth and mostly smooth twigs, a firm, juicy, bright-colored, thin-skinned fruit which is never flattened, a clinging, turgid, comparatively small, rough stone, which is sometimes prolonged at the ends, but is never conspicuously wing-margined, and by comparatively thin and firm, shining, smooth, flat, more or less peach-like, ovate-lanceolate, or ovate, long-pointed leaves, which are mostly closely and obtusely glandular-serrate, and the stalks of which are usually glandular. *Prunus hortulana* in the wild state appears to follow the Mississippi river from northern

Illinois to Arkansas, in its middle region ranging so far east as eastern Kentucky and Tennessee, and possibly to Maryland, and in the southwest spreading over Texas.

This species does not appear to have been recognized by writers upon the genus, although pomologists have long regarded the varieties of it as distinct from *P. Americana*. As it has come into prominent notice through the labors of horticulturists, I take pleasure in recording the fact in the name *hortulana*. The varieties are intermediate between the Americana and Chickasaw groups, while the Miner group, which I refer provisionally to this species, is anomalous in its characters. The fruits lack entirely the dull-colored, compressed, thick-skinned, and meaty characters of the Americanas, and approach very closely to the Chickasaws. They are usually covered with a thin bloom, and are more or less marked by small spots. They are variable in period of ripening, there being a difference of no less than two months between the seasons of some of the cultivated varieties. In color they range from the most vivid crimson to pure golden yellow. The botanical features of the species are not yet well determined, and it is not impossible that more than one species is confounded in it. Some of the gross features of the species are well illustrated in Fig. 3.

In this group B, as I have here constituted it, there are two more or less clearly marked types, but which I am not yet able to separate by positive botanical characters. One type is characterized by thin and very smooth, peach-like leaves, which are very finely and evenly serrate. It comprises Cumberland, Indian Chief, Roulette, and Wild Goose. The other form or type is characterized by thicker, duller, and more veiny leaves, which are more coarsely and more or less irregularly serrate. This includes Golden Beauty, Kanawha, Moreman, Reed, Sucker State, World Beater, and Wayland. It forms a transition to the Miner group (C).

46. *Clark.*—A variety which I know only from the growing tree. Leaves elliptic-ovate, rounded at the base and comparatively short pointed, finely serrate, the stalks two-glandular. Recently introduced and said to have been found wild in Anne Arundel county, Maryland. If it is really indigenous there, it greatly extends the range of the species. C.

47. *Cumberland.*—Fruit medium, oblong, yellow, skin thin; stone rather short, rounded at the base but somewhat pointed at the apex; flowers medium, short-stalked, the calyx lobes glandular; leaves ovate, rounded at the base, long-pointed, finely serrate, the stalks bearing two to several glands. Medium to late. Said to have originated in Georgia, under cultivation. Introduced by PHILIP SCHLEY. C.

48. *Garfield.*—Fruit medium, round-oblong, dark red, skin thick; stone slender (twice as long as broad), prolonged at both ends; flowers medium, stalked, the calyx lobes conspicuously glandular; leaves large to very large, ovate-lanceolate, rounded at the base, rather finely serrate, the stalks usually furnished with a string of glands; tree a strong spreading grower. Late. C. M. STARK writes that it is unproductive in Missouri. Said to have been found wild in Ohio. Introduced in 1887 by the late LEO WELZ, Wilmington, O. C.

49. *Golden Beauty* (Fig. 12; also illustration on title-page).—Fruit medium, round ovate, deep clear yellow; skin medium thick, flesh very firm and of excellent quality; semi-cling, the stone small and broad (only one-fourth larger than broad), the point very short; flowers large, prominently stalked, the calyx lobes glandular; leaves narrowly ovate-lanceolate and very peach-like, rather tapering at the base, thick and dull and somewhat pubescent below, coarsely serrate, the stalk with very small glands. Late; blooms very late. One of the best. A wild south Texan variety, introduced by GEORGE ONDERDONK in 1874.

Honey Drop.—See Missouri Apricot, below.

50. *Indian Chief.*—Large, round, dull red, skin medium thick; flesh firm; cling, the stone very broad and scarcely prolonged into a point, very rough; flowers medium,

short-stalked, the calyx lobes glandular; leaves short, broadly elliptic-ovate, comparatively short-pointed, finely serrate, the short stalks glandular. Early. Recalls the Chickasaws. Origin uncertain; said by MUNSON to have originated in southern Texas, and by ONDERDONK to have come from Georgia; others say that it came from Arkansas. C.

51. *Kanawha.*—Fruit medium to large, round, red, skin medium thick; cling; leaves large and broad with long points, rather thick and dull, the edges irregular with rounded teeth and notches, with several glands on the stalks. Late. Georgia? "Similar to Wayland"—*Munson.* "Almost like Reed. Excellent for spicing. An enormous bearer."—*Berckmans.* C.

52. *Mississippi Apricot* (*Honey Drop*).—Medium to rather large, round, deep yellow, skin medium; semi-cling, the stone rather short and turgid, produced abruptly into short points; flowers medium, short-stalked; leaves medium in size with conspicuous points and with rather large serrations, light-colored, the whitish stalks bearing very small glands or sometimes even glandless. Late. Perhaps the best yellow plum. Quality high. Found wild in Missouri and introduced by STARK Bros. in 1886. "Every way an improvement on Golden Beauty."—*C. M. Stark.* C.

53. *Moreman.*—Medium in size, round, dark red, skin medium thick; cling, the stone small and nearly circular; the points very short; leaves medium, long-pointed, rather coarsely serrate, rather dull in texture, the stalks nearly or quite glandless. Late. A strong spreading grower, producing abundantly of handsome and high quality fruit. It suggests the Miner group and may belong to it. Originated in Kentucky. Introduced by W. F. HEIKES in 1881. "Cooks well. As good as a Damson when spiced."—*Kerr.* C.

54. *Poole* (*Poole's Pride*).—Large, round-oblong, red, skin medium thick; cling; leaves rather small and narrow, very finely serrate, the short stalks glandless or nearly so. Early to medium, of high quality. Succeeds Wild Goose. A wild variety from Illinois. introduced in 1888 by STARK Bros. I am not well acquainted with this variety. It looks much like a Chickasaw.

55. *Reed.*—Medium, round, dark red, skin medium; cling, the stone short and turgid, pitted, the point abrubt and short; flowers medium, short-stalked; leaves very broad (elliptic-ovate or even nearly round-ovate) and large, firm, the point abrupt and conspicuous, unevenly serrate, the stalks bearing few small glands. Late. A very strong spreading grower. Much like Moreman in fruit. Said to have been introduced by the late Mr. REED, Hightstown, N. J. C.

56. *Roulette.*—Medium to rather large, round or round-oblong, red and coloring completely before dropping from the tree, skin thin; cling, stone (like Wild Goose) oblong-obovate and rather slender, scarcely pointed above; flowers medium on rather conspicuous stalks; leaves the shape and size of peach leaves and like those of Wild Goose, the serratures small and even, the stalks glandular. Early to medium. Texan? The Mexican Roulette is evidently the same. C.

57. *Sucker State.* Large, round, dull red, skin thick; cling; flowers large, stalked; leaves medium to large, long taper-pointed, irregularly and obtusely but rather finely (for the size of the leaf) toothed, stalks glandular. Medium to late. Illinois? C.

58. *Texas Bell* (or *Belle?*).—Fruit medium to large, nearly spherical, red; stone short and turgid, obtuse below and very short-pointed above; leaves medium, elliptic-oblong and short-pointed, finely and even serrate, the stalks glandular. Ripens last of June in Texas. Originated by STEPHAN H. TURNER, Texas, and introduced by J. T. WHITAKER, Tyler, Texas. Perhaps a Chickasaw.

59. *Wayland.*—Fruit large, round-oblong, shining pink-red, skin medium; smi-cling, the stone rather small for the size of the fruit, turgid and slightly pitted, very short-pointed at both ends; flower large and long-stalked, very late; leaves medium to large, rather thick and heavy, long pointed, the edges irregular serrate and notched, the stalks usually glandular. Very late. One of the best native plums, but too late for the northern states. Introduced by DOWNER & Bro., Fairview, Ky. First propagated in 1876. It came up in a small plum ticket in a corner of the garden of Professor H. B. WAYLAND, Cadiz, Ky. C.

68. *Whitaker.*—Very large, red; leaves medium; oblong-ovate, points rather short, very finely and evenly serrate, the stalk with small glands or none. Originated under cultivation in eastern Texas by J. T. WHITAKER. Seedling of Wild Goose. C.

61. *Wild Goose* (Fig. 3.)—Large, round-oblong, light red, skin thin; cling, stone long and narrow, prolonged above into a sharp point and below into a narrow base, finely pitted; flowers medium to large, stalked; leaves oblong-lanceolate, peach-like, not prominently

pointed, the margins finely and evenly serrate, and the stalks usually bearing two to four small glands. Early. Quality poor, but on account of its productiveness, earliness, beauty, good shipping qualities, and its early introduction, it is the most popular

FIG. 3.—*Wild Goose.* Sprays half size. Stones full size.

of the native plums. The Wild Goose was first brought to notice by JAMES HARVEY of Columbia, Tenn. Some time before 1850 a man shot a wild goose near Columbia, and on the spot where the carcass was thrown this plum came up the following spring. It

was introduced about 1850 by the late J. S. DOWNER, of Fairview, Ky. This is the first native plum introduced to general cultivation, although the Miner was first known and named. C.

The Wild Goose is either very variable or there are two varieties passing under that name. In the orchards of Mr. KERR, in Maryland, and Mr. MUNSON, in Texas, the flowers appear before the leaves in crowded lateral clusters, but in the plantations at the Michigan Agricultural college and at Cornell, they appear with the leaves in diffuse cherry-like clusters, and the pedicels are longer. These latter specimens are so anomalous as to lead good observers to wonder if they are not hybrids with some cherry. I have not been able to observe any constant differences between these two types in foliage or fruit. I am disposed to regard these peculiarities as variations of one variety due to climate or some other local cause, for I find the same differences in other varieties grown here and in the south, as in Newman, Robinson, and Marianna (Nos. 83, 86 and 92). I have examined a number of seedlings of Wild Goose at Mr. KERR'S, and while they differ from the parent in flavor and shape of fruit, they are much like it in general texture and character of fruit, the stones are singularly alike and the habits of the trees are similar; but in some of them the leaves tend to be irregularly toothed at the margins after the manner of the Wayland class. It should be said that the tree from which these seedlings were grown stood beside a tree of German Prune, but it is not known if these plants will hybridize.

The range of adaptability of the Wild Goose is great. It is hardy in central New York and southern Michigan, and it succeeds well in Georgia and Texas. The tree resembles a peach tree.

62. *World Beater.*—Large, round-oblong, dark red, skin medium; cling; leaves medium and long-pointed, rather dull, somewhat irregularly serrate, the stalks usually glandular. Very late. Of good quality. Found wild in Tennessee. Introduced by STARK BROS. in 1889.

The Wild Goose type or group of plums, as a whole, appears to be best suited to the middle latitudes, being grown with satisfaction from Illinois and Indiana, and the southern part of Michigan and New York to Maryland, Virginia, and Tennessee, and in the southwest to Texas. The varieties which are most highly prized are Golden Beauty, Indian Chief, Missouri, Apricot, Morman, Wayland, and Wild Goose.

C. THE MINER GROUP.—(*Prunus hortulana* var. *Mineri*). This group includes a few anomalous varieties which appear to be intermediate between *Prunus hortulana* and *P. Americana.* They may be an off-shoot of *P. hortulana*, or it is possible that they constitute a distinct species. The Miner is particularly well marked, but there are others which it is somewhat difficult to separate from *P. hortulana.* The group differs from the species by the dull and comparatively thick leaves which are conspicuously veiny below and irregularly coarsely toothed and more or less obovate in outline; by a late, very firm fruit, and by a more or less smooth and Americana-like stone. Fig 4 is an excellent illustration of the under surface of a leaf of this group, and Fig. 5 shows the general habit. I am not able to designate the range of the wild plant, but it appears to occur in Illinois (and perhaps Indiana), Missouri, Tennessee. and perhaps in Arkansas.

63. *Clinton* (Fig. 4).—Fruit large, round, dull red, skin medium thick; cling, the stone short and broad and scarcely pointed, nearly smooth; flowers medium; leaves (see cut) elliptic to elliptic obovate, rather prominently pointed, the stalks glandular. Mid-season, ripening several days before Miner. Thought by some to be the same as Miner, but the leaves, at least, appear to be different.

FIG. 4.—*Leaf of Clinton, full size.*

64. *Forest Rose.*—Large to very large, round, dull, red, skin medium thick; stone cling, broad and comparatively flat, sharp on the front edge, scarcely pointed, smooth, Americana like; flowers medium to large; leaves elliptic to elliptic-obovate, prominently pointed, the stalks ordinarily bearing two small glands. Medium to late, of good quality. A Missouri wild variety, introduced by WILLIAM STARK in 1878. C.

65. *Idol.*—Medium to rather large, round, bright light crimson splashed with magenta, skin thin; stone small, cling; leaves obovate, the stalks glandular. Medium season. Said by D. B. WIER, the originator, to be very large, weighing as much as the average Lombard, but B. O. CURTIS, Paris, Illinois, who now handles some of Wier's varieties, says that with him it is rather small and ripens the last of September and first of October. Said by Mr. WIER to be a cross between Miner and Wild Goose. Illinois.

66. *Indiana Red.*—Large, round, red: cling; flowers medium; leaves elliptic-ovate, prominently pointed, coarsely toothed, the stalks mostly prominently glandular. Medium to late. Said to have been an Indiana wild variety and to have been introduced by Dr. I. CRAMER. By some thought to be the same as Miner. C.

67. *Iris.*—A medium red plum, with rather small and turgid stones which are scarcely pointed, and smooth or nearly so; flowers medium; leaves elliptic or elliptic-obovate, long-pointed, the stalks glandular. Illinois. D. B. WIER, originator and introducer. C.

68. *Langsdon* (Fig. 5).—Medium, round or round-oblong, light-red: stone cling, small and nearly smooth, turgid, very short-pointed; leaves obovate or elliptic-obovate, moderately pointed, the glands small. Medium to late. Much like Miner.

69. *Leptune.*—Medium, round, dark-red, skin thick: cling, stone rather small and turgid, nearly smooth, short-pointed; leaves elliptic-ovate to elliptic-obovate, very long-pointed and coarsely serrate, stalks either glandless or glandular. Late. Said to have been introduced by J. D. MORROW & Sons, Arkansas.

70. *Miner.*—Large, round or roundish-oblong, dull red, skin thick; stone cling, short and broad, smooth or very nearly so, very short-pointed, rather sharp on the front edge, Americana-like; flowers medium to large; leaves large and heavy, usually inclined to be obovate, rather long-pointed, the stalks glandular. Medium to late. Said by DOWNING to have originated with Mr. MINER, Lancaster county, Penn., but this is a mistake. The seed which produced the Miner plum was planted in 1814, in Knox county, Tennessee, by WILLIAM DODD, an officer under General Jackson. DODD appears to have had two batches of seed, one which he gathered the year before upon Talaposa creek, and the other given him by an Indian chief. It is not clear from which lot this plum sprung. The plum gained some notice when it came into bearing, and was known as Old Hickory and General Jackson. In 1823 or 1824 DODD moved to Illinois and settled near Springfield, taking some sprouts of his plum with him. The plums soon attracted attention among DODD's neighbors, and the variety was called in its new home William Dodd and Chickasaw Chief. The year following WILLIAM DODD'S removal to Illinois, his brother moved to Galena, Illinois, and took some of the plums. About Galena the plumb became know as the Hinckley. I do not know how the name Miner came to be applied to it, but Downing's reference to Mr. MINER of Pennsylvania—who probably grew and disseminated it—undoubtedly explains it. It is said by D. B. WIER that the late Hon. JAMES G. SOULARD of Galena, introduced this plum to general cultivation, and I repeated this statement last year in a discussion of the Soulard crab. For a fuller history of the Miner, see A. GIDDINGS in Iowa Agricultural Report, 1871,

332.) Downing gives Hinckley, Isabel, Gillett, Townsend, and Robinson as synonyms of Miner. The Robinson now known is a very different fruit. (See No. 86.) The Miner is one of the best and most popular of the native plums, and is probably grown further north with success than any other variety of this species (Groups B and C). In central New York it ripens in October. Colored plate in Agriculture of Pennsylvania, 1881. C.

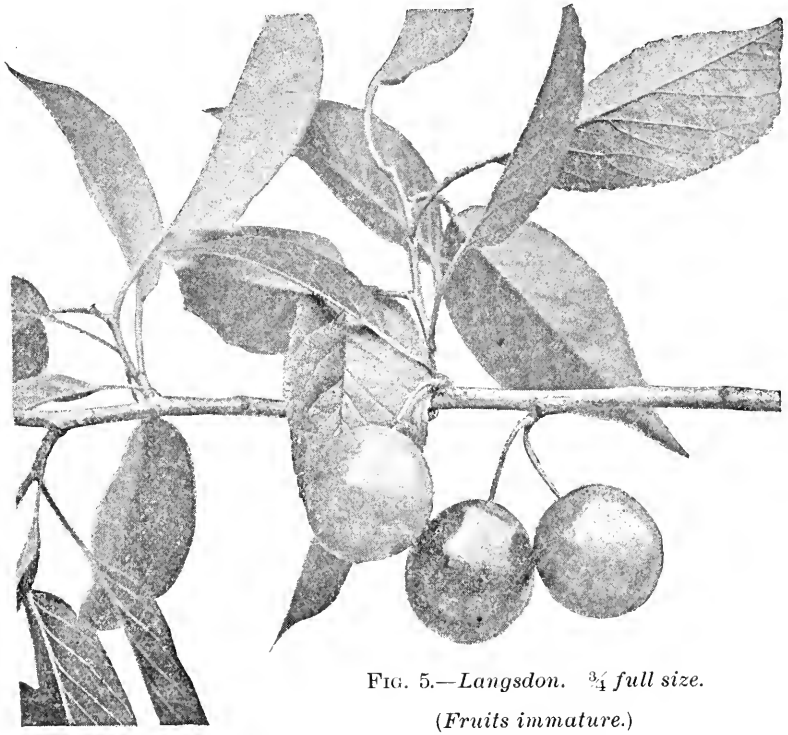


Fig. 5.—*Langsdon.* ¾ *full size.*

(*Fruits immature.*)

Parsons.—Supposed to be identical with Miner, which see. C.

71. *Prairie Flower.*—A variety introduced by Stark Bros., Missouri; probably belongs in this group.

72. *Rachel.*—Medium, round-oblong, dull red, thick skin; stone cling, short and broad, thin-margined on the front edge, scarcely pointed, smooth, Americana-like; leaves long, elliptic-obovate, moderately pointed, stalks glandular. Medium to late. C.

The Miner group appears to be a strong and hardy race which is particularly adapted to the northern limits of the cultivation of the Hortulana family. The varieties are much alike. The Miner is the most popular member of the group, and it succeeds even in northern Illinois. In New York the varieties ripen from late September even to late October.

D. The Chickasaw Group.—(*Prunus angustifolia*, Marshall, Arbustrum Americanum, 111. [1785]. [*Prunus Chickasa*, Michx. Flor. Bor.-Am. i. 284]). This group of plums differs from the Wild Goose group (B) by a more slender, spreading, and zigzag growth, usually smaller size of tree, red twigs, by smaller, lanceolate or oblong-lanceolate very closely serrate shining leaves which are conduplicate or trough-like in habit, by early small flowers, which, upon old wood, are densely clustered on the spurs, and by an early red (rarely yellow) and more or less spotted

translucent fruit, the flesh of which is soft, juicy, and more or less stringy and very tightly adherent to the small, broad, roughish stone. It is difficult to separate some of the cultivated forms of this species from small-leaved and weak-growing varieties of *Prunus horlulana*, but the two

FIG. 6.—*Newman.* Sprays half size. Leaf and stones full size.

species are easily separated in a wild state. The zigzag young twigs and trough-like leaves of the Chickasaws are characteristic, and are shown in Fig. 6. The leaves are often very small, scarcely exceeding an inch in

length, but upon the more vigorous cultivated varieties, as the Newman, the leaf-blades are often three inches long and nearly flat. In herbarium specimens the species is usually recognized by the two halves of the leaves being pressed together so that the upper surface is hidden. In a wild state the trees or bushes are thorny, and the thorns persist in some of the cultivated varieties. It grows wild, often in dense thickets, from southern Delaware to Florida, and westward to Kansas and Texas. It is commonly stated in the books that the Chickasaw plum is not native to the Atlantic states, and some suppose that it was introduced into the United States from countries to the south of us. I have been unable to find sufficient reasons for these opinions, and I believe that the species is native to the southeastern states. In Maryland, as I have seen it, it behaves like an indigenous plant, and the people regard it as a true native. The small acerb fruit of the thorny and straggly wild bushes is known in Maryland as "Mountain Cherry."

This species, like *Prunus Americana*, was founded by Humphey Marshall in 1785. His description is as follows: "*Prunus angustifolia.* Chickasaw Plumb. This is scarcely of so large a growth as the former [*P. Americana*], but rising with a stiff, shrubby stalk, dividing into many branches, which are garnished with smooth lance-shaped leaves, much smaller and narrower than the first kind [*P. Americana*]; a little waved on their edges, marked with very fine, slight, colored serratures, and of an equal, shining green color, on both sides. The blossoms generally come out very thick, and are succeeded by oval, or often somewhat egg-shaped fruit, with a very thin skin, and soft, sweet pulp. There are varieties of this with yellow and crimson colored fruit. These being natives of the southern states, are somewhat impatient of much cold."

73. *African.*—Medium to rather large, round-oblong, dark red; leaves small, short oblong-lanceolate. Early to medium. Originated under cultivation by G. Onderdonk, South Texas, and introduced by him in 1870. C.

74. *Arkansas Lombard.*—Medium round or round-oblong, red; leaves medium, ovate-oblong. Early to medium, ripening just before Newman. Arkansas. Said to have been introduced by J. D. Morrow & Sons.

75. *Caddo Chief.*—Medium or rather small, round, red; leaves medium in size, short, ovate-oblong. Very early, ripening with Early Richmond cherry. Wild from Caddo parish, Louisiana. Introduced by G. W. Stoner. Blooms and ripens very early. In northern Texas the fruit is ripe the middle of May. C.

76. *Coletta.*—Medium to large, round-oblong, light red; leaves small, oblong-lanceolate. Tree somewhat thorny. Early or very early. Originated under cultivation in southern Texas by G. Onderdonk, who introduced it in 1874. Ripens with Caddo Chief. C.

77. *Early Red.*—Medium, round, red; leaves medium, oblong-lanceolate. Early or very early. Origin southern Texas under cultivation by G. Onderdonk; introduced by him in 1872. There is a Russian plum (*Prunus domestica*), introduced by Professor Budd, known as Early Red. C.

78. *El Paso.*—Medium, round, red; leaves medium, ovate-oblong. Ripens during July and August in southern Texas. Originated and introduced by Lee Beaty, Texas.

79. *Emerson's Early.*—Rather large, round, purple-red, skin very thin; cling. Said to be a good market sort. Very early. Wild variety from northern Texas. Introduced by Mr. Bruce. Similar to Lone Star, but a better grower.

80. *Hoffman.*—Medium to rather large, round, purple-red; leaves medium, oblong-lanceolate. Mid-season too late. A wild variety from southwestern Missouri. "Very sure and prolific [in Texas]."—*Munson.* Ripe in northern Texas the middle of July, later than the Wild Goose.

81. *Jennie Lucas.*—Medium to rather large, round, yellow; leaves short, ovate-oblong. Early. Originated under cultivation and introduced, in 1875, by G. ONDERDONK, southern Texas. C.

82. *Lone Star.*—Rather large, round-oblong, red, skin very thin; leaves rather small, oblong-lanceolate. Early. Originated in Texas by E. W. KIRKPATRICK; grown from wild seed from eastern Texas. C.

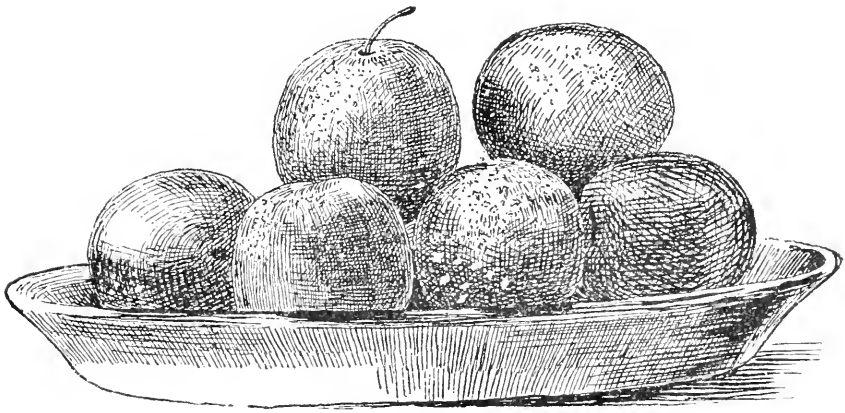


FIG. 7.—*Newman Plums.* Natural size.

83. *Newman* (Figs. 6 and 7).—Rather large, nearly globular or round-oblong, pink-red with prominent light spots near the apex, yellowish opposite the sun; leaves rather large, oblong-lanceolate. Medium to late. Ripens in New York in October. Introduced from Kentucky by W. F. HEIKES. One of the best known of the Chickasaws. In our plantation the Newman is hardy, but the flowers, instead of appearing before the leaves as in the central and southern states, appear with the leaves in loose umbel-like clusters. This is the same kind of variation which occurs in the Wild Goose (see No. 61). In some of the New York trees the leaves are unusually large and often nearly plain. The Chickasaw method of growth is fairly well retained, however. Warren is thought to be indentical with Newman C.

84. *Ogeechee.*—Small to medium, round-oblong, red; leaves short, ovate-oblong. Very early. Similar to Caddo Chief. Wild from Georgia. introduced by G. BOURQUIN.

85. *Pottawattamie.*—Rather large, round, red; leaves rather small, narrowly oblong-lanceolate to ovate-oblong. Early to medium. Tennessee; it was taken to Iowa in a lot of Miners, and came under the notice of J. B. RICE, Council Bluffs, in 1875, who introduced it. Various stories are told about its origin, but the above is correct. It appears to have received its name from Mr. RICE. Like the Newman, the leaves appear to be larger in the north. "Enormous bearer."—*Berckmans.* C.

86. *Robinson.*—Medium, round, blotched red; leaves medium or small, ovate-oblong or oblong-lanceolate. Mid-season. "This is a seedling grown by a Mr. PICKETT, of Putnam county, Indiana, from a seedling brought with him from North Carolina, nearly fifty years ago, and has, almost every season (since large enough), borne abundant crops, but was neglected, and never brought to the notice of the public till 1879, when Dr. J. H. ROBINSON (of the same township) read a paper before the Indiana Horticultural society, on Chickasaw plums, and gave a very flattering description of this plum, which he had been watching since 1872, and of which he had two good crops on his own trees, which bore two bushels to the tree five years after planting, and has borne good crops annually, except once, when killed by late frosts. It was named by the Putnam County Horticultural society in honor of Dr. ROBINSON."—ALBERTSON & HOBBS, Bridgeport, Indiana (1-85), who introduced the variety in the fall of 1884 and spring of 1885. Like Wild Goose and Newman, in New York the flowers appear with the leaves. C.

87. *Schley* (*Schley's Large Red*).—Rather large, round, red; leaves medium, ovate or lance-ovate. Early to medium. Said to have been introduced from Georgia by W. K. NELSON. Much like Roulette except in foliage. Possibly *Prunus hortulana.* A very spreading and straggling grower. C.

88. *Strawberry.*—We are growing but have not fruited a plum under this name which appears to have been recently introduced. I know nothing of its history. C.

Warren.—See Newman.

89. *Wooten.*—Large, round-oblong, yellow with red markings; leaves medium, oblong-lanceolate. Medium to late. Found wild in central Texas (Colorado river), and introduced by A. M. RAMSEY. "Very sure and prolific."—*Munson.* Ripe from early to middle July in northern Texas. Possibly *P. hortulana.*

90. *Yellow Transparent.*—Rather large, oblong, lemon yellow; leaves rather small, oblong-lanceolate. Early. Originated in northern Texas by J. L. FREEMAN. Selected from thousands of varieties grown from wild seed.

I have plants from Kansas under the name of "Kansas Dwarf Cherry," which are evidently a bush-like form of this species. They have not yet borne.

The "Sand Plum," which is occasionally grown in Nebraska, is *Prunus angustifolia*, if I may judge from leaves sent me by Dr. C. E. BESSEY of the University of Nebraska. Dr. BESSEY writes as follows of this plum: "Occasionally I hear of a "Sand Plum," said to grow in the southwestern and western parts of the state. No authentic specimens have been seen although I have in my collection some twigs and leaves from plants cultivated under this name, and thought, by the growers, to have been taken up from wild patches in the state." It is not improbable that this sand plum is the same as the Kansas dwarf cherry mentioned above.

The Chickasaw group is particularly adapted to the southern states, and it succeeds so far north as Maryland and Kentucky, while some of the varieties are hardy in central New York. The leading varieties are Caddo Chief, Jennie Lucas, Lone Star, Newman, Pottawattamie, Robinson, and Yellow Transparent.

E. THE MARIANNA GROUP.—The Marianna and De Caradeuc plums—and probably, also, the Hattie—constitute a distinct class from any of the foregoing, differing in habit of tree, very early flowering; elliptic-ovate, rather small and finely serrate dull leaves, glandless leaf-stalks, and soft, spherical, very juicy plums of a "sugar and water" character, and broad ovate stones which are scarcely pointed, and are prominently furrowed on the front edge. The botanical position of these plums has been a subject of speculation, to which I have added my full share of confusion. I have devoted more study to these plums than to any others, and I am now convinced that the De Caradeuc is myrobalan, and that the Marianna is either the same species or a bybrid between it and some American plum, possibly the Wild Goose. This, I am aware, is a startling conclusion, particularly as the Marianna has come to be so extensively used as a stock to replace the myrobalan, which appears to be growing in disfavor. Before entering into detail concerning the origins of these plums, it will be useful to our inquiry to clear up some of the history of the myrobalan plum.

The word myrobalan (or myrobolan), as a noun, is used to designate various small tropical fruits which are used in the arts, chiefly for tanning purposes. It is now commonly applied to the fruits of the species of Terminalia, of the family Combretaceæ, which are imported from India. The word was early applied to a small plum grown in Europe, probably because of some resemblance in size or other characteristics to the myrobalans of commerce. This plum has had a curious history. The first undoubted reference to it which I know is in CLUSIUS' *Rariorum Plantarum Historia*, 1601. CLUSIUS gives a good figure of it, but says that it

was not generally known. Some people thought that it came originally from Constantinople, and others that it came from Gaul. CLUSIUS leans toward the latter view. He calls it the myrobalan plum, but does not know the origin of the name. For nearly two hundred years after CLUSIUS wrote, the fruit is described by various authors in different parts of Europe, under the names of myrobalan or cherry plum, during which time doubts were cast upon its European origin. Thus Tournefort in 1700 said that it came from North America In 1789 EHRHART described it as a distinct species under the name *Prunus cerasifera*, or "cherry-bearing plum," and said distinctly that it is a native of North America. Some thirty years before this time, LINNÆUS had described it as *Prunus domestica* var. *myrobalan*, and gave it a European origin. In 1812, LOISELEUR DESLONCHAMPS described it as *Prunus myrobalana*, saying that it was supposed to be of American origin. From that time until now the nativity of the myrobalan plum has been uncertain, but European writers have usually avoided the difficulty by referring it to America; and American botanists have, for the most part, ignored it because it is a cultivated plant. So it happens that this pretty fruit has fallen between two countries, and is homeless. SERENO WATSON, in his Index to North American Botany, published in 1878, refers EHRHART'S *Prunus cerasifera* to the common beach plum (*Prunus maritima*) of the Atlantic coast. But the myrobalan is wholly different in every character from the beach plum, and it has been long cultivated upon walls in Europe, a treatment which no one would be likely to give to the little beach plum. TORREY and GRAY, in 1838, in the Flora of North America, do not mention the myrobalan plum. After all the exploration of the North American flora, no plant has been found which could have been the original of this plum; while its early cultivation in Europe, together with the testimony of CLUSIUS and other early herbalists, is strong presumption that it is a native to the Old World. This presumption is increased by the doubt which exists in the minds of the leading botanists, from LINNÆUS down, as to its systematic position, for if there is difficulty in separating it from *Prunus domestica*, the original of the common plum, and which is itself a native of the Old World and immensely variable, there is strong reason for suspecting that it is only an offshoot of that species; and this presumption finds strong support in other directions. But one need not study far into the European plums until he convinces himself that the essential features of the myrobalan plum are present in several of the wild or half wild forms of southern and southeastern Europe, no matter what the ultimate origin of the fruit may be. Plums from Turkestan (presumably wild), now growing upon the grounds of ELLWANGER & BARRY at Rochester, N. Y., are certainly myrobalan; and it may be said that the so-called *Prunus Pissardi*, which has been recently introduced from Persia, is but a purple-leaved myrobalan plum. I have no doubt, therefore, but that the myrobalan plum is native to Europe or Asia: and it is full time that an American origin be no longer ascribed to it.

The myrobalan plum has long been used in this country as a stock for various plums. Except upon the Pacific coast, it appears to be falling into disuse, however, as it dwarfs the scion and is not suited to all varieties. The endeavor to find some stock which can take the place of the myrobalan has resulted in the popularizing of the Marianna, but which, if not pure myrobalan, certainly partakes very largely of it. The myrobalan is generally distributed over the country as a stock, and bearing trees of it are

occasionally seen. The Golden Cherry plum of Downing is undoubtedly this species, and the fruit now known as Youngken's Golden Cherry is certainly myrobalan, and it is probably identical with the variety described by Downing. The fruits may be either yellow or red in various shades.

FIG. 8. *Marianna. Sprays half size. Details full size.*

They are round and cherry-like, with a depression at the base, on slender stems, ranging in size from that of a large cherry to an inch and a half in diameter. The myrobalan is very variable, a fact which finds record in the various shapes and sizes of the commercial imported stones.

91. *De Caradeuc.*—Rather large (1 to 1¼ in. diam.), globular, deep, dull purple-red when ripe with a prominently colored suture, but yellowish green splashed with red when it first becomes edible; flesh thin, very juicy and sweet; cling, the stone round-ovate, rather turgid, scarcely pointed and evenly pitted; leaves rather firm, ovate-oblong. Early. In central New York it ripens from the first to the middle of August. Tree an erect grower. This plum appears to agree with the myrobalan in all important botanical characters, gven to the broad and strongly reflexed calyx lobes and stalked flowers. About a year ago I became convinced that De Caradeuc is *Prunus cerasifera*, and I was glad to have my opinion confirmed by so good a nurseryman as P. J. BERCKMANS of Georgia, who named the variety; and the origin of the plum, which I have since learned corroborates my conclusion. It originated with A. DE CARADEUC upon his farm near Aiken, South Carolina, about the years 1850 to 1854. Mr. DE CARADEUC imported some French plums, from the seed of which this variety came. There were several Chickasaw plums in the vicinity of the French trees and Mr. DE CARADEUC thinks that the variety under consideration is a hybrid, but I am unable to discover any evidence of hybridity. The original tree of the variety "outgrew the parent, and reached a diameter of head of fifteen feet, was entirely free from thorns and suckers, and bore a remarkably rich and beautiful foliage." The variety blooms very early, some days ahead of the Marianna, and the flowers, as in all varieties of *P. cerasifera*, are somewhat scattered and less abundant than in the native species. C.

92. *Marianna.* (Fig. 8).—Large, round-oblong, short stemmed as compared with the DeCaradeuc, bright red and finely speckled and covered with a thin bloom; flesh soft and sweet, juicy; semi-cling, the stone like that of DeCaradeuc (see Fig. 8); flowers small, sessile or short-stalked, in dense lateral clusters like the native varieties, the calyx lobes, narrow and erect; leaves much as in DeCaradeuc, but thinner. A little later than DeCaradeuc, but ripens before the Wild Goose. Tree a very spreading grower. C.

From the above description it will be seen that the Marianna is in several respects intermediate between *Prunus cerasifera* as represented in DeCaradeuc, and the native American plums, particularly in the short-stemmed fruit, small, nearly sessile, and clustered later flowers, and erect, narrow calyx lobes, and spreading habit. It is therefore little surprise to learn that the originator considers it a seedling of Wild Goose. It originated as a seedling in a mixed orchard at Marianna, Polk Co., Texas, the property of CHARLES G. FITZE. So far as I can learn, the seed was not hand sown, and there is a chance for error in the history. The variety was introduced in 1884 by CHARLES N. ELEY, Smith Point, Texas.

The Marianna grows readily from cuttings, and this, in connection with the hardiness and vigor of the variety and the readiness with which it unites in graftage, with several species of prunus has made it very popular as a stock. The myrobalan itself grows from cuttings, but in most cases not to a profitable extent. I have recently made a small experiment upon the rooting of cuttings of myrobalan, De Caradeuc, and Marianna in identical conditions, under heat. Of myrobalan cuttings, less than ten per cent. grew; of De Caradeuc, less than twenty per cent.; of Marianna, about seventy per cent. I do not know where the Marianna could have obtained this peculiarity to grow readily from cuttings; but it is idle to attribute it to hybridity until we have determined if all varieties of myrobalans grow with equal difficulty from cuttings. The question will at once arise if the Marianna is reliable as a stock, seeing that it is probably partly of myrobalan origin; and in reply I can only say that experience alone can determine the value of a stock. Thus far the Marianna has given good results. I apprehend that some of the dissatisfaction with Myrobalan stock should be laid to the indiscriminate use of variable seedlings; in order to obtain uniform results a particular variety or strain of myrobalan should be used. In this connection I may observe that the flowers of Marianna appear with the leaves in New York, while they appear before the leaves—as shown in Fig. 8—in the middle and southern

states; and this peculiarity I have observed in myrobalan, and also, as previously recorded, in Wild Goose, Newman, and Robinson.

93. *Hattie.*—Medium, round-oblong, red; cling, the stone much like that of Marianna in shape but rather more pointed and nearly smooth; flowers small and clustered, the calyx lobes small and erect; leaves small, short-oblong or ovate-oblong, somewhat conduplicate, dull and firm, finely serrate, the stalks glandless; branches stiff and conspicuously rough or warty. Early, below medium in quality. The history of this plum I am unable to trace. In some respects it closely resembles the Chickasaws, but I can not escape the conviction that it is partly myrobalan. I have seen the same rough shoots in the myrobalan plum. C.

FIG. 9.—*Beach Plum* (*Prunus maritima*). Sprays half size. Details full size.

F. THE BEACH PLUM.—(*Prunus maritima*, Wangenheim [1781]). Fig. 9. The beach plum is a straggling, more or less decumbent, bush, reaching three to six or even twelve feet in height, growing in the sands of the sea-coast from New Brunswick to Virginia, and perhaps extending further toward the southwest. The flowers are rather large for the size of the plant, and are borne on prominent stalks in clusters. The fruit, in the best forms, is about a half inch in diameter (see Fig. 9), and is deep, dull purple when ripe, and covered with a dense bloom; the flesh is brittle, sweet, and juicy, entirely free from the stone; the skin is thick and tough, and usually leaves an acrid taste in the mouth when the fruit is eaten. Upon the Jersey coast the fruit is ripe the middle of August. *Prunus maritima* is in cultivation as an ornamental plant, it being very showy when in bloom and interesting in fruit. It succeeds well under cultivation in the interior states. As a fruit plant it has given rise to but one variety.

94. *Bassett's American* (Fig. 10).—Small (about three-fourths inches in diameter), round or slightly round-oblate, dull red, skin medium thick; free-stone, the stone nearly circular in outline with a very short point or even pointless, thin upon the front edge, slightly rough; leaves a fourth or third larger than those of the wild beach plum. Medium to late, ripening in late August in eastern Maryland. Quality poor. Introduced about 20 years ago by WM. F. BASSETT, Hammonton, N. J., who bought the original tree of a man who found it in the neighborhood. It works well upon the Wild Goose, and Mr. BASSETT writes me that he has a tree on such roots which is fifteen feet high. It was largely brought to notice through the efforts of the Rumson nurseries, where it was worked upon the myrobalan plum and peach. I have seen a vigorous large tree at Mr. KERR's grafted upon the Richland, which is *Prunus domestica*. Mr. KERR also finds that it grows upon the Chickasaws. The variety appears to differ from the wild beach plum only in size.

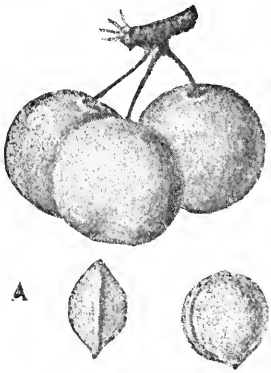


Fig. 10.—*Bassett's American.* Full size.

G. PRUNUS SUBCORDATA, the wild plum of the Pacific coast, was introduced to cultivation in 1889 by T. V. MUNSON (see Annals of Horticulture 1889, 104; 1891, 235). It is a straggling, much branched shrub growing from three to ten feet high. It has subcordate, roundish, or round-ovate tomentose leaves, and large, pedicelled flowers which appear with the leaves. The red fruit reaches three fourths inch long. It is eaten by Indians and whites. Its value in cultivation is yet to be determined.

H. HYBRIDS.—It is not known to what extent the native species of plums hybridize with each other or with foreign species, and nearly all the definite attempts at crossing are so recent that results have not been obtained. The only apparently authentic hybrids have come from the union of the Wild Goose and the peach. Mr. KERR has what appears to be an undoubted hybrid. The tree, as I recall it, is large, spreading, and peach-like. The leaves are long and peach-like, although rather broad and short-pointed, but the flower buds, although they form in profusion, never open, so that the tree is barren. This is a hybrid between the Wild Goose and Troth's Early peach. Twenty-five flowers of Wild Goose were emasculated in the bud and covered with paper sacks. When in full bloom, peach pollen was applied, but the flowers were not again covered. Twenty-one of the flowers set fruit, and twenty-one trees were obtained

from the seeds. Twenty of the trees were indistinguishable from peach, but the remaining one, as indicated above, gives every evidence of being a hybrid. One other apparent hybrid is the

95. *Blackman.*—Nearly thirty years ago Mrs. CHARITY CLARK procured from an orchard in Rutherford county, Tenn., which contained Wild Goose and Washington plums, seeds of plums and gave them to Dr. BLACKMAN, of Nashville. One tree among the resulting seedlings bore good fruit and it was called the Blackman, and was disseminated by a local nurseryman. A competing nursery, in endeavoring to procure cions from this tree, inadvertently cut them from an adjacent tree—itself one of the batch of seedlings—and sold the trees which it grew as Blackman. Now this second tree makes fruit buds in abundance but they never open; and from the resemblance of the leaves to those of the peach the plant is generally thought to be a hybrid between the Wild Goose and the peach. This assumption finds partial confirmation in the experiments of Mr. KERR, recorded above, for this spurious Blackman is very much like his hybrid although the leaves are more pointed and still more peach like. Curiously enough, the genuine Blackman has never been widely disseminated, but the spurious and worthless substitute has been sold in large quantities. In order to avoid confusion, the original Blackman has been rechristened Charity Clark. There are therefore, two Blackman plums, one of which is practically unknown to cultivation, but which has been renamed, and the other is barren and will soon pass from sight.* C.

I. UNCLASSIFIED VARIETIES.—The following varieties I know only from printed references or from information afforded by correspondents, and I can not, therefore, refer them to their proper species.

96. *Allen's Yellow.*—Medium, round, yellow and red, skin thick; cling. Kansas.

97. *Barry.*

98. *Champion.*—Very large, oblong, dark red, thick skin; flesh firm; cling. Late. H. A. TERRY, 1890. Originated under cultivation.

99. *Charles Downing.*—Large, round-oblong, red, skin thin; flesh firm; cling. Medium to late. Should be worked on peach. H. A. TERRY, Iowa, 1885. Originated under cultivation.

100. *Cherokee.*—A medium size plum, round-oblong, blotched red, thick skin; cling. Said to have been found wild in Kansas.

101. *Col. Wilder.*—Large round-oblong, red, thin skin; flesh firm and of best quality; cling. Medium to late. H. A. TERRY, Iowa. 1888. Originated under cultivation.

102. *Cook's Choice.*—Medium, round, red, thin skin; flesh of best culinary quality; cling. Medium to late. H. A. TERRY, 1885. Originated under cultivation.

103. *Couler.*—From WM. COULER, Chickasaw county, Iowa. "The Couler is a large plum of fair quality, ripening a little before Miner, but sometimes cracks open badly before ripe."—*O. H. Kenyon McGregor, Iowa Hort. Rept. xvii., 255.*

104. *Crescent City.*—Rather large, oblong, dark red, skin thick; cling. Late. H. A. TERRY, Iowa, 1885. Originated under cultivation.

105. *Diamond.*—Seedling from wild Nebraska, seed grown by JOHN A. HOGG. "Grows fully as large as most of the tame varieties. Ripens last of September, and when fully ripe gets bright red on one side."—*John A. Hogg, Nebr. Hort. Rept. 1890, 121.*

106. *Dr. Dennis.*—Large, round-oblong, red, thin skin; flesh firm and good; cling. H. A. TERRY, Iowa, 1890. Originated under cultivation.

107. *Dunlap.*—Large, round, yellow, thin skin; flesh firm and of high quality; cling. Medium season. Nebraska seedling introduced by J. P. DUNLAP.

108. *Early Honey.*—An early variety, evidently a Chickasaw, which originated in Grayson county, Texas.

109. *Ellis.*—Rather large, round, red, skin very thin; semi-cling. Ranks high for market or for home use. Late. Said to be a cross between Wild Goose and Golden Beauty. North Texas. Introduced by T. L. ELLIS.

* For a fuller account of the Blackman plums, see VanDeman in Rept. Dept. Agric. 1887, 636. The Blackman has been recommended as a stock for peaches upon the supposition that it enjoys immunity from yellows. See Cal. Orchard and Farm, iv. 3.

110. *Esther*—Rather large, round-oblong, dark red, skin thick; cling. Medium to late. H. A. TERRY, Iowa, 1885. Originated under cultivation.

111. *Excelsior.*

112. *Hammer.*—Large, oblong, light red, skin thin; of extra quality; cling. Medium to late. H. A. TERRY, Iowa, 1888. Originated under cultivation. Said to be a seedling of Wild Goose.

113. *Houston County.*

114. *Hughes.*—A large round red plum said to have come from northern Mississippi.

115. *Iola.*—Very large, oblong, dark yellow and red, skin medium thick; flesh firm; free. Late. D. B. WIER, Illinois.

116. *Irene.*—Very large, round, bright red, thick skin; flesh firm; cling. Late. D. B. WIER, Illinois.

117. *Ithaca.*—Said to have come from PETER M. GIDEON, Minn.

118. *James Vick.*

119. *Jewell.*

120. *Jones.*—Large, oblong, red, skin thick; flesh firm, good; cling. Late. H. JONES, Iowa, 1882. Originated under cultivation.

121. *Miles.*—Said to have originated in Illinois from seed taken from North Carolina.

122. *Milton.*—Rather large, round-oblong, dark red, skin thin; flesh firm; cling. Early. H. A. TERRY, 1885. Said to be a seedling of Wild Goose.

123. *Mrs. Clifford.*—Very large, pear-shaped, red, skin very thin; semi-cling. Fine for market or home use. Possesses a peculiar and agreeable pineapple flavor. Medium early. Originated in northern Texas under cultivation, and introduced by E. C. CLIFFORD. Said to be a seedling of Wild Goose, and a great improvement upon that variety.

124. *Muncy.*

125. *Munson.*—Rather large, oblong, red, skin thin; cling. Late. Originated under cultivation in Texas. Introduced in 1888 by G. ONDERDONK.

126. *New American.*

127. *Okaw.* (Annals Hort. 1890, 175).

128. *Piram.*—Large, round, yellow, skin thin; cling. Medium early. A very productive variety. Originated under cultivation in Texas and introduced by G. ONDERDONK.

129. *Rare Ripe.*—A dark red plum, a little smaller than De Soto; cling. Quality better than De Soto, but inferior to Harrison's Peach. Hardy.—*C. A. Keffer, Bull. 26, S. Dak. Exp. Sta.*

130. *Raymond.*

131. *Rockford.*—Good size, round, purple, thin skin; of best quality; cling. Medium to late. Wild Iowa variety, introduced by C. G. PATTEN, Charles City, Iowa, 1889. C.

132. *Rocky Mountain Seedling.*

133. *Round.*—From Iowa.

134. *Silas Wilson.*—Large, round-oblong, light red, skin thin; of best quality; cling. Medium to late. H. A. TERRY, Iowa, 1890. Originated under cultivation.

135. *Smiley.*—Very large, dark red. Alabama?

136. *Tennehа.*

137. *Tomlingson.*

138. *Van Deman.*—Large, round, light red, skin thin; of best quality; cling. Medium to late. H. A. TERRY, Iowa, 1890. Originated under cultivation.

139. *Wady's Early.*—Early and very good, but the tree is a poor grower and the fruit is rather small.

140. *Winnebago.*—Fruit above medium in size, orange-scarlet, excellent for culinary purposes. Minnesota. Probably *P. Americana.*

§ 2. *Cultivation of the Native Plums.*

1. *Impotent varieties. Planting.*—It is not strange that difficulties should beset the cultivation of fruits which are yet scarcely rescued from a wild state. The chief difficulty in the growing of the native plums is the fact that some varieties do not fertilize themselves. This peculiarity appears to be due not to any imperfection in the flowers but to the comparative impotency of pollen upon flowers of the same variety. Imperfect flowers are occasionally observed, but they are apparently peculiarities of individual trees or particular seasons. Thus in our Newmans this year only about every twelfth flower has a perfect pistil. I have observed a similar defect in wild plums. I know a wild tree of *Prunus Americana* which bears flowers without pistils. The impotency of pollen appears to be characteristic of certain varieties, as, for example, Wild Goose, Miner, Wazata, Minnetonka, Itaska. Other varieties of the same species are fertile with themselves, as Moreman, Newman, Wayland, Golden Beauty, Marianna, Deep Creek, Purple Yosemite. In order to insure fertilization, mixed planting is practiced when the impotent varieties are grown; and it is an important study to determine what varieties are the best pollinizers for a given kind. Evidently, the two varieties in any case must bloom at the same time and the pollinizer must produce an abundance of pollen. Thus the Newman is a good pollinizer for the Wild Goose, but it blooms too early for the Americana varieties. In some of the western states, Forest Garden is considered to be a good pollinizer for Miner. It is a common opinion among plum-growers that the common or Domestica plums, the peach, and even the cherries will fertilize the Wild Goose. There is certainly much general evidence in support of this opinion, but it remains to be proved. A case within my own experience lends color to this opinion. A half dozen large trees of Wild Goose were barren until trees of plums and cherries about them bloomed profusely, when the Wild Goose bore a heavy crop.

There is much difference of opinion concerning the methods of planting in order to secure fertilization. Many growers advise planting in thick hedge-like rows, the trees standing not more than four or eight feet apart in the row, every fourth or fifth tree, or every alternate row, being a self-fertile and very polliniferous variety. Others practice setting the trees from nine to twelve feet apart each way, with the impotent varieties in alternate rows. In this way, for example, Forest Garden is made to fertilize both Miner and Wild Goose. This treatment is commonly known as "close planting," and it has many able advocates. It is said, also, that this close planting shades the ground so completely as to make it too cool for the rapid development of the curculio. Such plantings, unless the trees are heroically trimmed, soon result in an unmanagable tangle. I have seen a Wild Goose tree 36 feet across and still growing and bearing, and Miner, Leptune, and Langsdon scarcely less. Mr. KERR, who is a very successful grower, sets his trees from twenty to thirty feet apart, and others have good success with equally thin planting. It is probable that different varieties or combinations demand different treatment in this respect; but it is plain that while the majority of native plums appear to be self-fertile, some of the most important varieties are impotent.

2. *Propagation.*—Another important difficulty is that relating to the selection of stocks. The native species work well upon each other, but the permanency and strength of the different unions are still moot points.

The varieties also unite readily with the Marianna; and Domestica plum stocks, myrobalan, and peach are also used. In general, it may be said that a variety prefers a stock of its own species, although the true Chickasaws sprout or sucker so badly as to make them undesirable. In the northern states, especially in the prairie region, the *Prunus Americana* stocks are most reliable because of their hardiness; and as the Americana varieties are the ones chiefly grown in this region, the problem is a comparatively simple one. Wild Goose is grown largely upon the peach in the warmer latitudes and some growers prefer this stock even in the north. All the Chickasaws grow well upon the peach, as do also Miner, Forest Rose, and perhaps all the Hortulana type. Recently the Marianna has come to be a popular stock upon which to work all varieties; and so far as known it is one of the best, although I fear that its indiscriminate use may result in some disappointment. Mr. G. ONDERDONK, a well known nurseyman and fruitgrower of Texas, is certain that the Marianna is preferable to the peach as a stock for the southern native plums. His reasons for this opinion are as follows:

"1st. The peach sometimes sprouts from the roots. The Marianna never does this.

"2d. The peach has more eyes or buds near the surface of the soil, both above and below, than the Marianna. These eyes cause at least two or three times more pruning in the case of peach stocks than in Marianna.

"3d. The peach requires better drainage than the plum stock. I raise good healthy plum trees on Marianna stocks in places where it would be useless to plant anything on peach stocks.

"4th. The peach stock is subject, under certain conditions. to root-rot. I have never seen a case of root-rot among Mariannas.

"5th. While the Marianna is subject to root-knot as well as the peach, yet it very seldom fails to have the knot at the bottom, so that it can be cut away without injury to tree. In case of peach stocks the tree is usually lost when infested with root-knot.

"6th. In extreme southern Texas peach seeds fail to germinate either totally or partially after a mild winter. In the spring of 1890, not a single peach seed germinated in this section. We have much annoyance from this source. On the contrary we have never failed of securing a good stand of Marianna plants from cuttings, when they had been properly treated. Therefore the Marianna makes us a sure supply of stocks for propagation of plum trees, which the peach does not do in southern Texas. Further north these conditions may be less worthy of consideration.

"7th. As each peach seedling is a distinct variety from every other one, and the different varieties vary materially in vigor, and often in other habits, it follows that the stocks necessarily vary in capacity to develop trees. On the other hand a reasonable amount of care in selecting cuttings of the Marianna enables us to produce stocks of nearly uniform capacity, and therefore to produce trees of a more nearly uniform strength and value."

These comparisons will hold, Mr. Onderdonk thinks, in reference to stocks for apricots, but for peaches the Marianna is a failure with him.

Sprouts from own-rooted trees are often employed for increasing native plums, of such varieties as sprout readily, as Miner, Wild Goose, Forest Garden, De Soto, and various Chickasaws. But this practice is not in general favor.

3. *Varieties.*—The question of the best varieties for certain purposes

and regions is a disputed one, as should be expected from the large number of varieties in cultivation and the newness of the native plum industry. Undoubtedly the most popular variety is the Wild Goose, but its popularity is due less to the quality of its fruits than to the hardiness and productiveness of the tree and the early fruit. The Miner is perhaps the hardiest well-known variety of the Hortulana type. It succeeds in many places in northern Illinois. In Wisconsin, Iowa, Nebraska, and regions to the north of them, only the Americana class is hardy, as a rule. The Chickasaws are best adapted to the middle and southern states. None of the native plums have been tried to any extent in New York and New England, from the fact that the common or Domestica plums succeed so well there. The incursions of the septoria or shot-hole fungus,—which causes premature dropping of the leaves,—are calling attention to the native plums, and it is not too much to expect that they will gain in favor as they become better known. And the growing taste for a greater variety of fruits must tend to popularize some of the native plums in the east.

4. *Insects and diseases.*—Numerous insects and fungi attack the native plums. Much has been written concerning the supposed immunity of the fruit from the attacks of the curculio, and while it may be said that there is no curculio-proof plum, it is also true that the native varieties, as a rule, are less injured than the common or Domestica varieties.*

The fungi which do serious injury to the native plums are indicated for this paper by Dr. E. F. SMITH, of the Division of Vegetable Pathology of the national Department of Agriculture, as follows:

"1. The American varieties suffer little from septoria, or the shot-hole fungus of the leaves. (See Arthur, 5th and 6th reports N. Y. experiment station, with which my observations coincide).

"2. Black-knot occurs on *Prunus Americana* in Michigan thickets, but I have never seen it upon the Chickasaws.

"3. The brown fruit-rot (*Monilia fructigena*) of the stone fruits attacks the native varieties, but they are more exempt, I think, than the varieties of *Prunus domestica*. As in the peach, the fungus attacks the twigs as well as the fruits.

"4. The leaf-rust (*Puccinia pruni-spinosæ*) is said to do injury in the southwestern states, but while I have seen it on peaches in many parts of the country, I have not found it upon the native plums.

"5. Plum-pockets or bladders (*Taphrina pruni*) is a frequent disease upon the native plums. It attacks the Americana and Chickasaw varieties and the Wild Goose. In Michigan I have seen it only on the fruit, which it changes into conspicuous bladders. In Maryland and Georgia it is common on shoots of wild Chickasaws and on cultivated Wild Goose, and it rarely attacks the fruit. It does considerable injury every spring.

"6. An obscure blight often attacks native plums—as Wild Goose, Robinson, Marianna and others—causing the branches to die back during the growing season. The leaves and large branches and sometimes the whole tree wilt and become brown without apparent cause, and sometimes the tree dies. The roots do not appear to be involved, for they often send up healthy shoots after the entire top has died. This blight has been known in middle Georgia for several years and does more injury to plums than all other troubles combined.

"7. The peach-rosette also attacks the native plums and perhaps is destined to make more trouble than any other disease in the south and west. (See Journal of Mycology iv. 143; same, vi. no. 4; also bulletin of Division of Vegetable Pathology on 'Additional Evidence of the Communicability of Peach Yellows and Peach Rosette.'")

The fruit-scab (Fig. 11), which injures many varieties, is discussed for me by Professor L. H. Pammel, of the Iowa Agricultural college:

"* The curculio prefers the domesticated to the native varieties of plums."—*C. P. Gillette, Bull. 9, Ia. Exp. Sta. 388* (1890). Other observers confirm this opinion. Professor Gillette finds that in central Iowa the plum gouger (*Coccotorus prunicida*) is very injurious, and it attacks the native more than the domestic varieties.

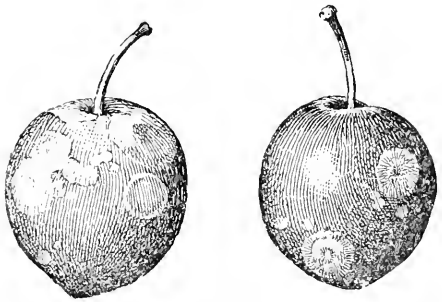


FIG. 11.—*Fruit scab.* Natural size.

"*Cladosporium carpophilum:* So far, I have found this fungus only on the fruit, but in case of the peach Mr. Galloway records it upon the leaves as well. When plums are ripe or just turning in color, small round patches not larger than a pin-head make their appearance. These spots are pale greenish or greyish in color and increase in size till in some cases they are half an inch across. They are mostly round with a somewhat paler border. In older specimens the patches are frequently confluent and of darker brown color. In very old specimens, especially in those where the fruit has undergone decomposition, the patches become black and uneven.

"A microscopic examination of the small greyish spots shows a nearly colorless mycelium creeping over the surface. In the darker portions of the large patches are septate hyphæ or threads. In some cases these come through cracks in the cuticle. The hyphæ are irregular in outline and frequently bent. As the material becomes older a dense stroma of short, brownish hyphæ appears. This stroma lies between the cuticle and the cellulose layers of the cell-wall. Under favorable conditions it keeps on producing the erect septate hyphæ which bears the slightly colored spores at the end. The spores are oval in shape, pointed at the end, and usually two-celled. On placing the spores in water they germinate in a short time, producing a colorless tube from one of the cells.

"The disease does not impair the quality of the fruit, as the injury extends little beyond the spot, and affects only three or four layers of underlying cells. These cells take on a brown color, and have a slightly bitter taste. The greatest injury arises through the cracks which are frequently found in the older patches, which allow other fungi, like the fruit-rot, to work their way in. So it frequently happens that the rot accompanies the scab. The cladosporium or scab fungus causes the fruit to shrivel, in severe attacks.

"Here in central Iowa I have observed this scab upon the following varieties: Speer, Chippeway, Cheney, De Soto, Rollingstone, Maquoketa (Fig. 11), Pottawattamie and Miner. It appears to be more or less local here, as well as elsewhere in the United States. A correspondent has sent me a specimens of the fungus on *Prunus Americana* grown in Virginia. The disease has also appeared in Canada, but principally on *P. Americana*, though in one case Professor CRAIG received specimens on the Blue Orleans (*P. domestica*), from Toronto. It is destructive, as he informs me, on Manitoba yellow plum, Cheney, Rollingstone, De Soto and Speer. The disease did not appear, according to Mr. CRAIG, in Canada on the Central Experimental Grounds last year. Here at Ames it has not appeared on *Prunus domestica*, but in addition to the above, it is found on *P. Spinosa*. It has become a very destructive fungus on sour cherry (*Prunus cerasus*), damage amounting from 2 to 25 per cent. The disease is undoubtedly on the increase."

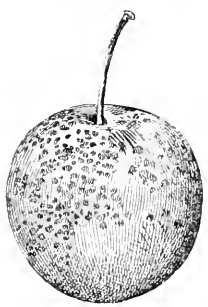


Fig. 12.—Fruit spot. Natural size.

A fruit spot (Fig. 12) has been sent me by T. V. MUNSON, Denison, Texas, on the Golden Beauty. The disease is said to be serious in some years. It does not injure the fruit greatly except to disfigure it and to render it unmarketable. I submitted the specimens to Prof. J. E. HUMPHREY of the Massachusetts Agricultural college, who found the disease to be a phoma, but the exact species could not be determined. It is, no doubt, somewhat allied to the black-rot of the grape, and the treatment used for grapes should be tried upon the plum; and a similar treatment is advised for the fruit-scab shown in Fig. 11.

There are no data for determining the extent of the native plum industry, but it is safe to say that it is much more important than anyone, except those immediately concerned,

has known. There are large areas of the country in which the common or Domestica plums do not succeed, either because of too great cold, too great heat, or the serious ravages of the shot-hole fungus. In nearly all of these areas there are native varieties which succeed. The natives are inferior in size and flavor to the common plums, but it must be remembered that the native plum industry is in its infancy, and that great results should not yet be expected. It is rather a matter of wonder that the present results have been attained with the expenditure of so little effort. The great variation in almost every direction in the existing varieties, and the fact that they spring from three or four distinct species, augur well for the future; while the facts that they find ready sale in the markets.* and that many people make their cultivation profitable, are encouragements to present effort.

II. THE CHERRIES.

1. THE SAND OR DWARF CHERRIES.—(Figs. 13 and 14).—The dwarf sand cherry has often attracted attention as a meritorious fruit. In 1867, A. S. FULLER published an important account of it and recommended its cultivation for fruit. In 1889, Professor C. E. BESSEY called the attention of the American Pomological society to it as "a promising new fruit from the plains" of Nebraska. It is only within the last two or three years, however, that the sand cherry has come into actual cultivation for its fruit, although as an ornamental plant it has been sold many years. Professor C. A. KEFFER described it last July in a bulletin of the South Dakota experiment station, and a little later Professor GREEN of Minnesota did the same. Both men have grown it, and have found it to be variable and promising. In South Dakota plants set three years bore heavily the second and third years. The "fruit begins to ripen the first week in August. The cherries on most of the bushes were ripe by August 20, and some few last into September, showing a season of from four to six weeks in a seedling plantation. Classifying roughly according to the fruit,

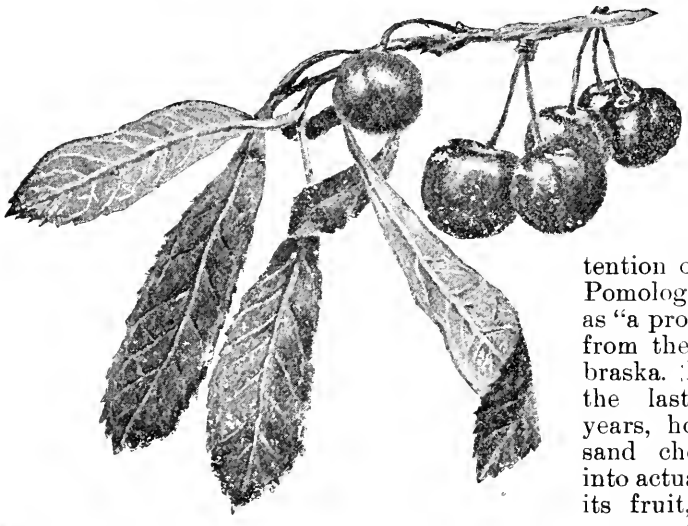


FIG. 13.—*Sand Cherry (Prunus pumila). Natural size.*

* "And as for the Wild Goose plum, it is the best we have here. There have been shipped from here as many as 600 boxes of this variety in a single day, and have sold in the Chicago markets at the enormous price of $2 per one-third-bushel box, or $6 per bushel.—*J. R. Logan, Duquoin, Ill., in Green's Fruit Grower, July, 1891.* Mr. Kerr sold Wild Goose readily in 1889 for 65 to 80 cents for 10-pound baskets: and in 1891 for 40 to 50 cents.

we find yellow and black fruited sorts. The yellow fruited sorts, as a class are earlier than the blacks, and of rather better flavor. They are greenish yellow when fully ripe, and vary in size, the largest being about the size of a medium Early Richmond cherry." The fruits vary greatly in flavor, some being entirely worthless, while others were acceptable for some culinary purposes. "While of little value when the quality of the fruit is considered, it would seem that these dwarf cherries should give rise to a race especially adapted to the northwest. They have withstood all the dry weather of the past three years without injury, and they have been covered with bloom for two seasons, though unprotected during the winter. Professor GREEN, in Minnesota, has "fruit varying in color from quite light red to almost black, and in form from round-oblate to oval. The largest fruit we have is oval with three-fourths inch and five-eighths inch diameters while one other is round and eleven-sixteenths of an inch in diameter; this is nearly as large as the Early Richmond cherry. The quality varies greatly, some being a mild not disagreeable sub-acid, others insipid, and still others very astringent. When cooked it makes a nice sauce. The period of ripening varies from July 24 to August 15. A peculiarity of the plant is that all the fruit on any plant is ripe at nearly the same time and can all be gathered at one picking. I consider this cherry not only of prospective value for its fruit, but of immediate value as a hardy shrub." I have been familiar with the sand cherry for many years, both wild and when transferred to the garden. It is very abundant on the sand dunes of lake Michigan, where it makes a shrub from five to ten feet high and bears very profusely of variable fruits. Some of these natural varieties are large, sweet, and palatable and at once suggest an effort to ameliorate them. Professor BUDD and others suggest its use as a dwarf stock for cherries, while it is found to grow well, for a time, at least, upon the peach. Finally, CHARLES E. PENNOCK of Bellvue, Colorado, is introducing the Improved Dwarf Rocky Mountain cherry, a description and history of which follow. I am particularly gratified to report this fruit because I remember with great distinctness that a "Rocky Mountain cherry" grew in my father's yard from my earliest boyhood. Pits were brought by a friend from Pike's Peak in an early day. As the western botanies do not mention any dwarf cherry, I have always been puzzled over this friend of my earlier years. Mr. PENNOCK describes his cherry as follows:

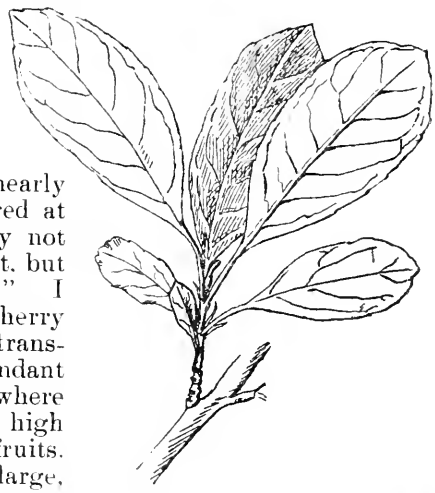


FIG. 14.—*Prunus cuneata*. Natural size.

"I have never seen a bush more than four feet high. They should be planted about eight feet apart, as they grow on the ground. The first I ever saw or heard of was in 1878. I was making and floating railroad ties down the Cache la Poudré river, in the mountains, about eight miles from my present farm. I thought at that time they were the most valuable fruit I ever saw growing wild. I got a start of these cherries, and have been improving them by planting seed (pits) of the best fruit. They vary somewhat in size, flavor, and season of ripening, and are capable of great improvement. I have known only one bush that was not good in my experience with it. We have

nearly all kinds of fruit, but we like the cherry to eat out of hand when fully ripe better than any of its season. It ripens a month later than Morello—in fact, I picked them off the bushes and exhibited at our county fair September 23, 24, and 28, where they attracted a great deal of attention. I have learned since I have had these cherries that other residents of the county had them in their gardens more than twenty years ago, and have them yet, so I do not claim to be the discoverer of them, but I believe I am the first to improve them and make their value known to the public. They are very scarce in their wild state here. There are two kinds of them, one that grows outside the mountains in the foot-hills, and is in every way inferior to the one that grows near the bank of the Cache la Poudré river. There are not 2,000 of these cherries of mine in existence. I could sell wagon loads of these cherries at 10 cents per quart. I have kept 200 of the young trees, which I intend to send to responsible parties who desire them for testing. The young trees I have are one year from seed. I have had them loaded down at two years of age from seed. They have never failed to bear fruit every year; late frosts never affect them; they are entirely hardy, having endured 40 degrees below zero without injury; ripen when all others are gone; would grace any lawn when in blossom; are easier pitted than other cherries."

Thus far, all appears to be simple enough; but if we begin to inquire into the species of these cherries we find great difficulty, for it is plain that two and perhaps even three species are passing as *Prunus pumila*. Propagators have long recognized two well marked types of sand or dwarf cherry. The commonest species is the one shown, natural size, in Fig. 13. It grows along rivers and sandy or rocky coasts, from northern Maine (and probably from Newfoundland) to Washington, and perhaps even further south, and ranges westward to the great lakes and Manitoba. I do not know if it grows on the sea shore, but aside from a specimen from Aroostook county, Maine, I have not seen it from New England. It is a *prostrate* or *decumbent* shrub, the roughish dark branches ascending in a straggling manner three or four feet, or sometimes twice that height. The flowers are rather small, with narrow petals. The leaves are *long and pointed* (nearly linear at flowering time), varying from oblanceolate to nearly obovate-lanceolate, or sometimes lanceolate, rather thick and firm and prominently veined, especially beneath, terminating usually in a sharp point and bearing on the upper half short but sharp teeth which, however, are usually smaller than shown in Fig. 13. This species is very variable. The form upon lake Michigan is characterized by very long and willow-like leaves, and broad-leaved forms occur in other places. Nurserymen take advantage of its straggling habit by grafting it upon standard stocks for the purpose of making a weeping tree. It is sometimes sold as *Cerasus pumila*. A variety *variegata* of this weeping tree is catalogued, but I have not seen it. The sand cherry is the plant which Linnæus meant to designate by his *Prunus pumila*. It is the plant, apparently, which the experiment stations of South Dakota and Minnesota have described, and it is the one which has been advised as a dwarf stock for cherries.

Another and much rarer cherry is the one shown in Fig. 14, and for which I have used Rafinesque's name *Prunus cuneata*. It grows near lakes and about bogs, mostly in wet or stiff soil, and is often found on hills and low mountains. I have seen it from New Hampshire, Massachusetts, Rhode Island, New York (Ithaca), New Jersey, Pennsylvania, North Carolina, Wisconsin, and Minnesota. It is an *erect* or even *strict* shrub with smooth, light-colored branches, growing from two to four feet high. The flowers are large with broad petals, and usually stand out squarely upon somewhat curved stems. The leaves are *short* and usually *blunt*, obovate, spatulate or when full grown sometimes elliptic-ovate and becoming more or less pointed, thin and inconspicuously veined, the teeth few and the points appressed. This cherry is in cultivation as an orna-

mental plant under the name of *Prunus pumila*. I do not know that it has been suggested as a fruit plant.

Professor PORTER of Easton, Pennsylvania, one of the most critical observers of our eastern flora, writes as follows concerning these dwarf cherries: "We have two forms of dwarf cherry, very diverse in habit. One [*P. pumila*] grows on the islands and flats of the Delaware, which are composed of gravel and cobblestone drift washed bare by the floods, and are treeless. Here it grows, sending out on all sides strong prostrate branches, often as thick as a man's arm, which form flat patches six feet or more in diameter. The branches are so close together that they hold the fine sand and mud and create low mounds or hillocks, and in the proper season the spaces between them are black with the fruit. The other [*P. cuneata*] occurs in southeastern Pennsylvania on the borders of swamps and remote from river bottoms. It is strictly erect and attains the height of four feet. It is so unlike the type that I have been inclined to regard it as a new species." On the dunes along lake Michigan *Prunus pumila* grows more erect than those described by Professor PORTER, but they always have a prostrate base over which the sand drifts.

P. cuneata grows at Ithaca in a dryish hill swamp, and it wholly lacks the habit and appearance of the common species.

The third dwarf cherry is the Rocky mountain plant to which I have already referred, and evidently the same as the one which Professor BESSEY has described from the plains of Nebraska. This plant is not mentioned in the Rocky mountain botanies, although there can be no doubt that it is wild in Colorado and Utah. Dr. C. C. PARRY collected it in eastern Colorado in 1867, and apparently the same was found somewhere in the Rocky mountains, presumably in Colorado, in 1888, by S. M. TRACY. A. S. FULLER also mentions it in the article to which I have already referred. He obtained the seeds from Utah. As compared with *Prunus pumila*, he found this Utah cherry to be "more erect, none of the branches trailing as in the species." GIPSON speaks of the native wild Colorado dwarf cherry as bearing a fruit "especially valuable for pies and preserves, and is often pleasant to eat from the hand. It is wonderfully productive, and will survive all changes and vicissitudes of the most exacting climate." It is interesting to find that this plant was collected so long ago as 1839 by GEYER, in NICOLLET'S famous expedition, being found on "arid sandy hillsides of the upper Missouri."

The affinity of this western plant is with *Prunus pumila*, but it differs from that species, and I am inclined to regard it as a distinct botanical variety, if not, indeed, a distinct species. It is a low, straggling, more or less prostrate plant, the tops rising only a foot or two in the plains form, the flowers small, the leaves much like those of *P. pumila* except that they are much shorter (1 to 2 in. long) and spatulate or elliptic when fully grown, the fruit large upon short stems. This plant is so little known that I do not venture to give it a name. Growing in our garden, it has more the aspect and light color of *P. cuneata*, but its thick and pointed leaves appear to distinguish it from that species. It lacks entirely the wand-like and willowy character of *Prunus pumila;* but this species is so variable and so little understood that it would be unsafe to separate the western plant from it upon our present evidence. We are growing this western cherry, as also *Prunus pumila* and *P. cuneata*, from various sources and shall probably soon be able to determine its botanical position.

The sand or dwarf cherries, therefore, are three, all of which are in cultivation; *Prunus pumila*, the true sand cherry grown for fruit and ornament; *Prunus cuneata*, grown for ornament; the sand cherry of the plains and the Rocky mountains, grown locally in Nebraska and now introduced from Colorado as the Improved Dwarf Rocky mountain cherry. Finally, it may be said that the sand plum is a form of the Chickasaw plum as we have already found.

2. "UTAH HYBRID CHERRY."—Under this name there has come into cultivation an anomalous fruit, the history and botanical characters of which I am unable to trace. It is usually referred by the nurserymen to *Prunus pumila*, but the specimens which I have seen do not belong to that species. In fact, as grown by Mr. KERR, it is a plum, with a stone very like that of the Marianna, and the catalogue cut of the fruit shows a short-stemmed and sutured plum. There are two varieties in cultivation, the black and red. These are described as follows by the Heikes nurseries of Dayton, Ohio, which was one of the first to grow them:

"*Utah Hybrid Cherry, black.*—This is an improved variety of the Dwarf or Mountain cherry of Utah. The fruit is about one inch in diameter, nearly round; color dark purple, with a delicate bloom, juicy, pleasant, and sweet; slightly astringent if the skin is pressed too closely. The bush is very dwarfish, but vigorous and prolific. This fruit has the merit of being something entirely distinct from anything cultivated in the way of fruits heretofore. The fruit is exceedingly beautiful; the tree is hardy enough to withstand the severest winters, and begins to bear the first year after planting.

"*Utah Hybrid Cherry, red.*—This is a dwarf variety, evidently belonging to the Chickasaw class, and while it has some merit as a novelty, it is not nearly equal to the above."

SAMUEL MILLER of Bluffton, Mo., informs me that he obtained the Utah Hybrid cherry over ten years ago from Nebraska. The Phœnix nursery company of Bloomington, Ill., "have been propagating it for many years," to supply the spontaneous demand for it, but the company writes me that it "can not recommend it," and that "the fruit is rather small, of dark purplish red color, and is merely a skin drawn over a pit." The plant sold by the Phœnix company is a slender under-shrub with elliptic-lanceolate prominently nerved and pointed leaves which are sharply serrate throughout, and which can not be referred to any form of *Prunus pumila* with which I am acquainted. The tree grown by Mr. KERR has the half-weeping habit of a Morello cherry, and the leaves are also very like those of the Morello. The flowers are borne in short-stalked umbels upon wand-like twigs, and they suggest, as do also the leaves, an approach to *Prunus maritima*, the beach plum. The original Utah Hybrid which Mr. KERR planted, he tells me, had fruit about the size of BASSETT'S American, but which ripened earlier than that plum. The present tree, described above, is a seedling of it, but this seedling has larger fruit—as big as a large Napoleon cherry—which is later than the Bassett, and the tree is less dwarf. He considers the Utah hybrid an inferior fruit.

3. PRUNUS SEROTINA, the Wild Black or Rum cherry. This well-known cherry, the wood of which is often used for cabinet work and house finishings, is planted for forestry purposes, as an ornamental tree, and sparingly for its fruit. Infusions of the bark are used for medicinal purposes and the fruit is often used in the manufacture of cherry brandy or as a flavor to rum. Occasional trees bear fruit of unusual size and attractiveness.

As an ornamental plant the wild black cherry possesses decided merits in its attractive habit, clean, shining foliage, striking white racemes, and handsome fruit. There are several cultivated varieties: *pendula*, a weeping form, worked standard high; *variegata*, with the leaves more or less discolored with yellow; *Golden-Leaf*, found wild by JACKSON DAWSON of the Arnold Arboretum, and somewhat disseminated, and probably essentially the same as *variegata; carthagena*, with small short-elliptic or ovate-elliptic leaves. *Prunus serotina* ranges through the eastern and southern states as far west as Kansas.

PRUNUS PENNSYLVANICA, the Bird, Wild Red, Pigeon, or Pin cherry, is occasionally cultivated for ornament, although it is not so well known as its merits deserve. It sprouts badly, a feature which no doubt discourages its dissemination. The species has been lately recommended as a stock for the common orchard cherries. Professor BUDD says that "when top-worked or crown-grafted with vigorous-growing sorts it does not appear to have any reserve material to waste in sprouts. We have trees of the Early Richmond and Dyehouse in the state which have not shown a sprout on this stock for twelve years." The union with the orchard cherries, both sweet and sour, appears to be good as a rule, and the species certainly possesses promise as a cheap and hardy stock. The fruit is sometimes used in the preparation of cough mixtures. It is generally distributed throughout the northern half of the Union from the Atlantic to Colorado.

5. PRUNUS VIRGINIANA, the Choke cherry, is cultivated for ornament. It is scarcely inferior for that purpose to its Old World congener, the true Bird Cherry (*Prunus Padus*), although its flowers are somewhat smaller than in that species, and they are also a few days earlier. If grown as a lawn tree where a symmetrical development can be secured, the Choke cherry, both in bloom and in fruit, is an attractive object. Although rarely more than a large tree-like bush, the choke cherry is often confounded with the Wild Black cherry, but it is readily distinguished by the very sharp small teeth of the leaves. The fruit of the Choke cherry is commonly red, but amber-fruited plants are occasionally found. This cherry has been mentioned as worthy of attention as a fruit plant, but the fact that none of the racemose cherries (those bearing their flowers in long clusters), have given marked results in this direction, indicates that efforts toward amelioration of the fruit are likely to meet with discouragement. The Choke cherry is generally distributed east of the Rocky mountains.

6. PRUNUS DEMISSA, the Western Choke cherry, was introduced in 1881 as an ornamental plant by EDWARD GILLETT, Southwick, Mass. Its merits as a cultivated plant are not yet well known. It is much like the Choke cherry, but more variable in stature and apparently in botanical characters. It occurs from Nebraska to the Pacific coast, extending the length of California and Oregon.

7. PRUNUS ILICIFOLIA, the "Islay" of southern California and western Arizona, was introduced to cultivation last year by C. R. ORCUTT of San Diego, California. It is a pleasing ornamental plant with holly-like evergreen leaves (whence the name *ilicifolia*), and a small astringent reddish fruit. In its wild state it reaches a height of 10 or 15 feet. Its merits for cultivation in eastern lawns are yet to be determined.

8. PRUNUS CAROLINIANA, the Cherry Laurel, Wild Orange, Mock Orange, or wild peach of the southern states, is in cultivation in the south as a small ornamental tree, and as a hedge plant. The leaves are long,

thick and glossy, and are evergreen. The white flowers are borne in small racemes, which are shorter than the leaves. The small black fruit soon becomes dry and is not edible. The species grows wild along rivers from North Carolina to Florida and Texas.

REVIEW.

I. PLUMS.

1. The native plum industry dates from the dissemination of the Wild Goose some forty years ago. It is only within the last decade, however, that this industry has assumed great importance.

2. Five species and one botanical variety of native plums are now in cultivation for their fruits. 140 named varieties are described in the preceding pages, very many of which are wild varieties transferred to cultivation,

3. Nearly all the commercial varieties belong to three species—*Prunus Americana*, *P. hortulana* and *P. angustifolia*. These species grow wild in regions east of the Rocky mountains.

4. *Prunus Americana* grows the furtherest north of any of the native plums, and its varieties are the hardiest of any. The species also grows so far south as northern Mexico. The range of adaptability of its varieties may therefore be assumed to be very great. The species is naturally variable, and is therefore attractive to the horticulturist.

5. The fruit of *Prunus Americana* is firm and meaty, usually somewhat compressed or flattened, often marked by a distinct suture, dull in color which ranges through various shades of red and purple to an ill defined and blotched orange. The skin is thick and tough, often acerb, and covered with a pruinose bloom. The stone is large and more or less flattened and winged, and is sometimes nearly or quite free, and the surface is either slightly pitted or perfectly smooth.

6. Forty-five varieties are referred to *Prunus Americana* in the preceding lists. The most popular of these are Cheney, Deep Creek, De Soto, Forest Garden, Itaska, Louisa, Purple Yosemite, Quaker, Rollingstone, Weaver, Wolf. The Americana varieties succeed best, on the whole, in the northern states of the Mississipi valley, as in Wisconsin, Iowa, and Minnesota. Some of them, however, are successfully grown in Texas, and on the Atlantic slope so far south as 37° or 38°.

7. *Prunus hortulana* grows wild in the Mississippi valley from northern Illinois to Arkansas, extending eastward into Kentucky and Tennessee and possibly further, and in the southwest spreading over a large area of Texas. It is naturally variable and has given many important cultivated varieties. It has never been recognized as a distinct species until this year. There are two or three distinct types represented in the species, one of which—the Miner group—appears to possess some radical points of difference form the typical representatives of the species.

8. The fruit of *Prunus hortulana* is firm and juicy, spherical or spherical-oblong, never flattened, and in color ranges through several shades of bright red to clear pure yellow. The skin is thin, often marked with small dots, and is usually covered with a thin bloom. The stone always clings; it is comparatively small, rough, turgid, sometimes prolonged at the ends, but is never prominently wing-margined.

9. The Wild Goose is the best known of the native plums, although its

quality is not high. This popularity is due to its productiveness, earliness, beauty, good shipping qualities, and to the circumstance that it was early introduced to cultivation. This variety is grown from Iowa, Michigan, and New York to Georgia and Texas.

10. The Wild Goose group of plums, as a whole, is well suited to the middle latitudes. The most prominent members of the group are Golden Beauty, Indian Chief, Missouri Apricot, Moreman, Wayland, and Wild Goose.

11. The Miner group differs from the Wild Goose or true Hortulana group by dull and comparatively thick leaves which are conspicuously veiny below and irregularly coarsely toothed and more or less obovate in outline, and by a rather late and very firm fruit and a flat and nearly or quite smooth stone. The varieties are all much alike. In a wild state, this form of native plum probably grows from Illinois to Tennessee and Arkansas.

12. Ten varieties are referred to the Miner group, of which the most prominent is the Miner. This variety was the first native plum to receive a name from horticulturists. Its history runs back to 1814. Seventy years ago it was known as Old Hickory and General Jackson. Next to the Wild Goose, the Miner is the best known of the native plums. It is hardy in northern Illinois and is popular in the central and some of the southern states.

13. The Chickasaw plums are characterized by slender, spreading and zigzag growth, comparatively small lanceolate or oblong-lanceolate conduplicate (or trough-like) leaves which are shining and closely and finely serrate, and by a nearly red or yellow soft stringy fleshed fruit which is more or less dotted, and a clinging broad roughish stone. In a wild state, the Chickasaw plum is usually thorny and the thorns persist in a few cultivated varieties. The species grows wild from southern Delaware to Florida and westward to Kansas and Texas.

14. The most important varieties of Chickasaw plum are Caddo Chief, Jennie Lucas, Lone Star, Newman, Pottawattamie, Robinson, and Yellow Transparent. The Newman is the most generally known and this is hardy in central New York. The Chickasaws are best adapted to the central and southern states. Many of them are not hardy in Michigan and New York.

15. The Marianna and DeCaradeuc constitute a distinct class or group of plums, and the Hattie is evidently allied to them. They are to be associated with the myrobalan plum. DeCaradeuc is probably myrobalan, and Marianna appears to be a hybrid. The history of the myrobalan is obscure, but it is clearly of Old World origin. It is largely used as a stock, and there are varieties grown for fruit.

16. The Marianna has assumed great importance because of its use as a stock for many plums and allied fruits. Its merits are the ease with which it grows from cuttings, and the facility with which it unites with other species.

17. The beach plum or *Prunus maritima*, of the Atlantic coast, is in cultivation both for ornament and for fruit. As a fruit plant it is represented only in Bassett's American, a fruit of little value.

18. The Pacific wild plum, *Prunus subcordata*, was introduced to cultivation in 1889, as a possible fruit plant, but its merits are not yet determined.

19. Hybrids appear to occur between the Wild Goose and the peach. J.

W. KERR of Maryland, has produced such a hybrid, and the so-called Blackman plum appears to be another.

20. Some varieties of native plums, notably Wild Goose and Miner, are not fertile with themselves, and this fact has undoubtedly retarded the progress of native plum culture. This infertility is due to comparative impotency of pollen upon flowers of the same variety rather than to any structural imperfection in the flowers themselves.

21. This infertility is avoided by mixed planting, by means of which foreign pollen is supplied to the impotent varieties. Care should be taken to associate varieties which bloom at the same time, and with this precaution the ordinary mixed or alternate planting, at usual distances, appears to be successful.

22. The best stocks for native plums are probably seedlings of the same species, although they grow well, as a rule, upon related species, and even upon the peach in some instances. Perhaps the most popular stock at present is the Marianna, because of its habit of growing readily from cuttings, and so far it appears to have given satisfaction. The Chickasaw and Hortulana types succeed well upon the peach. Chickasaw stocks sprout so badly that they are in disfavor. In the north, Americana stocks are popular for all the varieties which succeed there.

23. As to the best varieties, there is a great difference of opinion. In the northernmost states the Americana class is most reliable, although some of the Hortulanas succeed. For the south the Chickasaws are numerous and popular. The Hortulanas occupy an intermediate position.

24. The native plums are in most regions comparatively free from insect abuses. Although there are no curculio-proof plums, the curculio does less damage to the native varieties than to the common or Domestica types.

25. Among diseases, a mysterious blight and the peach-rosette are prominent in the south. A fruit-scab and fruit-spot also occur. The septoria or shot-hole fungus—which causes the serious shedding of leaves in the Domestica plums—does little damage upon the natives. The black-knot, brown fruit-rot, and plum-pockets are other diseases which the grower will be likely to meet.

26. As a whole, the native plum industry has made astonishing progress and it has already assumed large proportions. It is certain to occupy a large place in future American horticulture.

II. CHERRIES.

27. Eight and perhaps ten species of native cherries are in cultivation. Of these, three are grown for fruit, and all but one or two are cultivated for ornament. None of the species have gained much prominence under cultivation, however. Most of them are of comparatively recent introduction.

28. The so-called dwarf or sand cherries are much confused, and two, perhaps three species, are passing as *Prunus pumila.* (a) The true *P. pumila*, or sand cherry, is a low straggling shrub, growing along rivers and coasts from Maine to Pennsylvania and Manitoba. It has long thick leaves, and produces cherries of variable size, color, and quality. Some of these varieties give great promise as garden fruits, and they are already under test at experiment stations. The plant is also being tested as a stock for dwarf cherries. (b) *P. cuneata* is a slender upright shrub with larger flowers and shorter obtuse spatulate or obovate thin leaves growing in

cooler lands from New England to North Carolina and Minnesota. It is in cultivation as an ornamental plant under the name of *Prunus pumila*. (c) The representative of *P. pumila* upon the plains of Nebraska and in the Rocky mountains is a very low plant with short thick leaves and large short-stemmed fruit, the botanical position of which is yet unknown. It is now in cultivation as the Improved Dwarf Rocky Mountain cherry.

29. The Utah Hybrid cherry is a fruit of uncertain value and doubtful affinity. Two varieties, the black and red, are in cultivation. It probably comes from some part of the western plains or the Rocky mountain region, but its wild prototype is not known.

30. Other native cherries in cultivation are: *Prunus serotina*, the Wild Black cherry; *P. Pennsylvanica;* the Bird, Pin, or Wild Red cherry; *P. Virginiana*, the Choke cherry; *P. demissa*, the Western Choke cherry: *P. ilicifolia*, the Islay of the Pacific slope: *P. Caroliniana*, Cherry-Laurel or Mock Orange of the southern states.

L. H. Bailey.

THE PEAR TREE PSYLLA.

The pear tree has heretofore suffered less from the attacks of insects than other extensively grown fruits like the apple, plum, and others. Recently, however, a minute insect known as the pear-tree psylla, *Psylla pyricola*, has inflicted such severe losses upon pear-growers that it threatens to seriously interfere with the successful cultivation of this fruit.

During 1891, pear-growers, in restricted localities in quite widely separated portions of this and of neighboring states, lost thousands of dollars' worth of fruit and many valuable trees through the ravages of this pest which suddenly appeared in enormous numbers early in the season. The pear orchard of Dr. Jabez Fisher, Fitchburg, Mass., was seriously injured; Coe Brothers, Meriden, Conn., had two orchards devastated by the pest. In New York state, orchards in the eastern, central, and western portions suffered. On West Hill, near Ithaca, Tompkins county, several orchards were severely attacked, some of the trees ultimately dying; Mr. H. S. Wright's orchard promised six hundred bushels of fruit, but less than fifty bushels matured, and but few trees made any growth. A severe attack prevailed at Menands, Albany county. Mr. G. T. Powell, an extensive fruitgrower in Ghent, Columbia county, states that the insects reduced his pear crop from an estimated yield of twelve hundred barrels to an actual yield of less than one hundred barrels of marketable fruit; the trees made but little growth and several were killed; his trees have been noticeably losing vitality for two or three years, due, no doubt, to the unsus-

pected attacks of this pest. These facts must convince the pear-growers, of New York state especially, where the insect seems to have obtained the strongest foothold, that they have to fear a very serious pest. Although very insignificant individually, this enemy becomes formidable and very destructive when the conditions are favorable for its reproduction in countless numbers.

THE PAST HISTORY OF THIS PEST.

The pest is an old offender; and its recorded history in this country shows that it has been present for many years in or near most of the localities above noticed. The insect was probably first introduced into this country upon young pear trees imported from Europe in 1832 by Dr. OVID PLUMB of Salisbury, Conn. Dr. PLUMB first noticed the insect in 1833; and during the next five years he lost several hundred trees from its ravages. By 1848, when the pest was first brought to the notice of an entomologist, Dr. HARRIS, it had spread into Massachusetts and into Dutchess and Columbia counties in New York. In 1879, W. S. BARNARD observed the pest in destructive numbers at Ithaca and at Saratoga, N. Y.

The earliest record we have of its appearance further west is in 1871 when Dr. LEBARON recorded a severe attack upon young pear trees in Illinois. Mr. E. A. SCHWARZ has found the insect in Michigan. Prof. J. B. SMITH of New Jersey has been unable to find it in that state, and we have no record of its occurrence further south.

It is thus seen that the pest is quite widely distributed over the northeastern portion of the United States and has reached the Mississippi valley in its westward progress. The severe outbreak of 1891 indicates that the insect has been increasing in numbers. It has apparently reached a point in New York state, at least, where it only awaits favorable opportunities, in meteorological conditions possibly, to repeat its ravages of last year in unexpected localities. Pear-growers should be watchful and prepared to fight it early in the season.

ITS CLASSIFICATION.

This pear pest is one of the true bugs belonging to the sub-order *Homoplera*, family *Psyllidae*, commonly known as jumping plant-lice from the leaping habit of the adult. Their general name, *Psylla*, is the Greek word meaning a flea. The Psyllid fauna of Europe comprises more than one hundred and fifty described species and has been thoroughly studied. DR. FRANZ LÖW of Vienna added much to our knowledge of the classification of this group and he has described the life history and habits of several species. Dr. E. WITLACZIL of Vienna has written exhaustively on the anatomy of the family.

In the United States but little attention has been paid to the *Psyllidae*, and less than twenty species have thus far been recognized.

Three species of *Psylla* infest the pear tree in Europe—*pyrisuga*, *pyricola*, *and pyri; pyrisuga* does the most damage, and *pyri* is comparatively rare. We have, as yet, no native species of *Psylla* feeding on the pear tree. Our pest, *Psylla pyricola*, although it was observed in this country in 1833, received its name in Europe fifteen years later, or about the time Dr. Harris' attention was called to it here. Previous to 1848, European writers had referred to the species as *Psylla pyri*, not

distinguishing it from that species; and nearly all of our entomologists have written of it under this name. *Psylla pyricola* sometimes attacks the apple tree in Europe, but it seems to confine its attacks to the pear in this country.

INDICATIONS OF ITS PRESENCE.

Among the first indications that pear-growers, who suffered from this pest in 1891, had of its presence was the noticeably lessened vitality of their trees early in the season. Old trees, especially, put forth but little new growth. Where new growth started, in many cases, the shoots began to droop and wither in May as if from a loss of sap. A little later, whole trees put on a sickly appearance; the leaves turned yellow and the fruit grew but little. By midsummer nearly all the leaves and half-formed fruit fell from many trees; this fact suggested the design on the title page of this bulletin.

Another peculiar phase of the attack was the immense quantities of a sweet water-like fluid called honey-dew which covered the twigs, branches, and trunks of the trees. In some instances it appeared in such quantities that it literally rained from the trees upon the vegetation beneath; in cultivating the orchard the back of the horse and the harness often became covered with the sticky substance dropping from the trees; in gathering what little fruit matured the hands and clothing would become smeared with the sticky fluid. This honey-dew appears on the trees soon after the leaves expand and is found throughout the season. It attracts thousands of ants, bees, and wasps which feed upon it. If copious showers fall during the early part of the season much of this honey-dew is washed off, making it less noticeable.

At first the honey-dew is clear like water, but soon a black substance appears and, spreading rapidly all through it, gives it a disgusting blackish appearance as if the trees were covered with smoke from a factory. This black growth is a fungus, *Fumago salicina*, which grows luxuriantly within the honey-dew, but does not attack the tree. It forms, however, with the honey-dew, a coating which must close many of the breathing pores of the tree and thus materially affect its healthy growth. Many trees appeared as though treated with a thin coat of black paint.

The attention of the entomological department of this station was first called to the pest by Mr. H. S. WRIGHT, Ithaca, N. Y., in the latter part of November, 1891; or not until the insect had done its damage for the season. A visit to his orchard a few days later revealed a most deplorable state of affairs. The whole orchard appeared as though a fire had swept quickly through it and scorched the trees, blackening the trunks, large branches, and the smallest twigs; both young and old trees of dwarf and standard varieties had been attacked, the Bartlett and Duchess varieties suffering the most; most of the trees had made little or no new growth dur- the season, and many buds were then dead. Neighboring orchards were similarly affected; and Mr. G. T. POWELL reported that his orchards at Ghent, N. Y., presented a similar appearance. Several trees in some orchards died before spring.

Although the indications of the presence of some enemy is thus so conspicuous, the depredator is an insect so small as to be easily overlooked.

THE APPEARANCE OF THE INSECT.

The immature insect.—Fig. 2.—These curious minute, oval, immature forms are called nymphs. When first hatched they are of a translucent yellow color, and hardly visible to the unaided eye; eighty of them placed end to end would scarcely measure an inch. They increase in size quite rapidly and undergo gradual changes in color and form until they measure .055 of an inch in length and .045 of an inch diameter; the natural size is indicated by the hair line at the right of the figure. These full grown nymphs are oval in shape, and of a general blackish color often tinged with red; the eyes are of a bright crimson color. A very conspicuous feature is the large black wing pads on each side of the body. The whole body is very much flattened, being only one fifth as thick as long.

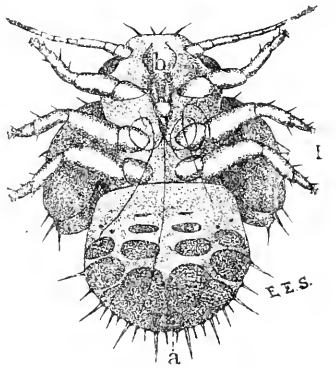


FIG. 2—Full grown nymph, ventral view; *a*, anus; *b*, beak.

The adult insect.—From the full-grown nymph, the change is to the adult insect. In this form the pest strikingly resembles a cicada or dog-day harvest fly in miniature. It would take nine or ten of them placed end to end and about forty placed side by side to measure an inch; the hair line beside the figure indicates the natural size of an adult. From the wide blunt head, the body tapers considerably to the sexual organs at the caudal end. When the insect is at rest, its two pairs of large, nearly transparent wings slope roof-like over the sides of the body. The general color is crimson with broad black bands across the abdomen. The legs have thickened femurs to aid the insect in leaping. The sexes are easily distinguished: in the male (Fig. 5) the abdomen terminates in a large trough-shaped segment from which project upward three narrow organs used in copulation; the end of the abdomen of a female (Fig. 6) resembles a bird's beak, an upper and a lower pointed plate coming together and enclosing the egg-sheath between them.

THE LIFE HISTORY OF THE INSECT.

The life history and habits of every insect which becomes of economic importance should be accurately determined in order to ascertain, if possible, the stage when it can be most successfully combated. Observations upon the habits of the two worst enemies to fruitgrowers, the plum curculio, *Conotrachelus nenuphar* and the codlin moth, *Carpocapsa pomonella*, revealed peculiar habits which made it practicable to combat them with the cheapest and most easily applied of the insecticides,—the arsenites. The adult plum curculio's habit of feeding upon the fruit and foliage left it open to attack by the arsenical spray. The eggs of the codlin moth were found in the apex of the forming fruit soon after the blossoms had fallen; the fruit then being in an upright position the arsenite lodges in the apex and is eaten by the newly hatched larva when it attempts to enter the fruit. A knowledge of the habits of injurious insects will also often enable the farmer to so manage his land and crops that the insects are placed under very unfavorable and often destructive conditions. Wheat sown as

late as it is safe to do so is usually secure from the attacks of the fall brood of the Hessian fly, *Cecidomyia destructor*. By harvesting the first crop of clover for hay early in June, the bulk of the first brood of the clover-seed midge, *Cecidomyia leguminicola*, will be destroyed and the second crop of seed be thus saved. Fall plowing destroys many cut-worms and the tender pupæ and adults of wireworms which are hibernating. Many similar instances might be given where a knowledge of the habits of injurious insects have been of incalculable value to the fruitgrowers and farmers. In fact, were it not for such observations upon the life histories of insects, fruitgrowers and farmers would not now be so successfully fighting many of their insect foes.

Of the life history of the pear psylla but little has been recorded either in Europe or in this country, although the insect has been known here as a pest for nearly sixty years. As the attention of this department of the station was first called to this pest at the beginning of winter, our study of its life history naturally began with the stage in which the insect was then hibernating.

Hibernation.—Observers have differed in their statements in regard to the stage in which this insect passes the winter. Dr. FRANZ LÖW, speaking of the three pear psyllids, sums up the general European opinion on this point in saying that the adults hibernate and lay their eggs in the spring; not in the fall and spring as translated in Insect Life, IV, 127. BARNARD, THOMAS, and ASHMEAD in this country have doubted that the adults of *Psylla pyricola* wait until spring to lay their eggs. Dr. LINTNER says the winter is passed in the egg state. Some species of *Psylla*, as *P. mali*, appear to pass the winter in the egg state according to the observations of SCHMIDBERGER and English observers.

An examination of Mr. H. S WRIGHT'S orchard in December, 1891, revealed a hibernating brood of adults. Notwithstanding the great numbers in which the insect had appeared during the summer, comparatively few of these adults could be found. Most of them were hidden in the crevices under the loosened bark on the trunk and large limbs of the tree; a favorite hiding place on some trees was in the cavity formed by the bark growing about the scar of a severed limb; on account of its being quite warm at the time, some adults were crawling about on the branches. The adults were not easily seen as they were so minute and their color so closely imitated the bark of the tree. Both sexes were found in about equal numbers, and an examination of the females in December showed no mature eggs. The trees were examined several times during the winter; the adults remained in their hiding places, and none were seen in copulation, nor were any eggs seen before April 7, 1892. It was thus evident that *Psylla pyricola* does not pass the winter in the egg state, but that there is a hibernating brood of adults whose eggs are not laid until spring.

Oviposition of the winter brood.—A few days of warm spring weather occurred about April 7, 1892, and many of the hibernating adults were seen in copulation, and a few eggs were also laid. Spring then opened and by April 18 a majority of the eggs had been deposited. The eggs were placed in the creases of the bark, or in old leaf scars about the basis of the terminal buds of the preceding year's growth; some were seen about the side buds near the terminal ones. They were usually laid singly but rows of eight or ten were sometimes found. The eggs (Fig. 4) are scarcely visible to the unaided eye; it would take eighty of them placed end to end

FIG. 4.—Egg.

to measure an inch. They are elongate pyriform in shape, smooth and shining, and of a light orange yellow color when first laid, becoming darker before hatching. A short stalk on the larger end attaches the egg to the bark, and a long thread-like process projects from the smaller end.

The temperature conditions in the spring influence not only the time of oviposition of the winter brood, but also the duration of the egg stage. Eggs brought into the warm insectary on April 7 hatched in eleven days. Other branches containing eggs were tied to trees near by, the end of the cut branch being kept in a vial of damp sand; these eggs hatched in seventeen days. The weather remaining cool, the eggs upon the trees under natural conditions did not hatch before May 10, or more than a month after oviposition began. By May 18, most of the eggs had hatched; and the hibernating adults had disappeared.

Habits of the nymph.—Immediately after emerging from the egg, the minute nymph seeks a suitable feeding place and is soon at work sucking the sap with its short beak which appears to arise from between the front legs. The favorite feeding places of the nymph, and to which their much flattened bodies are well adapted, are in the axils of the leaf petioles and stems of the forming fruit. A few nymphs emerged in the spring before the leaves had expanded; these nymphs crawled into the buds out of sight. When the axils of the fruit-stems and leaves become full, the nymphs gather in closely packed clusters about the base of the petioles and stems; if very numerous they gather on the under side of the leaves along the mid-rib and often on the petioles of the leaf. The nymphs move about but very little, sometimes becoming covered with their own honey-dew; if disturbed they crawl about quite rapidly. The only times when the nymphs seem to stop feeding is during the casting off of their old skin which has become too small, and which gives place to a new and elastic skin formed just beneath the old one. At the last moulting of the skin, which occurs about one month after the nymph's emergence from the egg, the adult insect appears.

Habits of the adult.—The adult insect has quite different habits from what it had when a nymph. The strong legs and wings of the adult enable it to spring up and fly away with surprising quickness upon the slightest unnatural jar or the near approach of the hand to its resting place. The hibernating forms, however, are quite sluggish in their movements and are readily captured when found. The summer forms fly readily from tree to tree and could easily be borne by winds for long distances, and thus infest neighboring orchards. The adults are provided with a beak with which they feed upon the tissues of the leaves and tender twigs of the tree. They seem to have no favorite feeding place.

Oviposition of summer broods.—Three or four days after their transformation from the nymph stage, the adults of the spring and summer broods copulate and egg-laying begins for another brood. These eggs are usually laid singly, sometimes several in a row or group, not on the twigs but on the under side of the tenderest leaves among the hairs near the midrib, or on the petiole near the leaf; sometimes the female very adroitly places an egg or two in each notch of the toothed edge of the leaf. The eggs of the summer broods do not differ from those laid by the hibernating adult. The summer eggs, however, hatch in from eight to ten days under the warmer and more even temperature conditions.

Detailed account of a single generation.—A detailed study was made of the second generation of the pest to ascertain any peculiarities of any of

its stages which might be of interest, or of aid in combating the insect. The breeding was done in the insectary, and field observations were made to verify the results as far as possible. The cages used consisted simply of a common lamp chimney set on the surface of the soil in a small flower pot; the top of the chimney was covered with Swiss muslin and a vial of water sunken into the soil kept the pear branch fresh for several days. These cheap and simple cages have been found very convenient and useful in breeding such small insects, or in getting the number of moults of larvæ isolated in them.

The females of the spring brood began to appear about June 10, 1892, and many were laying eggs by the 20th. On the 21st, several females were placed in cages on uninfested pear leaves. Eggs were laid the following day. When first laid they were tender and easily crushed; but in a few hours the shell became hard and the egg could be dislodged and quite roughly handled without injuring it. The shell was found to be impervious to several oils and weak alkalies. The acids and strong alkalies penetrated the shell and killed the embryo. The eggs hatched in from eight to ten days; a day or two before hatching the crimson eyes of the embryo could be plainly seen through the shell near the larger end of the egg.

The nymphs which emerged were oval in form and of a pale translucent yellow color with the abdomen more opaque and darker. The crimson eyes were large and distinct. The curious creatures were scarcely visible to the unaided eye, measuring only .013 of an inch in length. A slight constriction of the body marked the beginning of the abdomen which is fringed with eight or nine long and several short hairs. The wing-pads were not yet distinguishable. The antennæ had but three joints, two short basal and a long terminal joint tipped with two long bristles. The short stout legs terminated by minute claws enabled the nymphs to soon find a suitable feeding place. Several nymphs were immediately transferred to other cages, only one being placed in each cage. The next day the location of the nymph was often readily determined by a globule of honey-dew several times larger than the little creature which had secreted it. After feeding thus for six or seven days the nymphs become too large for their skins which burst open along the middle of the head and back and the insect crawled forth clothed in a new and elastic skin that had formed beneath the old one. After thus moulting the nymph usually sought a new feeding place, leaving its old shriveled skin attached to the globule of honey-dew it had secreted.

In their second stage the nymphs increased about one third in size, but were of the same general color except the tips of the antennæ which were black. There were four joints in the antennæ, a division of the third taking place at the moult. The segments of the abdomen were more distinct and the wing-pads were developing. The nymphs remained in this stage about four days, when the second moult occurred.

At the third stage the nymphs measured .027 of an inch in length. The wing-pads were larger and blackish; and the other black markings which distinguish the full-grown nymphs were faintly outlined. Six or seven joints were now distinguishable in the antennæ, the last three being black.

About three days later, the third moult occurred. The nymphs differed from those of the third stage in having eight antennal joints; the wing-pads were larger; the nymphs were .038 of an inch in length; and the eyes

had become of a dark crimson hue. In some cases the nymphs in this stage were very distinctly marked, differing from the full-grown nymphs only in having fewer and larger black spots on the thorax. The duration of this stage was about four days.

At the fourth moult, the markings which had been faintly visible since the second moult now came out very distinct. This proved to be the last nymph stage. The general appearance of the full-grown nymph is described at Fig. 2. The black markings are represented in figures 1 and 2.

After feeding five or six days, the nymphs moult for the last time; at this moult the adult insect crawls from the nymph's skin. European observers have recorded but four moults for the nymphs of several species of *Psyllidae*. The observations at the insectary were made upon several individuals isolated in small cages which were under daily observation from the emergence of the nymph from the egg to the appearance of the adult insect.

In each stage the nymphs secreted globules of honey-dew several times larger than themselves: sometimes the globule completely enveloped a nymph. After each moult the nymphs usually sought a new feeding place, leaving the old skin attached to the drop of honey-dew. The old moulted skins, of the last moult especially, often retained their form almost perfectly. So life-like did some of them appear, with the legs and antennæ naturally placed, that it often required close examination with a lens to determine whether the object was a live nymph or only the cast-off garment of one.

The whole life cycle of the generation studied, from the laying of the egg to the appearance of the adult insect, was about one month. The adults upon emerging are of a delicate greenish color; the blackish markings soon appear, however, and in two or three days the green changes to the normal reddish brown color. Although the adults are so distinct sexually, there seems to be nothing about the full-grown nymphs which would indicate the sex of the adult soon to emerge from the nymph's skin.

The adults begin feeding at once after emerging, but do not increase visibly in size. They appear to secrete no honey-dew, but void considerable quantities of a whitish excrement. Adults of the summer broods lived for several days in cages in the insectary; how long they live under natural conditions has not been ascertained, probably less than a month. The adults which hibernate, however, remain alive for at least six months.

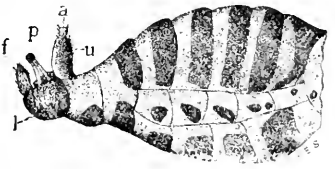


FIG. 5.—Abdomen and genital organs of the male, side view; a, anus; f, forceps; l, lower genital plate; p, penis; u, upper genital plate.

About a week after the summer broods of adults emerge, copulation takes place and the deposition of eggs soon begins. The winter brood, as has been said, do not, however, copulate and oviposit until spring. Several of the adults were observed with a lens while in copulation. The operation was of particular interest; for a glance at figures 5 and 6 of the sexual characters and abdomen will show that the male organs (Fig. 5, *a*, *f*, *l*, *p*, *u*.) are so peculiarly situated as to seemingly render the grasping of the female organ (Fig. 6, *a*, *e*, *l*, *u*.) no easy matter. It was found, however, that the caudal segments of the abdomen of the male were very flexible and enabled the trough or lower male genital plate (Fig. 5, *l*) to be curved

upward, thus bringing the forceps (Fig. 5, *f*) in a position to grasp the upper genital plate (Fig. 6, *u*) of the female; this allowed the penis (Fig. 5, *p*) to enter between (at *e*, Fig. 6) the valves of the female organ, and the upper male genital plate (Fig. 5, *u*) to simply lie along the venter of the lower genital plate (Fig. 6, *l*) of the female. A further slight side twist of the abdomen brought the male beside or in some cases upon the female; the wings of both remained in a resting position. The hair lines beneath figures 5 and 6 represent the natural length of the abdomen, including the genital organs. Copulation lasts for several minutes, and one male may copulate with more than one female.

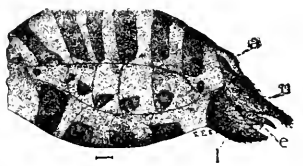


FIG. 6.—Abdomen and genital organs of the female, side view; a, anns; e, egg-sheaf; l, lower genital plate; u, upper genital plate.

The number of broods.—The pest may be said to be many-brooded, the number varying with the conditions of the season. The weather at the opening of spring greatly influences the time of appearance of the hibernating brood, and the date of the laying and hatching of the eggs. An overlapping of the broods occurs, so that after June 1 all stages of the insect, eggs, nymphs, and adults may be see on the trees at the same time. This is due to the facts that the eggs of any female are not all laid the same day, and thus do not hatch at the same time; and the duration of the stages of the nymphs vary slightly, thus varying the time of the appearance of the adults.

Observations at the insectary and in the field have shown that during the present year, 1892, there has been at least four broods of the pest. The hibernating adults oviposited in April, and adults of this spring brood appeared about June 15. The adults of the summer broods were the most numerous on or about the following dates, July 20, August 20, and September 25; or a brood appeared about once a month. All stages of the insect were found on the trees as late as September 20; evidently winter must overtake some of them before they reach the adult state. The adults emerging in September and later were found to be all of the hibernating form.

Peculiarities of the winter brood.—The hibernating adults found in December, 1891, were so different from the descriptions of *Psylla pyricola* that they were believed to belong to another species, perhaps new.* When the summer adults appeared, however, they were readily recognized as the old offender *Psylla pyricola*. The hibernating adults differ from the summer adults in size, being nearly one third larger; in their much darker coloring, the crimson becoming a dark reddish brown; and especially in the coloration of the front wings. The summer forms or typical *pyricola*, have the veins, even in darker specimens, of a light yellowish brown color, and the whole front wing has a slight yellowish tinge. The veins of the wings of the hibernating adult are invariably of a dark brown or black color; the front wings are quite transparent with more or less blackish shades in the cells and a blackish shade in the basal cell along the whole suture of the

* Well marked specimens were submitted to Dr. C. V. RILEY, the recognized authority upon American Psyllids. In his reply he says: "Your pear tree Psylla is a species which I have never seen before and which is not in my collection. Its general appearance is not that of our native species of *Psylla* and it has, no doubt, been introduced from Europe. It is unquestionably different from *P. pyricola* which I have from Ithaca, N.Y., Connecticut, and Massachusetts. Owing to the difference in the genital apparatus of the male it can not be identical with *P. pyrisuga* and *pyri*, but agrees perfectly with the description of *P. simulans*."

clavus. The male genitalia differ slightly in size in the two forms. Figure 3 represents an adult of the summer form: and the wings shown in figure 8, are also from a summer adult.

The hibernating adults were studied at the insectary in connection with the descriptions of *Psylla simulans* and Dr. Löw's remarks† upon the difference between the pear psyllids. This study left but little doubt that *Psylla simulans* was described from specimens of the winter form of *Psylla pyricola.*

This difference between the summer and the winter adults is common among the *Psyllidæ*, and has before led to their being described as different species. It seem not to have been suspected that these insects were truly dimorphic or appeared in two distinct forms during the year. The general impression seems to have been that the adults appearing in the fall were at first the same as the summer form; and that as winter approached, these adults gradually assumed the characteristics of the hibernating form. However, frequent observations upon *Psylla pyricola* in the field during August and September, 1892, have shown that from eggs laid about August 20, by typical summer adults, there hatched nymphs which showed no variations from the typical summer nymphs and from these nymphs there emerged about September 25, the distinct hibernating form *simulans.* The hibernating forms feed until the leaves fall and then seek their hiding places in which to pass the winter. None have been seen to copulate in the fall. But very few summer forms were seen after September 20. Thus in our pear-tree psylla we have a case of true dimorphism. The summer form is the typical *Psylla pyricola*, and may be designated when necessary to refer to this form alone as *Psylla pyricola pyricola;* while the hibernating form should be known as *Psylla pyricola simulans.*

Honey-dew and excrement.—Many have supposed that the honey-dew, so conspicuous a feature in severe attacks of this pest, is the sap of the tree which exudes through the punctures made by the insects. As the honey-dew occurs in such immense quantities it does seem almost impossible that it is wholly the secretion of the little creatures. All of this fluid does, however, first pass through the body of the insect. The amount which a single individual will secrete during its lifetime is small, but when many thousands of the insects occur on a tree, the aggregate becomes large. A single nymph isolated in a cage, secreted at least four drops (i. e. four minims) of the fluid before it became an adult. Thus fifteen nymphs would secrete one drachm.

The food of the insect consists entirely of the sap of the tree. The feeding apparatus, both in the nymph (Fig. 2 *b*) and the adult stage consists of a short pointed beak which apparently rises from between the front legs. The sucking organs are three long thread-like setæ which move along groves in the beak; in many cases, when the nymphs are quickly killed, the setæ are found extruded as shown in Fig. 2. In sucking, the point of the beak is placed against the tissue and the setæ are forced into the sap cells. The sap is then drawn up through the beak into the body. In the case of the nymphs most of the food is elaborated into

†Verh. Zool. Bot. Ges. in Wien, 1886, p. 154. A translation of most of Dr. Löw's article occurs in Insect Life, IV. 127. Dr. Löw gives a tabular statement of the differences between *Pyrisuga* and *pyri* and *pyricola*, and briefly points out how *simulans* differs from *pyri* and *pyricola.* A serious error occurs in the translation in connection with *simulans.* The sentence preceding the last in the translation should be divided into two, the period occurring after the phrase, "Along the whole fold of the clavus." The remainder of the sentence is not only incorrectly translated but it should form a distinct sentence. Dr. Löw says: "The tip of the clavus is larger with more black and in the hind basal cell there is a brownish or blackish stripe along the whole suture of the clavus. The forceps of the males are as in *Psylla pyricola* only a little wider."

honey-dew; some is assimilated, and the waste matter voided as excrement. The adults, however, seem to secrete no honey-dew, all the food being assimilated. Consequently the adults void considerable quantities of excrement, much more than do the nymphs.

The honey-dew and excrement are very different substances, but the fact does not seem to have been before observed. The honey-dew is a clear water-like liquid and forms into globules when secreted. The excrement, however, is a whitish semi-solid substance which is voided in long cylindrical strings, or minute whitish balls which roll from the anus like quicksilver globules.

In the adult, the anus is situated upon the dorsal surface. In the female it is just at the base of the upper genital plate (Fig. 6 *a*); in the male, the anus opens upon the tip of the upper plate (Fig. 5 *a*). In voiding the excrement, the male twists the abdomen downward so that none of the whitish substance adheres to the anus. The females, however, can not thus twist the body and some of the excrement frequently adheres as whitish flakes; or not dropping freely, it sometimes forms into a string often reaching half an inch in length. In the nymphs the anus is situated on the venter near the caudal end (Fig. 2 *a*) of the abdomen. It is surrounded by a ring of large wax-cells; a similar ring also surrounds the anus of the adult female. The excrement of the nymphs is usually voided in a string. It has often been seen in the midst of a globule of honey-dew secreted by the same nymph; thus clearly demonstrating that the two secretions are distinct.

Many observations were made to discover, if possible, the manner in which the honey-dew was secreted by the nymphs. It has been supposed that the secretion came, either from the long so-called wax-hairs around the edge of the abdomen, or from excretory pores on the dorsum of the abdomen. Globules of honey-dew were, however, seen attached to the nymphs in such a position that it seemed very improbable that it came from either of the above sources; it seemed that it must have been secreted from the anus of the nymph. A German observer now asserts that the honey-dew secreted by the common plant-lice or aphids comes from the anus, and not from the honey-tubes as commonly supposed. Honey-dew thus seems to be what might rightly be called the fluid excrement of the insect.

METHODS OF PREVENTING THE RAVAGES OF THIS PEST.

All of the attempts to prevent the ravages of this pest during 1891 were ineffectual. This was due, in large part, to a lack of knowledge of the life history and habits of the pest. No severe outbreak had occurred within recent years which would call the attention of the fruitgrowers to the pest. The result was that when the insect appeared in enormous numbers early in the spring of 1891, fruitgrowers were at a loss what to do and how to do it; and entomologists could only suggest methods which seemed practicable. In most cases the attempts to combat the pest were begun too late; most of the damage had been done, the fruit and new growth being severely blighted; the nymphs had covered themselves with honey-dew, and the very active summer adults had appeared. After several unsuccessful attempts with various substances such as kerosene emulsion, solutions of whale-oil soap, fir-tree oil, and carbolic acid, and London purple and Paris green, the afflicted fruitgrowers gave up in despair. Nothing seemed to check

the pest. They saw the leaves and most of the fruit fall before midsummer; and some of their trees were left in a dying condition, while others presented a blighted, blackish, desolate appearance. Fruitgrowers reported two causes which rendered their efforts ineffectual. These were peculiar phases in the habits of the insect. First, the nymps were so completely enveloped in honey-dew that none of the insecticides reached them. Second, the activity of the summer adults rendered it impossible to reach them with a spray; as soon as the first spray struck a tree, the adults arose instantly and flew to some distance, remaining away till the spraying ceased.

During 1892, the pest has done no perceptible damage in orchards which it devastated last year. Fruitgrowers noticed that the pest considerably decreased in numbers later in the season last year. This decrease and the scarcity of the insect this year was probably due principally to the fact that the insect feeds almost exclusively upon the tenderest leaves and branches of the trees. As hardly any new growth was formed and as most of the leaves fell off early in the season, the insect was thus deprived of its favorite food and consequently its increase checked. So great was the decrease that but very few of the hibernating adults appeared. On this account we tried no experiments to destroy the adults in their winter hiding places. It seems practicable, however, that a thorough washing of the trunks and larger branches of the trees in winter with kerosene emulsion (at least five per cent. kerosene) or a strong soap solution, would destroy many of the adults.

As soon as the eggs of the hibernating form were found, experiments were begun with a view to the destruction of the insect in this stage. As the eggs were so freely exposed on the bare twigs to the action of any fluid, it was confidently expected that the pest could easily be checked here. Both field and laboratory experiments were conducted. The branches containing the eggs were dipped into the solution in each case, thus making sure that the treatment was thorough. The results obtained were very surprising. Eggs dipped in the following substances hatched a few days afterward:

Kerosene emulsion (Hubbard-Riley formula) used full strength, and diluted with three parts of water heated to 130° F. Kerosene undiluted. Turpentine emulsion diluted with three parts of water. Turpentine undiluted. Crude carbolic acid emulsion diluted with ten parts of water. Resin wash used triple strength; and heated to 130° F. Whale-oil soap and sulphide of potash wash used double strength. These last two washes are successfully used in combating all stages of scale insects. Concentrated potash, one pound to one gallon of water. Benzine undiluted.

Most of the above substances injured the buds; concentrated potash and carbolic acid when used in less dilutions killed the buds. These results made it evident that it was impracticable to fight the pest with insecticides while in the egg state.

However, if the pear-growers could wait until about April 15, before pruning their trees, they could destroy many eggs. Most of the eggs are laid by that date, near the tips of the last year's growth; so it is only necessary to cut back these shoots, as many growers do, and burn them, to destroy large numbers of eggs.

After the unsuccessful efforts to destroy the eggs with insecticides, we could do nothing more until the nymphs appeared. Some of the nymphs appeared before the buds had opened much; these nymphs immediately

crawled into the buds out of the reach of the insecticides. It was feared that all the young and tender nymphs would thus get out of reach. But a majority of the eggs did not hatch this year until many of the leaves had expanded, thus leaving the nymphs exposed. During a warm early spring the eggs might hatch early but many of the leaves expand in a few days and thus the nymphs would be exposed before they had become more than one third grown.

Our experiments against the young nymphs were first carried on in the insectary upon infested branches brought in from the field. It was soon found that the young nymphs were very tender and very susceptible to kerosene. A kerosene emulsion was prepared according to the Hubbard-Riley formula.* The nymphs were dipped in the emulsion diluted with different quantities of water. It was found that every nymph was killed by the emulsion even when diluted with twenty-five parts of water, and thus containing less than three per cent. of kerosene. The nymphs died almost immediately after the liquid touched them. These laboratory results were thus very encouraging.

Field experiments were soon begun to test the practicability of the emulsion. No trees could be found that were very badly infested. But by carefully examining the trees before and soon after spraying it was estimated that from 75 to 90 per cent. of the nymphs were killed by one spraying with kerosene emulsion diluted with twenty-five parts of water. Some of the nymphs had by this time become nearly full-grown, but these were as quickly and effectually destroyed as were the young ones. The habit of the nymphs of feeding in the leaf axils made it easier for the spray to reach them; the liquid would naturally run down the leaf petioles and twigs and gather in the axils, and thus become very effective. It was found that two quarts of the dilution was sufficient for a large dwarf tree; and thirteen such trees could easily be sprayed in half an hour with a knapsack sprayer. It would, of course, take more time and material to spray the large standard trees, but the whole cost for each tree would not be more than one cent per tree for time and material. The experiments with the kerosene emulsion against the nymphs were so successful that no other insecticides were tried. The emulsion is the cheapest effective insecticide now known for sucking insects; and our experiments have shown that it will prove a very practical and efficient means of checking the ravages of the pear-tree psylla if it be used thoroughly and in time.

The honey-dew did not interfere with the action of the insecticide this year, 1892. This was probably due to the fact that many hard showers fell during the early part of the season. The rain washed off much of the secretion. This fact should be taken advantage of by fruitgrowers in spraying for the pest. Spray soon after a heavy rain-storm if possible; a shower soon after spraying will not lessen the destructiveness of the emul-

* The formula is ½ pound hard or soft soap, 1 gallon water, 2 gallons kerosene.
First, thoroughly dissolve the soap in boiling water. While this solution is still very hot add the kerosene; if the whole is then left over the fire for a few moments to raise the temperature of the kerosene slightly, it will facilitate the emulsifying process. Remove from the fire and quickly begin to agitate the whole mass through a syringe or force pump of some kind; draw the liquid into the pump and force it back into the dish. Continue this operation for five minutes or until the whole mass assumes a creamy color and consistency which will adhere to the sides of the vessel, and not glide off like oil. If desired for use immediately, it may now be readily diluted with cold water, preferably with rain water. Or the whole mass may be allowed to cool when it has a semi-solid form, not unlike loppered milk. This stock if covered and placed in a cool dark place will keep for a long time. In making a dilution from this cold stock emulsion, it is necessary to measure out the amount of the emulsion required, and first dissolve it in three or four parts of boiling water; if cold water be used a large quantity of a white flocculent mass rises to the surface and does not dissolve. After the stock emulsion is dissolved, cold water may be added in the required quantities. If all the utensils are clean, and the directions followed closely, no free oil will rise to the surface of the dilution.

sion as the nymphs are killed almost instantly. There is not the least danger of injury to the trees from the diluted emulsion. All dwarfs and young trees of all kinds may be sprayed with a knapsack sprayer.

The best time to spray is early in the spring just after the leaves have expanded. In 1892, about May 15, was the best time. Then the first brood of nymphs had all emerged and were exposed in the axils. It was this first brood which did the most damage in 1891. Therefore it is very important that the insect should be checked early in the season. Fruitgrowers should examine their orchards when the leaves are expanding in the spring, and if the nymphs are numerous no time should be lost in spraying the trees with the emulsion. A second or even a third spraying could be profitably applied if the attack were serious, and especially if but little rain had fallen to wash off the honey-dew. The destruction of the nymphs is practicable during a period of two weeks about May 15. If the spraying is thoroughly done at this time, the pest will be so completely checked as to necessitate but little, if any, further attention during the season. Most of the damage is usually done before June 15, but spraying after this date will decrease the number from which the hibernating forms are produced; and thus the orchard may be saved from a severe attack the following year.

The summer adults were not numerous enough this year to thoroughly test the effect of spraying upon them. It seems from the experiments made last year by fruitgrowers that it is hardly practicable to try to kill the adults by spraying. A few may be destroyed by coming in contact with the emulsion when they return to the tree.

MARK VERNON SLINGERLAND.

TOMATO NOTES FOR 1892.

I. *Quick and slow fertilizers.*—The influence of heavy manuring upon tomatoes has engaged our attention for a number of years. It is a common belief that the tomato, unlike most plants, is not benefited by rich soil or heavy fertilizing. "The plants run to vine," the gardeners say. There must be some truth in this belief, else it could not have become so widespread and be held so tenaciously. Productiveness in the tomato in the northern states is largely, if not chiefly, a question of early bearing; the plant will outlive any northern season, and its life is therefore determined by contingencies of frost rather than by any inherent limit of duration. The plant never matures here, and it would probably continue to bear for some months if not destroyed. We have carried plants in bearing condi-

tion through two winters. It is apparent, therefore, that any fertilizer which is not at once available to the plant, but which gives up its materials comparatively late in the season, will maintain a vigorous growth and probably delay fruitfulness. Coarse stable manures belong to this class. It is some time before they become thoroughly decomposed and incorporated with the soil, and if applied heavily it is probable that they will give unsatisfactory results. If the season were long enough to allow the plant to live out its natural lifetime it is conceivable that the materials would be gradually used and that the total productiveness of the plant would be as great, if, in fact, not greater, than it would have been under a treatment which caused it to bear heavily at an earlier period. Thoroughly decomposed manures ought to give quicker and therefore more satisfactory results than coarse ones, and proper concentrated fertilizers might give better results than either. It would be interesting to know if stable manure applied in the fall—and which therefore becomes thoroughly incorporated with the soil before spring—will give earlier fruitage than similar manure applied in the spring. We tried this experiment the past season, but the soil in the plots proved to be so heterogenous in character that we have no confidence in the results. We made a very suggestive test in this direction last year with nitrate of soda. Upon a certain area the material was applied all at once early in the season (June 25), and upon another equal area the same amount of nitrate of soda was applied in four applications from June 25 to August 28. Up to about the first of October, the yield from the first or single treatment area was 20 per cent. greater than from the other; but when the last picking (October 5) was added, the single treatment area fell some 8 per cent. behind. "This means," as the bulletin states, "that the intermittent application of fertilizer in lot two was beginning to be felt late in the season, while the single early application of the same amount of fertilizer gave quicker results. Frost held off until the second week in October, so that it happened that the intermittent fertilizing gave us the better result, but had frost come the last of September, as it frequently does at Ithaca, it would have given us the poorer result." This year the frost did come early (October 1) and the intermittent fertilizing gave us the poorer result. The figures which follow afford a most striking confirmation of the foregoing remarks, and they will bear careful study. Four plots, containing 15 plants each, were under experiment. In the first plot, 3 lbs. of nitrate of soda were applied at one time early in the season (June 20); in the second, the same amount was applied in four applications from June 20 to July 27; in the third, this amount was applied at four different times from June 20 to August 26, thereby extending the growing season very greatly; the fourth plot had no fertilizer. The plants were set in the field June 1, and they were all Ignotum. Table I gives the yields until frost (October 1). Table II gives the total yield found by adding to Table I all the fruits which remained on the plants after they had been killed by the first frost.

TABLE I.—*Single vs. intermittent fertilizings, to frost.*

Plots. 15 plants each.	Average number of fruits per plant.	Average wt. of crop per plant. Lbs.	Average wt. of individual fruits. Ozs.
1. Single application. 3 lbs. nitrate of soda, June 20	24.2	10.0	6.8
2. Four applications. 12 oz. each, June 20, June 28, July 11, July 27	20.0	8.7	6.9
3. Four applications. 12 oz. each, June 20, July 21, August 8, August 26	15.2	6.6	6.9
4. Check	15.8	5.8	5.9

TABLE II.—*Single vs. intermittent fertilizings, total crop.*

Plots. 15 plants each.	Average number of fruits per plant.	Average wt. of crop per plant. Lbs.	Average wt. of individual fruits. Ozs.
1. Single application of 3 lbs. nitrate of soda, June 20	53.3	17.8	5 3
2. Four applications of 12 oz. nitrate of soda, June 20, June 28, July 11, July 27	51.6	16.6	5.1
3. Four applications of 12 oz. of nirate of soda, June 20, July 21, Aug. 8, Aug. 26	44.2	14.4	5.2
4. Check	31.1	9.8	5.3

The second column of figures gives the total yields. It will be noticed that the best yields, in each table, are given by the single fertilizing, and that between the intermittent fertilizings the one which was completed first (No. 2) gives the better result. This was true in both the yield before frost and in the total yield, but it must be observed that in the total yield the differences between the intermittent fertilizings and the single fertilizings are not so great as in the yield to frost: that is, the intermittent fertilizings were catching up, and would probably have surpassed the other had the season been a month longer. Thus, in the first table, the first intermittent plot (No. 2) is 13 per cent. less in yield than the single treatment plot, but in the second table it is only 6.7 per cent. less; the second intermittent plot (No. 3) is 34 per cent. less in the first instance and only 19 per cent. less in the second instance. It will be noticed, also, that the number of fruits—in the first column of figures—follows the same course. All this is proof that productiveness in the tomato is largely a question of early bearing and that the best tomato fertilizers are those which give up their food materials quickly.

It must not be understood, however, that this early productiveness necessarily implies earlier individual fruits; that is, the idea refers rather to the production of many fruits—heavy pickings—early in the season rather than to the actual few first ripe fruits. A detailed account of the pickings from the plots illustrates this:

TABLE III.—*Single vs. intermittent fertilizing. Detail record.*

Date.	Plot 1. Single fertilizing.		Plot 2. Intermittent fertilizings. June 20–July 27.		Plot 3. Intermittent fertilizings. June 20–Aug. 26.		Plot 4. Check.	
	No. fruits picked.	Wt. of picking.	No. fruits picked.	Wt. of picking.	No. fruits picked.	Wt. of picking.	No. fruits picked.	Wt. of picking.
July 27							1	
Aug. 8	6	1 lb.	6	1 lb.	4	1 lb.	12	4
Aug. 20							13	4
Aug. 22	25	9	32	9	13	4	8	2
Aug. 29	34	14	14	5	8	3	17	7
Sept. 2	42	17	29	12	11	6	30	11
Sept. 6	4	1	1		1		2	1
Sept. 8	77	31	60	27	52	23	50	19
Sept. 14	42	20	52	26	64	28	44	18
Sept. 21	32	14	36	18	27	12	22	9
Sept. 28	102	39	50	21	48	20	39	10

It appears that all the fertilizer plots were about equally early in first fruits, but after the first two pickings the single treatment plot gave the heaviest returns, and this advantage was maintained throughout the picking season. As between the two intermittent treatment plots (Nos. 2 and 3), it will be observed that heavy pickings were much more early in No. 2, in which the fertilizing was completed late in July. The habit of the variety as to the season of its bearing was not greatly affected by the different treatments, but the amount of fruit borne at stated intervals was greatly influenced. It is probable that the plant had determined the date of its first fruiting, so to speak, before the fertilizer became available to it, for the plants were beginning to flower when the first application was made; but as soon as the fertilizer came into use, the habit of the plant was influenced, and the late fertilizing delayed, in a measure, the productiveness. At all events, I can offer no other explanation of the facts at the present time.

But these tests afford a means of comparing nitrate of soda with no fertilizing, for the check plot (No. 4) received no treatment. In each case, the check plot gives the poorest results, showing that nitrate of soda has a distinct value as a fertilizer. The differences in the appearance of the two plots (Nos. 1 and 4) is well shown in the accompanying engraving (page 193) in which the check plot occupies the left-hand portion. This appears like a contradiction of some of our former experiments in which we found no benefit to arise from the use of this material. But in former tests, the soil was very poor and there was very little potash or phosphorus to mate the nitrogen in the nitrate of soda; but in this test, the soil was fairly good. If we repeat our statements of a year ago, it will be seen that our present results are a confirmation of former trials rather than a contradiction of them: "It should be borne in mind that this substance (nitrate of soda) is an incomplete fertilizer and that unless the soil contains potash and phosphorus in sufficient amount the nitrate is nearly valueless. It is simply a convenient and useful form in which to apply nitrogen alone." So that, while nitrate of soda is a good tomato fertilizer when applied early upon fairly good soils, we can not recommend that anyone should rely upon it exclusively year after year. Potash and phosphoric acid must also be applied at intervals.

2. *General Fertilizer Tests.*—We shall pursue this study of nitrate of soda still further in the following tests of the influences of nitrogen, potash, and phosphorus applied separately and in combination. Eight plots of six plants each, upon fairly good gravelly soil which had been sparingly enriched in previous years, were treated as follows June 20, the yield being given in the second column of figures:

TABLE IV.—*Fertilizer test, to frost.*

	Plots. 6 plants each.	Average number of fruits per plant.	Average weight of fruit per plant—lbs.	Average weight of individual fruits—oz.
1	Nitrate of soda, 1 lb.	30.0	9.5	5.07
2	Bone black, 2 lbs.	19.6	5.8	4.8
3	Muriate of potash, 1 lb.	24.2	7.7	5.1
4	Nitrate of soda, 1 lb. / Bone black, 2 lbs.	20.0	7.2	5.7
5	Nitrate of soda, 1 lb. / Muriate of potash, 2 lbs.	27.5	7.1	4.4
6	Bone black, 2 lbs. / Muriate of potash, 1 lb.	21.0	8.8	6.7
7	Nitrate of soda, 1 lb. / Bone black, 2 lbs. / Muriate of potash, 1 lb.	19.8	7.3	5.9
8	Check	23.4	8.9	6.1

TABLE V.—*Fertilizer test, total crop.*

	Plots. 6 plants each.	Average number of fruits per plant.	Average weight of crop per plant—lbs.	Average weight of individual fruits—oz.
1	Nitrate of soda, 1 lb.	50.6	14.5	4.5
2	Bone black, 2 lbs.	25.4	7.2	4.5
3	Muriate of potash, 1 lb.	34.6	9.6	4.4
4	Nitrate of soda, 1 lb. / Bone black, 2 lbs.	35.3	10.5	4.7
5	Nitrate of soda, 1 lb. / Muriate of potash, 2 lbs.	36.0	8.0	3.6
6	Bone black, 2 lbs. / Muriate potash, 1 lb.	29.5	10.5	5.7
7	Nitrate of soda, 1 lb. / Bone black, 2 lbs. / Muriate of potash, 1 lb.	48.2	14.4	4.8
8	Check	40.2	12.6	5.0

The first of these tables shows that nitrate of soda gave the heaviest yield before frost, and it was the only treatment which gave as good results as the check plot, which had no fertilizer. It is to be observed, also, that while bone black and muriate of potash gave the poorest results as single fertilizers, they gave the best result of any of the combinations. If we turn to table V., however, and study the total yield of the season, we notice that the nitrate of soda plot has preceptably gained in proportional yield, and that the best combination is No. 7, which contains nitrate of soda; but the combination plot gives a trifle poorer results than the nitrate alone. These two instances are also the only ones which equal or exceed the yield of the no-treatment plot. These tests are a repetition of a series made in

1891, when one-fortieth-acre plots were used. Last year, however, the trial was made upon very poor and intractable soil, and nitrate of soda gave the smallest yields of the single treatments, and the best yield was obtained from a combination of all three materials, but even then the crop averaged to frost only 3.3 lbs. per plant, against 9.5 lbs. in the best yield this year, in a shorter season. The experiments of 1891 seem to show, therefore, that on very poor land nitrate of soda alone gives very little result, all the three elements being needed to produce even a small yield; the experiments of 1892 seem to show that upon tolerably good soil nitrate of soda alone may give profitable results, and this conclusion is strengthened by the other evidence which as been presented in this paper.

3. *Relation of variety to fertilizing.*—Last year we raised the question as to whether there is any difference between varieties in the readiness with which they respond to fertilizers. Are some types of varieties more likely to give good results from manuring than others? The small test made upon this point last season showed a decidedly greater tendency on the part of improved or highly developed varieties, like the Ignotum, to produce more fruits to the plant, but the total weight of crop did not appear to follow this course. This year, five varieties were submitted to this test, Ignotum representing the more improved types, Ithaca and Peach the intermediate types, and Yellow Plum and Red Cherry the least improved ones. On June 20, nearly three weeks after the plants were set in the field, each plot, containing six plants, received a liberal dressing of equal parts of nitrate of soda, muriate of potash, bone black, and Bradley's vegetable fertilizer. The yields to frost are displayed in the following table:

TABLE VI.—*Relation of variety to influence of fertilizer.*

Variety, 6 plants.	Average No. fruits per plant.			Average weight of crop per plant.			Average weight of individual fruits.		
	Unfertilized.	Fertilized.	Per cent increase.	Unfertilized.	Fertilized.	Per cent increase.	Unfertilized.	Fertilized.	Per cent decrease.
Ignotum	19.0	23.5	23.7	7.3	9.9	35.6	6.2	6.8	9.6 gain
Ithaca	38.8	50.2	29.3	12.6	13.7	8.7	5.2	4.3	1.7
Peach	23.7	38.6	62.8	2.5	4.2	68 0	1.7	1.7	0.0
Yellow plum	25.3	35.3	39.5	6.8	9.3	36.8	0.43	0.42	23.2
Red cherry	269.6	273.5	1.44	4.9	4.8	2.0 loss	0.29	0.28	3 4

These results agree with those of 1891 in the fact that the least improved variety—red cherry, in this instance—gave the least increase in number of fruits, but beyond this there appears to be no uniformity in the outcomes. It is remarkable that in the red cherry there was somewhat less total yield in the fertilized plot than in the other; yet the yellow plum, which is very little superior to it in degree of amelioration, gives a greater increase, both in number of fruits and in total weight of crop, than the Ignotum. Last year, the Ithaca gave the most remarkable response to the fertilizer, but this year it gave comparatively little response. It should be said, however, that the experiments of last year were made upon very poor soil, and the effect of the fertilizers was therefore undisguised; but this year the plots were upon good soil, somewhat variable in character, upon which the fertilizers produced comparatively small effect. We shall attempt to repeat this study upon a uniform poor soil.

4. *Early and late setting.*—Three lots of Ignotum, each containing twelve plants, were set in the field at different times, for the purpose of determining if the date of planting, within ordinary limits, greatly influences earliness and yield. The plants were all grown from seed sown January 19, and they were vigorous and stocky when set in field. The first lot, which may be designated No. 1, was set May 7. That night there was a frost and the tips of the plants were killed. Another lot was therefore set May 9. For some days the weather was cold and raw, although no frosts occurred, and for three weeks it was very wet. The third lot was set at the general planting, June 1.

TABLE VII.—*Early and late setting. Total crop.*

Plot.	Date of first picking.	Avg. No. of fruits per plant.	Avg. wt. of crop per plant.	Avg. wt. of individual fruits.
No. 1. Set in field May 7	August 22	23.8	8.5	5.8
No. 2. " " " 9	July 27	26.7	9.5	5.7
No. 3. " " June 1	" 27	26.2	8.8	5.4

The results are decidedly in favor of the second planting, made May 9. Even the frosted lot nearly equaled the main planting, but the plants were so checked that the first ripe fruits were three weeks later than in the other lots. It will be noticed, however, that lot 2 was no earlier, so far as first fruits are concerned, than the late planting, but the first pickings were heavier in lot 2. In both lots, the flower buds had already appeared when the plants were set, so that the first fruits were already determined; in the earliest lot, these buds had been killed by frost. The following is a detailed account of the behavior of the plants to frost:

TABLE VIII. *Early and late setting. Detail record.*

Date.	1. Set May 7.		2. Set May 9.		3. Set June 1.	
	Whole No. fruits picked.	Weight of picking.	Whole No. fruits picked.	Weight of picking.	Whole No. fruits picked.	Weight of picking.
July 27			1		7	1
August 8					3	1
August 22	13	3	11	6	7	1
August 29	26	8	23	7	26	7
September 2	71	21	54	19	45	17
September 8	43	20	50	20	61	25
September 14	47	18	48	19	37	14
September 21	34	13	45	15	53	13
September 28	52	17	89	26	75	22
	286	100 lbs.	321	112 lbs.	314	101 lbs.

It will be noticed that the lessened productiveness of lot 1—the earliest setting—as compared with the main setting in lot 3, was due to the delay of fruiting caused by the injuries of the frost, for the pickings, when they once began, averaged heavier than in the latest setting. The great advantage maintained by the second setting—lot 2—was not due to absolute earliness, but to early productiveness; and this supports the conclusions which we have already drawn from our studies of fertilizers, that pro-

ductiveness in the tomato is chiefly a question of early prolific bearing. These remarks may also throw some discredit upon the common method of determining comparative earliness of varieties by recording the date of the first ripe fruit; profitable earliness is determined by the ability of the variety to maintain heavy early pickings rather than by the date at which the few first fruits ripen.

This is the third year that we have made this test upon early and late settings, and our results have been substantially alike throughout,—that tomato plants are not injured by the cold, raw weather of late spring, and that a slight frost may not greatly retard them. This conviction has been an unwilling one on the part of the writer, for he entertained the belief that the inclement weather of early May in the northern states is very prejudicial to the tomato. In our tomato bulletin for 1889 this statement was made: "It is a common mistake to set tomato plants in the field too early. Cold nights, even though several degrees above frost, check the plants sometimes seriously." This statement now seems to be much too strong, and we are gradually adapting our general practice to our new belief. In 1889, our tomatoes were set in field June 10 to 12; in 1890, they were set June 12; in 1891, June 10; in 1891, June 1; and next year we shall set our plants in May.

5. *Early and late seed sowing.*—In 1889 we made some tests to determine if it pays to start tomato plants under glass with artificial heat, rather than to wait until they can be started under cold frames. Sowings were made March 21 and 22, April 10, 12, and 15, and May 15. "In every instance the early sown plants gave earlier fruits than the others." "The gain in earliness sometimes amounts to three or even four weeks." We were satisfied that in this climate it pays to start tomatoes as early as the middle of March. Further south, where the seasons are longer, this may not be true. The question now arises if it pays to start tomatoes earlier than March, for this state. Four lots of Ignotums, twelve plants in each, were grown for a test. The first lot was sown January 19, and the plants were transplanted February 1, March 3, and May 17. The second lot was sown February 12 and transplanted March 4, April 4, and May 2. The third lot was sown February 24 and transplanted March 22 and May 2. The fourth lot was sown March 14, and transplanted April 14 and May 9. The plants were all set in field June 1, and all were thrifty and stocky plants. The outcome to frost was as follows:

TABLE IX.—*Early and late seed sowing.*

Date of sowing.	Av. number fruits per plant.	Av. weight of crop per plant.	Av. weight of individual fruits.
January 19	20 6	8.5	6.5
February 12	20.6	8.4	6.5
February 24	21.0	9.1	7.0
March 14	26.0	11.0	7.4

The result, as read in the second column of figures, is decidedly in favor of the latest sowing, the second best yield being in the second last sowing. The earliest two sowings give practically the same results. The detailed behavior of the plants during the bearing season is recorded below:

TABLE X.—*Early and late seed sowing. Detail record.*

Date.	1. Sown Jan. 19.		2. Sown Feb. 12.		3. Sown Feb. 24.		4. Sown March 14.	
	Whole no. frts picked.	Weight of picking.	Whole no. frts picked.	Weight of picking.	Whole no. frts picked.	Weight of picking.	Whole no. frts picked.	Weight of picking.
July 27	8	2 lbs.	3	1 lb.				
Aug. 8			7	2	9	3	4	1
Aug. 22	5	1	12	3	9	3	5	2
Aug. 29	11	4	12	4	25	10	8	2
Sept. 3	26	12	37	17	61	26	31	13
Sept. 8	37	19	37	16	51	23	49	25
Sept. 14	46	20	32	14	41	17	62	32
Sept. 21	38	14	36	14	18	6	26	11
Sept. 28	77	28	72	26	37	19	100	32

The figures show that the earliest fruits were got from the earliest sowings, but at the end of August the third sowing (February 24) had exceeded the earlier ones in yield. It was not until the middle and late September pickings that the fourth lot began to gain over the others, and by the last of the month it had surpassed them all in yield. Our experiments of four years ago show that it is profitable to start tomato seeds in this climate as early as the middle of March; our experiments this year show that it is not profitable to start them earlier than the middle or first of March. But inasmuch as earlier fruits can be got by earlier sowings, it may be worth while to start a small part of the crop in the middle or first of February if an early market is to be supplied; but the cost of this extra care and handling must be reckoned. The main crop, it appears, should be started in March.

But it must be said that much depends upon the manner in which the plants are handled. Early plants must be transplanted to keep them growing, and they must have congenial surroundings. We tried to determine the effect of ill treatment. A lot of vigorous seedlings, in pots, were placed in a cold and leaky house. The pots were packed in moss and set upon a cold, damp earth floor. Several times the mercury fell nearly to the freezing point. The plants became yellow and weak, and were finally unable to support themselves readily. In this condition the plants were taken into the tomato house and given the most careful nursing. They never outgrew the disaster. Yet plants little better than these are often set in the field to shift for themselves.

6. *Few and Several Transplantings.*—The vigor and stockiness of plants, as we have said in the last paragraph, are important features, and these are greatly influenced by the frequency of transplanting. Two dozen uniform Ignotum plants were selected from a sowing made in flats March 14. One dozen were transplanted once, May 18, into 4-inch pots; the others were transplanted three times, April 14, May 9, and 17, into a flat, 3-inch and 4-inch pots respectively. All were again transplanted into the field June 1.

There was very little difference in the yields of the two lots, but the three transplantings gave the earlier fruits, and in this respect the results agree with those obtained last year. In 1891, in a comparison of one, two, and three transplantings, all lots being duplicated, the two transplantings gave decidedly the heaviest yields.

TABLE XI.—*Few and several transplantings, to frost.*

Plot.	Date of first picking.	Average number of fruits per plant.	Average weight of crop per plant. Lbs.	Average weight of individual fruits. Ozs.
No. 1, transplanted once	Aug. 22	17.3	8.5	7.8
No. 2, transplanted three times	Aug. 3	22.2	8.3	5.9

7. *Flat-grown vs. Pot-grown Plants.*—It is a question whether young tomato plants thrive better in "flats,"—or shallow, tray-like boxes in common use among gardeners—or in pots. From each of two sowings of Ignotum, made February 12 and March 14 in flats, two dozen uniform plants were selected. One dozen, in each instance, were transplanted into flats, and one dozen into pots, on the same days. The transplantings were made as follows:

Series I (sown Feb. 12), March 4, April 4, May 5.
Series II (sown March 14), April 4, May 9.

The flat-grown plants in each instance were set so far apart in the flats that the plants could not interfere with each other, and at the final transplanting they stood from three to four inches apart each way. The pot-grown plants in the first series were transplanted into thumb pots and then into 3-inch and 4-inch pots. In the second series, they were placed in 3-inch and 4-inch pots. The records are these:

TABLE XII.—*Flat-grown vs. pot-grown plants.*

Samples.	Average No. fruits per plant.		Average weight of crop per plant.		Average weight of individual fruits.	
	Flat.	Pot.	Flat.	Pot.	Flat.	Pot.
Series I. March 14	30.4	26.0	11.2	11.6	5.7	7.0
Series II. February 12	20.5	31.0	8.6	11.5	6.7	5.9

The yields, in the second double column of figures, are decidedly in favor of pot-grown plants, especially in the later sowing. And it may also be said, although the table does not show it, that the pot-grown plants gave earlier fruits.

8. *Seedlings vs. cuttings.*—In 1890, seedling tomato plants gave twice as heavy yields as cuttings of equal age. In 1891, seedlings gave earlier fruits, and with one variety—Lorillard—the yield was also much greater from seedlings, while in the Ithaca it was less. Secondary cuttings, that is, cuttings taken from the cutting plants, gave much larger yields than their parents, but the crop was much later. These experiments were repeated this year. The stock from which all the lots of this year came was one fine seedling plant of unknown parentage, of the peach type, which came up in our forcing-houses. Late in winter, strong cuttings were taken from the axillary shoots of this plant and were set out regularly in our tomato house. In March, therefore, we had the one old or parent plant, still in full vigor, which we shall call A, and a small brood of cutting plants which we shall call, collectively, B.

March 29, 12 cuttings were taken from A. These cuttings were three to

four inches long, and comprised the entire length of vigorous axillary shoots. At the same time, seeds were sown from fruits on the same plant. The two lots were thereafter treated as nearly alike as possible. They were set side by side in the field, June 1. Their behavior was as follows:

TABLE XIII.—*Seedlings vs. cuttings (to frost).*

Samples (March 29).	First picking.	Average No. fruits per plant.	Average weight fruit per plant. Lbs.	Average weight individual fruits. Ozs.
Seedlings	Aug. 22	23.6	3.0	2.0
Cuttings	Aug. 3	43.	4.8	1.8

Here, then, the cuttings were both much earlier and more productive than the seedlings. This is opposed to most of our earlier results.

May 3, another batch of cuttings was taken from the old plant A. These were three or four inches long and were made from the tips of axillary shoots which had reached a foot or more in length. Seedlings were started from the same plant at the same time, and the two lots were placed side by side in the field. The results are like those above, only less pronounced:

TABLE XIV.—*Seedlings vs. cuttings (to frost).*

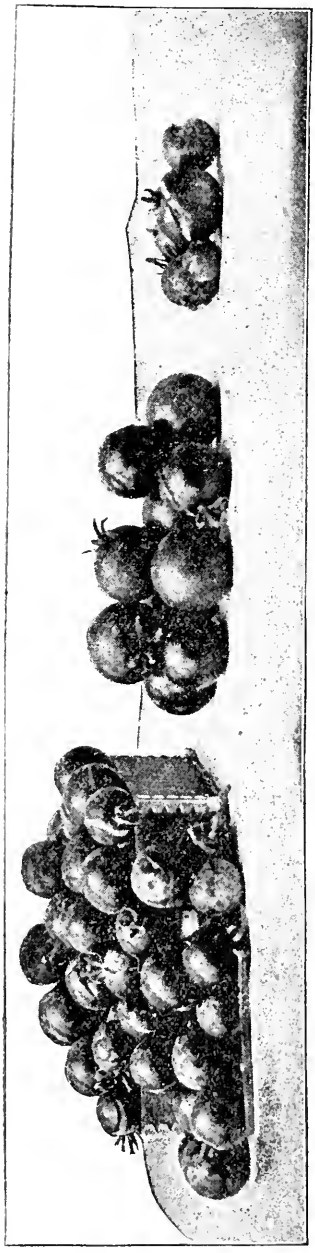
Samples (May 3).	First picking.	Average No. fruits per plant.	Average weight fruit per plant. Lbs.	Average weight individual fruits. Ozs.
Seedlings	Sept. 2	12.	2.1	2.9
Cuttings	Aug. 22	15.3	2.3	2.3

Now, at the same time that this last lot was started, May 3, a dozen good cuttings were taken from the plants B, which were themselves cuttings. These cuttings of cuttings were given the same treatment as the cuttings specified in the above table, and were set alongside them in the field. They gave their first picking August 22, the same date as the one-generation cuttings, but they gave over twice the yield of either cuttings or seedlings—5.4 lbs. per plant, which is a fair yield for plants started in May. This, in general, tallies with our experience last year. We can not account for it. Another strange thing about these cuttings of cuttings is the fact that they did not reproduce the parent type, A, but of this we do not feel competent to speak more fully at present.

9. *Products of early and late fruits.*—A house plant of the Currant-Ithaca hybrid described last year (Bulletin 32, p. 165) gave its first ripe fruit December 3, 1891. Seeds were saved from this, and also from another fruit upon the same plant which matured March 18, 1892. These seeds were sown at the same time and at this time, also, cuttings were taken from the plant. The three lots made the following record:

TABLE XV.—*Products of early and late fruits. (To frost.)*

Samples.	Date of first picking.	Av. No. of fruits per plant.	Av. wt. of fruits per plant. Lbs.	Av. wt. of ind. fruits. Ozs.
1. First ripe fruit	July 27	76.4	1.1	0.22
2. Late ripe fruit	July 27	117.8	2.1	0.20
3. Cuttings	June 20	120.3	1.8	0.25



Products of early and late fruits and cuttings, at the first general picking. The left-hand and right-hand samples show products of late and early fruits respectively; the middle lot is from cuttings.

The poorest results were got from the seeds of the earliest fruit. The earliest picking was obtained from the cuttings, but the heaviest yield came from seedlings of the late fruit. The light yields are due to the variety, it being a cherry-like tomato. The table also affords a comparison of seedlings and cuttings, as discussed in § 8, the cuttings being earliest, and producing more than one lot of seedlings and less than another. The accompanying picture shows the status of these three lots at the picking of July 27. The left-hand sample comprises all the fruits picked from the dozen plants of No. 2—products of late fruit; the middle one those picked from No. 3—the cuttings, and the right-hand sample is the picking of No. 1—the product of first ripe fruit. It may seem strange that early fruits should give less yield than late ones, but the result is not novel. We found the same thing to be true last year in a number of varieties, and similar results have been obtained elsewhere. In our experiments last year there were no constant differences between the sets in point of earliness. This illustrates the law that any fruit reproduces its parent rather than itself; that is, the character of the plant as a whole is more important than the character of any individual fruit upon it. We should therefore expect better results in earliness by selecting fruits from an early plant rather than by selecting early fruits from an ordinary plant.

10. *Products of mature and immature fruits.*—In March, a fully ripe fruit, and one which was full grown and was about to begin to color, were selected from a house-grown plant of the Brick tomato—a large, regular, red variety. Plants were grown from each lot of seeds.

The mature-fruit lot gave the better results, both in earliness and yield.

11. "*Leggy*" *plants.*—Plants which have grown tall and spindling are known among gardeners as "leggy" plants, in distinction to those which are "stocky," or short and stout. Leggy plants usually give very poor results in the field when set in the ordinary manner; but some growers

TABLE XVI.—*Products of mature and immature fruits.*

Samples.	Date of first picking.	Average No. of fruits per plant.	Average weight of fruit per plant. Lbs.	Average weigt of individual fruits. Ozs.
Mature	August 8	26.0	12.0	7.4
Immature	" 22	24.7	11.1	6.9

obtain good returns from them by laying the stem upon the ground or in a little trench, when setting, and covering it with earth, allowing only a few inches of the tip to protrude. This treatment prevents the breaking of the plant by the wind, and roots will form along the buried portion which may aid in the production of a crop of fruit. This system was tried last year, but the layered leggy plants gave less results than normal plants set in the ordinary fashion, but they gave better results than leggy plants not layered. Our leggy plants last year were very poor, however; they were so badly drawn that they could scarcely stand alone. This year the effort was repeated, but the drawn or leggy plants, while tall and slender, were still able to support themselves, and they were vigorous. The lots for this year's test came from Ignotum seeds sown February 12. All the plants were transplanted at the same times, March 4, April 4, May 2, and were set in field June 1. Lot No. 1 was transplanted into pots at the first shifting. At the date of setting in the field they were in 4-inch pots, and were short, stocky plants of ordinary dimensions. Lot 2 was also grown in pots of the same sizes, but the plants stood amongst a general collection of other plants, and because of lack of room and light, ran up 18 or 20 inches high. Lot 3 was grown entirely in flats, being given more room at each shifting, but the plants were allowed to grow 18 or 20 inches tall from crowding. Lot 1 was set in the field in the ordinary manner. Lots 2 and three were trimmed of their lower leaves, the root was set at the ordinary depth—three to four inches—and half the length of the slender stem was laid down and covered in a trench of the same depth, the free portion lying nearly parallel with the surface of the ground. The following figures show how all these lots behaved:

TABLE XVII.—"*Leggy*" *or drawn plants.*

Lots.	First picking.	Average no. fruits per plant.	Average wt. of fruit per plant. Lbs.	Average wt. individual fruit. Ozs.
1. Check. Normal setting	August 8	12.	4.3	5.8
2. Leggy, pot-grown	" 8	19.5	7.3	6.
3. Leggy, flat-grown	" 22	12.2	4.4	5.8

These figures show plainly enough that the layered leggy pot-grown plants gave decidedly best results, and that even the flat-grown leggy plants gave slightly heavier yield to frost than normal plants, although they came into bearing later. If these figures are to be relied upon, there is some advantage in growing tall and slender plants and then laying them down in setting; but the test needs to be repeated, and it should also be said that the plants, while leggy, were still vigorous.

12. *Shearing Young Plants.*—It is a frequent practice to shear the tops

off young tomato plants to make them stocky, in place of a transplanting. Two dozen Ignotum plants, for which seeds were sown January 19, were distributed into two lots. One lot, which we may call No. 1, was transplanted on February 1, March 3, April 14, and May 17; the second lot was treated the same way except that in place of the last transplanting, May 17, the plants were sheared. At this time the plants were some 15 inches high, and about three inches of the top were cut off.

TABLE XVIII.—*Shearing young plants.*

Lots.	First picking.	Average number fruits per plant.	Average weight fruit per plant. Lbs.	Average weight individual fruits. Ozs.
1 Normal	July 27	26.2	8.8	5.4
2 Sheared	Aug. 29	23.6	9.6	6.5

There was considerable loss in earliness in the sheared lot, but a gain in weight of crop before frost. This gain was not great, and too much dependence should not be placed upon it.

13. *Hilling.*—Two plots of 28 good Ignotum plants each, were set aside for a test of the value of hilling tomatoes, half of each plot being hilled July 2, the remaining halves receiving common level cultivation. The soil was drawn up around the base of the plant to a height of six inches, as potatoes are hilled.

TABLE XIX.—*Hilling tomatoes.*

Plot.	Average number of fruits per plants.	Average weight of fruit per plant. Lbs.	Average weight of individual fruits Ozs.
A. YIELD TO FROST.			
1 Hilled	24.6	11.0	7.2
1 Not hilled	24.6	9.8	6.4
2 Hilled	20.5	8.5	6.6
2 Not killed	25.0	10.1	6.4
B. TOTAL FOR SEASON.			
1 Hilled	56.4	17.9	5.2
1 Not hilled	86.2	27.1	5.0
2 Hilled	72.6	22.2	4.8
2 Not hilled	61.0	18.7	4.9

The results are conflicting, although on the whole the normal or check plants gave rather the better results. In earliness there was no appreciable difference. This hilling experiment was first made last year, it having been urged upon us by a gardener who thinks that hilling gives greatly increased yields. But in both years we have found no advantage in it.

14. *Trimming.*—It is sometimes said that trimming or heading-in tomato plants in the field is an advantage, giving earlier and heavier crops. We have tried it three years. This year, four plots of a dozen plants each of Ignotum were selected for treatment, three of the plots being trimmed, and the remaining one having only common treatment. The trimming consisted in heading-in the main shoots to the first fruit which had attained the size of a marble. From four to eight inches of the shoot was therefore removed. The trimming was done at different times, as recorded below:

TABLE XX.—*Trimmed plants.*

Plot.	Average No. of fruits per plant.	Average weight of crop per plant. Lbs.	Average weight of individual fruits. Ozs.
1. Trimmed July 28, August 8 and 30	20.2	7.7	5.7
2. Trimmed August 8 and 30	20.4	7.6	6.0
3. Trimmed August 30	24.6	9.3	5.9
4. Check	24.2	9.1	6.1

The early trimmed plants gave considerably less yield than the late trimming or the check. There was no constant difference in earliness. The figures, as they stand, seem to teach that the plants had better not have been trimmed, for although there is a trifle gain in the late-trimmed lot (No. 3), the increase is not enough to make one feel sure that it is due to the treatment. In 1890, however, trimming on July 28 and August 25 gave considerably increased productiveness and earliness. In 1891, the trimmings were made August 3, August 24, and September 18, and the results were indifferent; it was then thought that the unsatisfactory yields were due to the lateness of the trimming, but the first trimming this year was made on the same date as in 1890, but with opposite results. So we are still in doubt as to whether trimming promises any benefit; but it is evident that it does not yield decided results.

15. *Single-stem training.*—A good number of Ignotum plants were set a foot apart in rows, and each plant was tied up to a perpendicular cord, but one stem or stalk being allowed to grow in each case. The first tying of the stem to the wire was made July 20, the plants having been set June 1. Probably earlier attention should have been given to this. Thereafter the plants were tied every week or two, as occasion required, but this attention was not arduous. Other plants of same age and variety were set along side, 4x4 feet apart, for comparison.

TABLE XXI.—*Single-stem training.*

Samples.	Crop previous to Aug. 31.			Crop for the season.		
	Average No. fruits per plant.	Average weight of crop per plant.	Average weight of individual fruits.	Average No. fruits per plant.	Average weight of crop per plant.	Average weight of individual fruit.
1. Single-stem training	2.9	1.08	5.9	10.7	4.0	6.0
2. Ordinary planting or check	2.8	1.04	5.8	24.2	9.1	6.1

The second column, in each instance, shows the total yield. The trained plants gave earliest results, averaging 1.08 lbs. to the plant up to the last of August, against 1.04 lbs. from the check lot; and this difference is important because the trained plants have much less bearing surface than the others. The total product for the season is nearly half as much to the plant (4 lbs. as to 9 lbs.) but the trained plants occupy five times, and more, less ground than the others, so that the yield per acre or per square yard is two or three times greater from the trained plants. These results match those obtained last year. This is the method pursued in forcing tomatoes for winter fruit where the greatest possible yield must be produced. Both last year and this we found less fruit-rot upon the trained plots than upon others. We feel safe in recommending single-stem train-

ing for home cultivation of the tomato, and we believe that it can be made profitable for the early crop in market plantations. The plants can be tied to stakes, to cords stretched up and down between two horizontal wires, or to any support which the grower may fancy. The important points are to let but one stalk grow, and to keep it securely tied to its support.

16. Fruit-rot.—It is well known that the rot of the fruit is influenced to a considerable extent by the method of growing and training the tomato. Single-stem training, as discussed above, usually lessens the rot, and so does any system of training which keeps the plant open and dry. Last year we found that weak plants—those which had been poorly handled before setting in the field, and which had no fertilizer—gave more diseased fruits than those which were strong and vigorous and had been well fed. The plants set very early in the field also gave more rot than those set in June. It is impossible to say, however, if these variations were due to the treatments, or if they were merely incidental. Accurate observations were made this year in all our tomatoes, and the most important of them are tabulated below:

TABLE XXII.—*Fruit-rot under various treatments.*

		Per cent rot.
1.	Land heavily manured in spring with stable manure	8.3
2.	" " " " fall with stable manure	14.0
3.	" fairly rich, no manure nor fertilizer	6.2
4.	" same as 3, one application nitrate soda (1, Table I)	6.6
5.	" " " " four applications nitrate of soda (2, Table I)	9.3
6.	" " " " " " " " (3, Table I)	7 0
7.	" fair, with nitrate of soda (1, Table IV)	5.5
8.	" " " bone-black (2, Table IV)	4.1
9.	" " " muriate of potash (3, Table IV)	8.3
10.	" " " nitrate and bone-black (4, Table IV)	16.6
11.	" " " nitrate and muriate potash (5, Table IV)	8.2
12.	" " " muriate and bone-black (6, Table IV)	8.7
13.	" " " all three above (7, Table IV)	14.1
14.	" " no treatment (8, Table IV)	11.9
15.	" good, earliest setting, May 7 (1, Table VII)	4.5
16.	" " second setting, May 9 (2, Table VII)	10.0
17.	" " general setting, June 1 (3, Table VII)	5.4
18.	" " earliest sowing, January 19 (1, Table IX)	13.7
19.	" " second sowing, February 12 (2, Table IX)	8.0
20.	" " third sowing, February 24 (3, Table IX)	6.3
21.	" " late sowing, March 14 (4, Table IX)	8.4
22.	" " once transplanted (1, Table XI)	5.3
23.	" " three times transplanted (2, Table XI)	3.7
24.	" " flat-grown, late (1, Table XII)	7.6
25.	" " pot-grown, late (1, Table XII)	7.8
26.	" " flat-grown, early (2, Table XII)	8.5
27.	" " pot-grown, early (II, Table XII)	7.3
28.	" " normal plants (1, Table XVII)	13.3
29.	" " leggy plants, pot-grown (2, Table XVII)	8.5
30.	" " " flat-grown (3, Table XVII)	8.1
31.	" fair, single-stem training (1, Table XXI)	7.0
32.	" " check (2, Table XXI)	9.7

There are no constant variations in these figures, and apparently nothing to show that the cultivation exerted any influence upon rot. If these various treatments determine to any extent the prevalence of rot, the results were probably obscured this year because rot was everywhere very slight in our plantations.

Following is a record of the amount of fruit-rot in different varieties grown this year:

TABLE XXIII.—*Fruit-rot in varieties.*

	Per cent rot.
Ignotum	7.0
Long Keeper	7.1
Nichol No. 5	5.3
Trophy	7.0
Plentiful	8.1
Telegraph	16 0
Belmont	10.0
Royal Red	5.5
Picture Rock	3.2
Yellow Plum	⅛

The amount of rot is not great except perhaps in Telegraph and Belmont, and it is probably not chargeable to the peculiarities of the given varieties, except in the instance of the Yellow Plum. In Table XXII, above, all the entries are Ignotum, and it will be seen that the figures run from 3.7 to 16.6 per cent.

Altogether, therefore, we are able to draw no definite conclusions from this year's studies of fruit-rot, largely, perhaps, because the disease was not sufficiently severe to emphasize itself in particular treatments.

17. *Southern or field blight.*—The accompanying illustration shows a trouble which was serious upon some of our tomatoes this year. The leaves become dull or slightly yellowish and curled, as if suffering from drouth, and the ends or individual leaflets shrivel and droop and finally become dry and black. The uppermost leaf in the engraving shows the shrivelled, dead and spindling extremity in a characteristic manner; and the lowest leaf shows the injured portion in an early stage of the disease. The middle leaf has not reached its normal size, and looks as if it were suffering from lack of water. This trouble is probably the disease described as the Southern blight by Professor B. D. Halsted, in Bulletin 19, of the Mississippi experiment station. Specimens were submitted to Professor Halsted, who thinks that the disease is probably identical with the southern one. This is not the first record

Southern or Field Blight of the Tomato.

of the occurrence of the disease in the north. In a recent issue of *Garden and Forest*, Professor Halsted reports it from Syracuse, N. Y., where it had invaded three tomato fields. Apparently the same disease has been reported to me from three localities in this state during the last two seasons, and in two cases

it had practically ruined the crop. This disease is probably due to a microbe, and it is therefore doubtful if spraying will be effective. Professor Halsted thinks that the same disease is one of the blights of the potato. Infected vines should be gathered and burned in the fall, and as a precautionary measure tomatoes or potatoes should not be grown upon the same land for two or three years.

18. *Impressions of Varieties.*—The Ignotum is still our best main crop tomato.

Among the new kinds, a variety called Nichol No. 5, sent us by A. M. NICHOL, Granville, Ohio, was the best. It is scarcely distinquishable from Mikado in foliage and fruit, except that the fruit is more regular and uniform in size.

Plentiful (Perry & Co.). A good red tomato, from medium to large in size, but inclined to crack about the stem. Appears to possess few superlative merits. An English variety.

Telegraph (*Salzer, 1891*). A medium to small tomato, irregular, not uniform in size and shape; cracks very badly. A weak grower. Worthless with us.

Picture Rock (*Childs*). A good, dark red, regular tomato, much like the Volunteer, but apparently no improvement upon that variety. There is a slight tendency upon some fruits to assume yellow markings, in bars about the stem.

Royal Red (*Livingston*). A good red tomato, showing a tendency to angular fruits, like those in cultivation some years ago. It reminds one of the Valencia Cluster, which was popular six and ten years ago.

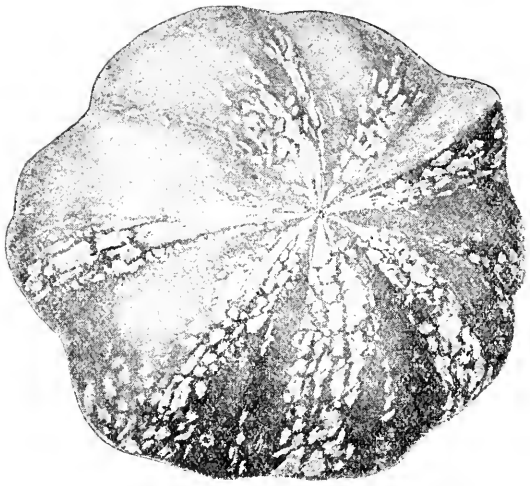
Belmont (*Breck*). A promising, regular, red tomato, uniform, early and productive.

The following table shows the earliness and yields of these varieties:

TABLE XXIV.—*Varieties.*

Varieties.	First picking.	Average no. fruits per plt.	Average crop per plant.
Nichol No. 5	Aug. 8	24.4	9.4 lbs.
Plentiful	Aug. 22	15.	5.2 "
Telegraph	Aug. 22	32.7	6.7 "
Picture Rock	Aug. 8	23.2	6.4 "
Royal Red	Aug. 8	23.6	8.3 "
Belmont	Aug. 1	24.1	7.4 "

We tried no introductions this year which give promise of unusual merits. In order to determine the character of the varieties now prized in Germany, we sent to a leading seed firm there for the six best market varieties of tomatoes. The varieties received were Paragon, King Humbert, Yellow Plum, Earliest Dwarf, Monstrous Giant, and French Upright. Of these, only the Paragon would be considered of any value in America for market cultivation. The Earliest Dwarf and Monstrous Giant, which are second best, represent the old angular sorts which we have long since outgrown. A singular German variety is that shown in the accompanying engraving, and which may be called the German Striped. It comes to us under the name of *Niedriche Gestreifte*, or "Low Striped." It belongs to the old angular type of tomatoes. The ground color is a deep clear red, and this is overlaid with splashes and bands of bright orange.



German Striped Tomato.

Sometimes the orange is the prevailing color and the red takes the position of stripes. The fruit is very striking and its quality is also good. In general productiveness and merit it will probably rank fully as good as General Grant, which was popular a few years ago. We first grew this German Striped tomato in 1887. Striped or variously marked tomatoes occasionally appear in plantations but this is the only one which we have ever known to be permanent, or to "come true to seed" for any length of time. A striped tomato appeared in an Ithaca garden three or four years ago, but it ran out in one or two generations.

The Currant-Ithaca hybrid which was described and figured last year was grown again this year from seeds and cuttings from one of the original plants. Among 36 plants, there were no reversions to either parent, although about one third of them gave larger fruits than the others. All the plants were very productive and vigorous, and the fruit is very handsome.

SUMMARY.

1. *Quick and slow fertilizers.*—This year's experiments confirm those of last year in showing that tomatoes need a fertilizer which is quickly available early in the season. Fertilizers applied late, or which gave up their substance late, in the season, gave poor results because they delay fruitfulness and the plant is overtaken by frost before it yields a satisfactory crop. This fact is no doubt the origin of the widespread opinion that the tomato crop is injured by heavy manuring. Nitrate of soda applied at once early in the season gave a much heavier yield than the same amount applied at intervals.

2. *Value of nitrate of soda.*—Upon fairly good soil, which contains some vegetable matter, nitrate of soda gives good results as a tomato fertilizer. We have formerly found that upon very poor soils it gives little or no benefit. It must be remembered, however, that nitrate of soda is an incomplete fertilizer and that it should not be relied upon for a permanent treatment of land. It is simply a source of nitrogen.

3. *Relation of variety to fertilizing.*—In 1891 our test seemed to indicate that the highly improved varieties give the greatest response to fertilizing in the number of fruits produced, although the little improved sorts gave greater proportionate increase in actual weight of crop. In 1892 these results were not verified, save that the little improved sorts gave least increase in number of fruits. But in the experiments of 1892 the test was made upon good soil, in which the results of fertilizing were obscured.

4. *Comparative values of early and late settings.*—Experiments this

year confirm those of 1890 and 1891 in showing that very early planting in the field is advisable. Even those plants which were slightly injured by frost nearly equaled in productiveness those set at the general planting June 1. The late planting gave better results at the first pickings, however. Our earliest satisfactory setting this year was made May 9.

5. *Early and late seed sowing.*—Tomato seeds were sown from January 19 to March 14. The earliest sowings gave the earliest fruits, but the largest yield came from the latest sowing, March 14, the difference in favor of this late sowing being very marked. In 1889 our tests showed that seeds sown in April and May gave poorer results than those started in March. It seems to be true, therefore, that the best time to sow tomato seeds in this latitude, for the main crop, if one has a forcing-house or a good hot-bed, is about the middle of March.

6. *Few and several transplantings.*—Earlier fruits were obtained from plants which had been three times transplanted in the house than from those transplanted only once. In 1891, greater yields were obtained from two transplantings than from either one or three. Much, no doubt, depends upon the vigor and age of the plants, but it is certainly safe to say that in all ordinary cases plants which are started in March should be transplanted at least twice.

7. *Flat-grown vs. pot-grown plants.*—Plants grown in pots, one lot transplanted twice and one lot thrice, gave earlier and heavier yields than plants similarly transplanted into "flats," or shallow gardener's boxes.

8. *Seedlings vs. cuttings.*—This year, cuttings gave earlier and heavier yields than seedling plants. In 1890, the cuttings gave the poorer yields, while in 1891 the results were mixed. These variations in results no doubt depend upon some condition of the plants or some factor in our handling which we have not yet discovered. Cuttings of cuttings gave better yields than one-generation cuttings, both last year and this.

9. *Products of early and late fruits.*—Plants grown from seeds from the first ripe fruit upon a given plant gave poorer yields and no earlier fruits than other plants grown from a fruit from the same parent which ripened three and a half months later. Similar results have been obtained before by ourselves and others, and it is probably safe to say that no gain is secured by selecting seeds from early or first ripe fruits without giving any attention to the character or habit of the plant as a whole.

10. *Products of mature and immature fruits.*—Plants grown from seeds from a fully ripe fruit gave earlier and better yields than other plants raised from a fully grown but unripe fruit from the same parent.

11. *Treatment of "leggy" plants.*—"Leggy" or "drawn" plants were set at the ordinary depth and half the stem was laid and covered in a shallow trench. These gave much larger yields than normal or stocky plants started and planted at the same time. Last year opposite results were obtained; but at that time the plants were so badly drawn that they were unable to stand alone. This year the leggy plants were about 20 inches high, but while slender they were still stiff and vigorous when put in the field. It is safe to conclude that if one has leggy plants he should layer them when planting.

12. *Shearing young plants.*—Plants which were sheared to make them stocky, in the place of one transplanting, were later than others which were transplanted at the date of this shearing. The yields were slightly in favor of the sheared plants, but this may have been an incidental variation.

13. *Hilling tomatoes.*—Hilling tomato plants, during two years, has given no favorable results.

14. *Trimming tomato plants.*—Trimming the plants after they have made a good growth in the field gave no advantage this year, and it is doubtful if it is advisable.

15. *Single-stem training.*—This year, as last, single-stem training in the field gave decidedly heavier yields to the square foot of land, and the crop was earlier.

16. *Fruit-rot.*—Rot was not serious this year, and it did not appear to be influenced by methods of cultivation or varieties.

17. *Southern or field blight.*—A new tomato disease appeared in our plantation this year. It is probably a bacterial trouble which may become serious. No remedy is known, but rotation of crop will probably check it. It is characterized by a yellowing, curling, and drying of the leaves, which finally become black and dead.

18. *Varieties.*—Few varieties were tested in 1892, and while they possess merit, none of them appear to be destined to supplant varieties already in existence.

L. H. BAILEY,
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MULBERRIES.

The mulberry is a neglected tree. It possesses decided value in ornamental planting, and some of the varieties are useful for hedges, shelterbelts, and small timber. The fruit has merit for the dessert, and it is easily grown and is produced more or less continuously throughout a period of two to four months of every year. It is this value of the mulberry as a fruit-bearing tree which I particularly wish to discuss in this paper. Perhaps there is no immediate prospect that the mulberry can be grown with profit for the market, because there is no demand for it, but it is capable of adding so much to the charm of the home garden and orchard that I desire to urge it upon the attention of every land owner. The botanical relationships of the various forms are also perplexed and they demand attention before any intelligent discussion can be made of their horticultural merits; but this subject is so difficult that I enter upon it with caution. No group of cultivated plants has bothered me more, and three years of study and collection of material appears only to have augmented the perplexities. Of all fruits cultivated in America, I think that none have so meagre a literature as the mulberries. There is an abundant record of the early attempts toward silk culture in this country and the mulberries which were grown for feeding the worms, but with the failure of these attempts the mulberry nearly passed from sight. There are men still living who remember the "multicaulis craze" of the thirties. PERROTTET had intro-

duced a new mulberry into France from the Phillipines in 1824, the large leaves and rapid growth of which at once attracted the attention of all silkgrowers. It turned out that this tree had come originally from China and was the source of the famous Chinese silk. PERROTTET called it *Moris multicaulis* from its habit of branching or sprouting from the surface of the ground. This tree reached America in 1829 or 1830, by way of the nurseries of Messrs. PRINCE, on Long Island, and in 1830 or 1831 it was introduced into Massachusetts by WILLIAM KENRICK, author of the "New American Orchardist." The fame of the tree spread rapidly, and there arose a fever of speculation such as has never been known in any other horticultural venture in America. The records of the next ten years read like fiction. Many nurserymen gave up all other business that they might grow the mulberry, and they realized several hundred per cent. profit. The secret of the Chinese silk had been discovered and every available acre from New England to the Gulf must be covered with the marvelous herbage of this mulberry, and men must train their hands to the breeding of the worms and spinning the silken threads! One nurseryman who is still living, went to the West Indies that he might grow hundreds of thousands of trees during the winter season, so great was the haste for plants. From the thinly settled portions of the west the planters came eager for trees at almost any price, and even in Maine the demand was great. Then came the reaction. The market was supplied and soon over-stocked. A disease appeared. The winters of New England were too severe. One man near Hartford lost nearly ten thousand trees from cold. Men lost their fortunes; and in 1839 the bubble burst. One man near Philadelphia sold 250,000 trees at one auction in the fall of that year. He realized 31 cents each with a discount of 7½ per cent for cash. His buyers were mostly from the west. The eastern men had grown cautious before this. Other dealers sold for much less, and many had thousands of trees left upon their hands. "The trees were sold, in some instances, for a few cents each, and thousands, if not millions, were never replanted after they had been taken out of the ground in the fall of 1839." So *Morus multicaulis* passed from sight and the present generation knows nothing of it. No nurseryman grows it. The last specimen in the east, so far as any one knows, was cut down nearly ten years ago. It stood on the old battle ground at Germantown. Only one tangible result of this great contagion remains to us. CHARLES DOWNING, whose name will long remain a household word among those who love gardens and fruits, planted seeds of this mulberry and raised the Downing Mulberry, which is now grown for its fruit.

This was not the beginning of American mulberry cultivation, although it was far the most important contribution to it. Before this time various forms of mulberries had been introduced, but mostly for the purpose of feeding silk worms. BENJAMIN FRANKLIN had demonstrated that good silk can be grown in this country. M'MAHON, 1806, had urged the cultivation of the mulberry for fruit and for hedges as well as for silk. In 1806, too, FREDERICK PURSH, a botanical traveler, found mulberries cultivated in orchards near Cayuga lake, N. Y., "may be for the raising of silkworms, as the trees were low and planted in regular close rows." WILLIAM PRINCE, in 1828, regarded the Black Persian and the wild native red mulberry as the best for fruit, and he enumerates several kinds for silk. Among other sorts which were introduced in the early days was *Morus Tatarica*, which has lately reappeared as the Russian mulberry. So far, there appear to

have been no varieties of any species of American origin. It is a significant fact that the first named variety originating in this country is an offspring of our own wild *Morus rubra*. This is the Johnson. The first mention of it, so far as I know, is in the first edition of Downing's "Fruits and Fruit Trees" in 1845.

I have said that the botany of the mulberries is perplexing. This is notoriously the case in every country where they are cultivated. There appear to be three well marked general types in cultivation, the white, black, and red—*Morus alba*, *M. nigra*, *M. rubra*. I must warn my readers that these names do not designate the color of the fruits of the respective species, although they were no doubt meant to distinguish them. Our native *Morus rubra* bears somewhat redder fruits than the others; fruits of the black mulberry are black, but so are those of the white mulberry in many cases. Perhaps we can apply the terms white and black in a general way to the color of the foliage, as that of *M. alba* is much lighter than that of *M. nigra*. The white mulberry is the species most used for silk. It has been cultivated in many countries for many centuries, and, as a consequence, it is wonderfully variable. Bureau, in his monograph of the genus in 1873, refers 31 described species to *M. alba* and recognizes 27 botanical varieties or types of it. But it is difficult, in some cases, to distinguish between *M. alba* and *M. nigra*, and if we are to follow Bureau's classification I do not see how the two can be kept apart, for some of the plants which he refers to *M. alba* seem to be as distinct from its type as *M. nigra* is. In this paper I have kept apart two species which are commonly referred to *Morus alba*. I do not know if they are distinct species, but they are more easily understood if they stand by themselves; and as species at best are only judgments of the particular author who describes them and not entities in nature, I may be allowed the present arrangement.

The later American mulberry culture for fruit, scant as it is, has developed along independent lines. The black mulberry, *Morus nigra*, is the fruit-bearing mulberry of history, and nearly all writers declare that the white mulberry possesses little or no value for fruit. Yet in America the black mulberry is almost unknown, except sparingly in the south and in California, and some of our common varieties are offspring of the white mulberry. And to these must be added varieties which I am satisfied belong to our native red mulberry.

The American mulberries, so far as I know them, may be grouped under the following species, omitting the kinds which were early cultivated for silk and are now practically unknown in the country:

1. The White Mulberry group.—*Morus alba.*
   1. (a). Russian mulberry.—Var. *Tatarica.*
   1. (b). Nervosa mulberry.—Var. *venosa.*
2. The Multicaulis group.—*Morus latifolia.*
3. The Japanese group.—*Morus Japonica.*
4. The Black Mulberry group.—*Morus nigra.*
5. The Red or Native Mulberry group.—*Morus rubra.*
   5. (a). Lampasas mulberry.—Var. *tomentosa.*

1. THE WHITE MULBERRY GROUP.—(*Morus alba*, Linn.) Leaves light green, rather small, smooth or very nearly so above and often shining, the veins prominent beneath and whitish, variously lobed or divided, the basal lobes unequal, the teeth large and for the most part rounded or nearly obtuse, the branches gray or grayish-yellow. The white mulberry is sup-

posed to be a native of China. It has been cultivated from the earliest times, chiefly for feeding the silk worm. It is a frequent tree along roadsides and in the old yards in the eastern states, where the trunk sometimes attains a diameter of two feet. This half-wild form usually has rather small rounded shining leaves with very large rounded teeth, and bears little whitish or violet fruits which are very sweet. Sometimes the fruits are an inch long, but they are oftener only half that length, and I sometimes find trees upon which the fruits are barely a quarter of an inch in length. Now and then a tree bears fruits nearly or quite black. Birds, poultry, and hogs are fond of these mulberries. The trees are usually very thick-topped and bushy growers, but occasionally one is seen which, when young, has branches as straight and trim as a Northern Spy apple. These half-wild trees are seedlings, and this accounts for their variability. If the best ones were selected and grafted onto others, we might find trees worthy of orchard culture. This, evidently, has been done in some cases, for the three following named varieties differ from these half-wild mulberries chiefly in their straighter growth, and larger and blacker fruit.

New American Mulberry.

New American.—This variety was brought to notice by N. H. Lindley, Bridgeport, Conn., about 1854. No one knows its parentage. It is now widely cultivated, and it is the best mulberry yet known for the northern states. It is a strong, hardy tree, very productive, and bears continuously from late June until September. Large trees will produce ten bushels of fruit in a season. The fruit ranges from an inch to over two inches long,

and it is glossy black when ripe. The accompanying picture shows a spray a little over half size. The fruit in this specimen is small. Notice the rounded teeth on the leaves, which are usually characteristic of these forms of *Morus alba*. The Downing has a greater reputation than any other variety, and this New American is often sold for it. In fact, the true Downing is now rare in cultivation. But this point will be discussed under the Downing, further on.

Trowbridge and *Thorburn*.—I do not know the origin of these mulberries. They are very like the New American, with a tendency, perhaps, toward a sharper toothing of the leaves. Some good judges declare that all three are alike, but I think that they are distinct. At least, I believe that the last two are distinct from the New American. And there is some reason for supposing that Trowbridge and Thorburn are distinct. A party of botanists, to whom both varieties were new, were asked to pick and eat fruit from the two kinds last summer. They agreed that Trowbridge is slightly more acid than Thorburn and has more pronounced flavor. But so far as I know, these two varieties possess no merits above the New American and they are little known.

1. (a) The Russian Mulberry Sub-group.—*Morus alba* var. *Tatarica*, Loudon. (*Morus Tatarica* of Linnæus.

This is a hardy type of *Morus alba* which was introduced into our western states during 1875-6-7 by the Russian Mennonites. It scarcely differs from the type of *Morus alba* in botanical characters, and perhaps should not be kept distinct, even as a botanical variety. As commonly seen, it is a low-growing very bushy-topped, small tree with small and much lobed leaves. The fruit is usually very small and insipid, and varies from creamy white to violet, deep red and almost black. The accompanying picture of the Russian Mulberry appeared in the *American Garden* some two years ago. It was made from a specimen taken early in the season from the Cornell garden. The Russian Mulberry is commonly propagated from seeds and it is therefore very variable. A large-fruited or distinct-growing form often appears, and three, at least, of these have been named. They are described below.

Russian Mulberry.

The irritation which the Russian mulberry has produced reminds one of the multicaulis fever of sixty years ago, but it is far less serious and wide spread than that disease. This Russian mulberry has suffered from indiscriminate and exaggerated praise. Save an occasionable sport, it has no merit for fruit, unless it serves to attract birds from cherries and other fruits, but even this is a problematic advantage. In the east, at least, it has no merits for timber, as it is too small and grows too slowly. In the prairie soils of the west it often grows into respectable post timber in a short time. Mr. I. HORNER of Emporia, Kansas, writes as follows, concerning it:

"It has been said that this tree is only a bushy shrub. I here exhibit to you a section of a Russian mulberry tree five years old, and which has been grown in a shelter belt and overshadowed with cottonwood trees. It is five inches in diameter, and, as you see, a nice, straight and smooth trunk eight or nine feet long. Another year's growth would make it suitable for posts. I measured one tree which gave a circumference of 37½ inches at a point two and a half feet above the ground, and which was only eight years old. * * * It is one of the very best trees for shelter belts and fence posts. From a hedge-row 15 rods long, I saw 200 nice fence posts cut. The wood is very durable. * * * It is a tree for fuel, shelter and posts for the western prairies." "There is a vast difference in character of growth and quality of fruit. Most trees sold by nurserymen have been grown from seed gathered from mulberry hedges and trees, with no regard to quality of tree, and which naturally generates a large per cent. of inferior stock. These may be known by a disposition to branch freely close to the ground, and a drooping inclination of their growth. They bear small notched leaves, and very small insipid fruit." "Shelter belts should be constructed in rows 12 to 16 feet apart, and the trees from two to four feet in the row. When three years old, cut all level with the ground. From their roots will spring up a strong and rapid growth of shoots. Remove all but the strongest to each tree. After two years, thin out as may be desired."

The Russian mulberry has been allowed by some land offices as a timber tree under the timber claim law.

But the chief merit of the Russian mulberry appears to be its value as a hedge plant in cold regions. Mr. ROSENBERGER of Nebraska makes the following note of it in a recent issue of *American Gardening*: "The Russian mulberry does not make a serviceable hedge to turn stock, but for an ornamental hedge there is nothing that I know of equal to it, at least for the west and northwest. It endures the extremes of climate better than any other plant or tree suitable for hedge purposes." This note is accompanied by an engraving, which is borrowed for this occasion, of a Russian mulberry hedge in Nebraska. Mr. G. J. CARPENTER, secretary of the Nebraska State Horticultural society and a prominent nurseryman, writes me as follows upon this point: "Russian mulberry hedges are found in nearly every town in Nebraska. It makes one of the finest ornamental hedges. The Mennonites, when they came to this country, planted a great many of them and used them to spread their clothing on to dry, and some of these hedges are 12 and 15 years old and in good condition yet. There are some very fine hedges in the western part of the state, west of the 100

meridian, that have been out for over eight years, and they are as perfect as any hedge can possibly be."

I think that the Russian Mulberry possesses considerable merit as a small ornamental tree and for the purpose of making low screens or shelter belts in the east. It is now largely used as a stock upon which to graft the named varieties of mulberry.

The named varieties or seedlings of the Russian type are three:

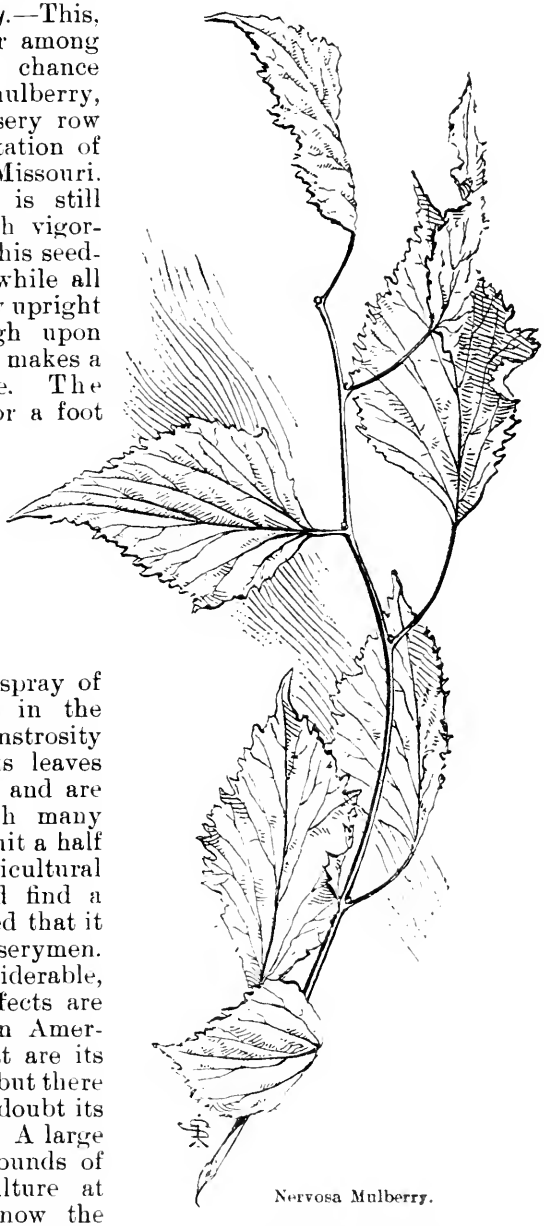
Victoria.—Originated in 1883, from seed of the Russian mulberry, by G. ONDERDONK of southern Texas. It is a tall and upright grower, bearing large sweet black fruit, which is in season for several weeks.

Mr. ONDERDONK writes me as follows concerning it: "I named the Victoria after our county. It is proving itself of excellent quality, and is enormously productive. The more I see of it the more I am convinced that its dissemination is not a mistake. It has become very popular all over Texas, and as the Russian race of mulberries is hardy against every extreme of climate, I can see no reason why it should not spread over every part of the United States where the mulberry can exist. Whatever may be the merits of other varieties in other sections, the Victoria is their superior in this part of southern Texas."

Ramsey's White.—A white fruited mulberry which came in a lot of Russian mulberry stock from Nebraska, purchased by RAMSEY & SON, Mahomet, Texas, some ten years ago. Mr. RAMSEY writes me that he has "concluded that it does not equal Hicks and two other varieties which we have." It is catalogued by Mr. ONDERDONK, who says: "A good white mulberry, bears young; requires some pruning to make a good shaped tree. A desirable new sort."

Teas' Weeping Mulberry.—This, the most pronounced weeper among our ornamental trees, is a chance seedling of the Russian mulberry, having come up in a nursery row nine years ago in the plantation of JOHN C. TEAS, Carthage, Missouri. The original seedling tree is still only three feet high, although vigorous. In the nursery row this seedling trailed on the ground, while all the others made the ordinary upright growth. Grafted head high upon vigorous Russian stocks, it makes a most striking lawn tree. The branches curve outward for a foot or two and then fall straight downward to the ground.

1. (b). THE NERVOSA SUB-GROUP.—*Morus alba* var. *venosa*, Delile. (*M. nervosa* of Bon Jardinier and horticulturists.)



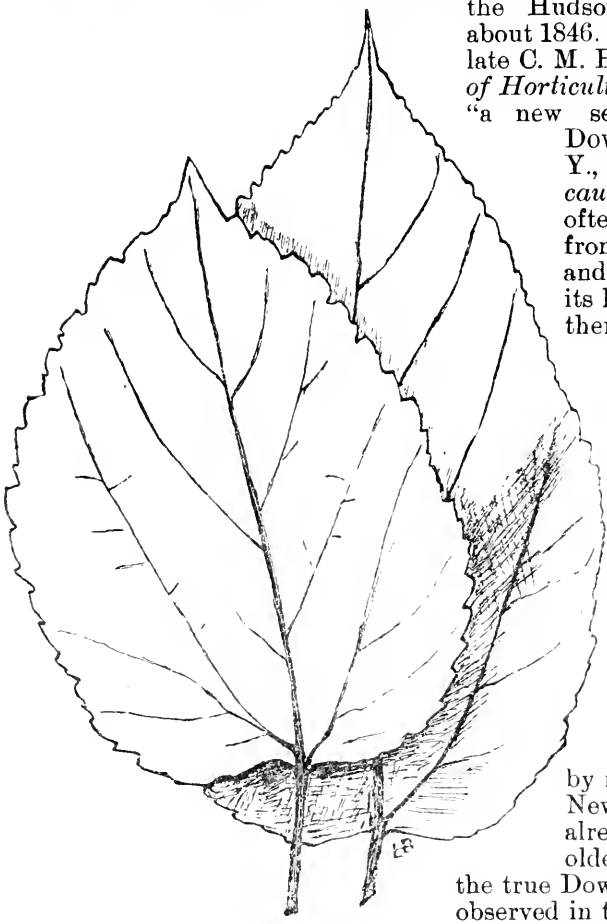
Nervosa Mulberry.

The Nervosa mulberry, a spray of which is shown half size in the engraving, is a strange monstrosity of the white mulberry. Its leaves are contracted and jagged, and are very strongly marked with many white veins. It bears a fruit a half inch long. Among the horticultural curiosities, this tree should find a place, and it is to be regretted that it is not grown by our nurserymen. Its ornamental value is considerable, especially when striking effects are desired. This tree is rare in America, and I do not know what are its adaptations to our climates, but there is apparently no reason to doubt its success if given a fair trial. A large specimen stands in the grounds of the department of agriculture at Washington. I do not know the history of the Nervosa mulberry, nor is it important for our present purpose. DELILE describes it in a French periodical so long ago as 1826.

2. THE MULTICAULIS GROUP.—*Morus latifolia*, Poiret. (*M. multicaulis* of Perrottet. *M. alba* var. *multicaulis* of Loudon.)

A strong-growing small tree or giant shrub, with dull, roughish and very large long-pointed leaves which are seldom or never prominently lobed, and which are often convex above, bearing black sweet fruit. I have already given a sketch of *Morus multicaulis* in America. Its most prominent offspring is the

Downing (*Downing's Everbearing*).—This originated at Newburgh, on the Hudson, from seeds sown about 1846. It was noticed by the late C. M. HOVEY in his *Magazine of Horticulture* in March, 1858, as "a new seedling raised by C. DOWNING of Newburgh, N. Y., from the *Morus multicaulis*." The Downing often looks very different from the old multicaulis, and I sometimes doubt if its history is correct; but there is probably no doubt as to its origin. For many years the Downing was the leading fruit-bearing mulberry, but it proved to be short-lived and was often injured by the winters in the northern states; and even so far south as Texas it frequently suffers from the cold. In Florida it is said to be still popular. The Downing now sold by most nurserymen is the New American, as I have already said. Only the older nurseries still grow the true Downing, so far as I have observed in the eastern states. Most planters and perhaps some nurserymen are not aware of this substitution. Some nurserymen habitually substitute the New American for the Downing, using the latter name, say-



New American and Downing Leaves.

ing that they are disseminating a better variety. It is true that the New American is the better of the two, at least for the north, but it is unfortunate that this substitution should have occurred. Many nurserymen suppose that the two varieties are the same, but they not only differ in hardiness but also in foliage and fruit. The accompanying outlines show some of the difference in foliage. The top leaf is the New American and the under one Downing. The Downing leaf is much the larger and longer, longer-pointed, with smaller teeth. It is usually proportionally larger than shown in the engraving. It is also a duller and usually a thinner leaf than that of the New American. By referring to the first illustration in this paper, it will be seen that the fruit of the New American is made up of closely compacted parts or drupelets, while in the Downing, as seen in the cut in the margin, the drupelets are more or less detached. This picture of the Downing fruit shows a small specimen. The fruit is black, of excellent quality, possessing a slight acidity which is apt to be lacking in the varieties of *Morus alba*. The fruit ripens from June until September.

Downing.

Spalding.—I am indebted to T. V. MUNSON of Denison, Texas, for a knowledge of this variety. It is said to be a seedling of the Downing, and the leaves and habit confirm this origin. Mr. MUNSON says that it is as tender as the Downing. It originated with the late E. H. SPALDING, who thought it the finest variety in cultivation. I do not know its fruit.

Rives.—This mulberry, which is sent me by G. ONDERDONK of Nursery, Texas, was found upon the premises of James Rives of Mission Valley, Victoria county, Texas. Its origin is unknown. Mr. ONDERDONK thinks it is a form of *Morus Japonica*, but it seems to me to belong to the multicaulis group, although it may be the native *Morus rubra*. I have not had an opportunity to study it thoroughly. "The fruit, while being good, has not special merit," Mr. ONDERDONK says. It is recommended chiefly for shade, the growth being very rapid and the leaves large. It is also said to be valuable for silk. In Texas it blooms so early that the fruit is often lost.

Two mulberries have recently been sent me from the University of California under the name of Lhoo—originally spelled Lhou—and Nagasaki. These, I think, belong with the multicaulis group, although they suggest *Morus Japonica*. Bureau refers some of the Chinese Lhou mulberry to *Morus alba* var. *macrophylla* (*Morus Moretti*), and some of it to this multicaulis group. At the university of California the climate is said to be too cold to allow these mulberries to fruit. These oriental varieties are grown chiefly for feeding silk worms.

3. The Japanese Group.—*Morus Japonica*, Audibert.—(*M. alba* var. *stylosa* of Bureau.)

Leaves usually large, dull, rather thin, long-pointed, the rounded teeth very large and deep, or the margin even almost jagged, the leaves upon the young growth usually deeply lobed. This species has been introduced very lately and it has not yet fruited in this country, so far as I know. It is tender in the north when young. The fruit is described as short-oblong and red.

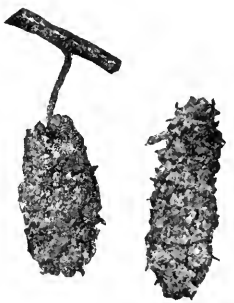
4. The Black Mulberry Group.—*Morus nigra*, Linn.

Leaves dark dull green, rather large, tapering into a prominent point, commonly very rough above, usually not lobed, the base equal or very nearly so upon both sides, the teeth rather small and close, the branches brown. The black mulberry is a native of Asia, probably of Persia and adjacent regions. It is the species which is cultivated in the Old World for its fruit. In America it is very little grown. It is not hardy, except in protected places, in New England and New York. The Black Persian mulberry of the south and of California is undoubtedly this species. This variety, with others, was inserted in the Fruit Catalogue of the American Pomological society for 1875. It was dropped from the Catalogue in 1883; and has not been inserted since. It is named in Wickson's "California Fruits," 1889, without particular comment. The same volume also mentions the Black mulberry of Spain, as having been fruited by Felix Gillet, of Nevada City, California. This I take to be *Morus nigra*. There must be large regions in this country which are congenial to the true black mulberry, and it is strange that it is so little known. The fruit of this species is much larger than that of any other, and it possesses an agreeable sub-acid flavor. The fruits of *Morus alba*, however, are often too sweet for most tastes when fully ripe, and in such case they should be picked before they have fully matured.

Wild Red Mulberry—*Morus rubra*. Half size.

5. The Red or Native Mulberry Group.—*Morus rubra.* Linn.

Leaves usually large, very various, those on the young shoots deeply lobed with very oblique and rounded sinuses in the base of which there are no teeth, the upper surface rough and the lower one soft or variously pubescent, the teeth medium or comparatively small and either rounded or bluntish. The native mulberry is generally distributed from western New England to Nebraska and southward to the gulf, being much more abundant and attaining a larger size in the south. The fruit is deep red, or when fully ripe, almost black, variable in size, often very good, nearly always having an agreeable slight acidity. This native mulberry has been tried for the feeding of silk worms, but with indifferent success. I am satisfied that at least three of the named fruit-bearing mulberries belong to it, and a yellow-leaved mulberry, which is somewhat grown for ornament, also appears to be of this species. The curious lobing of the leaves on the young growth is shown in the middle spray in the accompanying engraving. This lobing is distinct from that in any other mulberry which I have seen and it has been one of the chief characters in influencing me to refer the Hicks and Stubbs mulberries to *Morus rubra.* The nearest approach to this lobing which I have seen in any other mulberry is in the Japanese (*Morus japonica*) and this affords another of those interesting parallelisms which exist between the Japanese and Eastern American floras. The red mulberry is the largest tree of the genus. It often attains a height of 70 feet in the south. The timber is much used for posts, fencing, and light wood work. The two accompanying pictures are made from wild specimens collected in Michigan.



Wild red mulberry.
Full size.

Johnson.—I have already said that this appears to have been the first named variety of Mulberry, of any species, originating upon American soil. The first record of it, so far as I know, is in the first edition of A. J. Downing's "Fruits and Fruit Trees," 1845, in which it is said that the variety has been "lately received from Professor Kirtland of Cleveland, one of the most intelligent horticulturists in the country;" and it is distinctly stated that it is a form of our native species. Charles Downing reaffirms this latter statement in Purdy's *Fruit Recorder*, in 1872, and in comparing the fruit with that of the wild *Morus rubra* says that it is "of about the same quality, but of larger size." In the second edition of "Fruits and Fruit Trees," 1872, by Charles Downing, it is described as follows: "A seedling from Ohio. Fruit very large, oblong cylindric; blackish color, sub-acid and of mild agreeable flavor. Growth of the wood strong and irregular. Leaves uncommonly large." The Johnson is very little known at the present time and will probably soon pass from sight. Mr. Berckmans of Georgia, writes that the "fruit is large, very good, but too little of it," and that he has "long since discovered it." "The fruit is fully two inches long by three fourths inch in diameter, very black and of a rich vinous flavor."

Hicks (*Hicks' Everbearing*). This is a Georgian variety, as near as I can learn, although Downing, in 1872, credits it to Kentucky. It was brought to notice about 1850, or before, by Simri Rose of Macon, Georgia,

who is said to have obtained it from THOMAS ELKINS of Effingham county, Georgia. Mr. ELKINS "planted it in avenues, on his lanes, in his fence corners, and many other favorite places on his plantation, for his hogs, and it is said that he always had pork or bacon to sell." At the present time it is much used in parts of the south as a food for swine. Mr. BERCKMANS says that "the value of mulberries as an economic food for hogs is beginning to be appreciated by many farmers, who have planted large orchards of the Hicks for that purpose." It is also one of the very pest varieties for poultry. It is a most profuse bearer, producing a continuous and bountiful crop for three and four months. The fruit is medium to large, very sweet and rather insipid.

Stubbs.—The original Stubbs mulberry tree was found growing in a wood near Dublin, Laurens county, Georgia. Col. JOHN M. STUBBS of that place gave scions to Mr. BERCKMANS some 15 years ago, and Mr. BERCKMANS introduced it to the public. It is probably the most productive of all mulberries, even exceeding the wonderful prolificacy of the Hicks. The fruit is deep black, with a very rich sub-acid vinous flavor. It is fully two inches long and over a quarter as thick in well developed specimens.

5. (a) THE LAMPASAS SUB-GROUP.—*Morus rubra* var. *tomentosa* Bureau. (*M. tomentosa* of Rafinesque.)

Leaves very soft-pubescent and whitish beneath, often glossy but rough above.

Lampasas.—This variety was found in the woods in Lampasas county, Texas, by F. M. RAMSEY, and was introduced in 1889 by T. V. MUNSON of Denison, Texas. It has a somewhat spreading and shrub-like habit. Mr. MUNSON writes as follows concerning it: "The Lampasas mulberry, although a native of the region only 200 miles southwest of here, is so tender here as to winter kill. I have ceased to propagate it on that account. I have never been able to fruit it."

There are three varieties of fruit-bearing mulberries which I have not seen, and I do not know to what species they should be referred. One is *Bigert* (*Bigert's Everbearing*), which I know only from the following note in the first volume of *Gardener's Monthly*, 1859: "A friend sends us some specimens under the above name, which he says continues in bearing from June till frost. It is very much in size and appearance like Downing's Everbearing, but the leaves are very different."

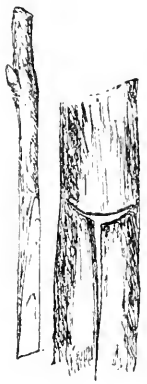
Another variety is the Paine, which, I think, has not been mentioned in print. All I know about it is the following description sent me by the venerable ISAAC HICKS of Westbury, Long Island: "Fruit about the size of Downing, not so large as New American. A very excellent variety, bearing a long time. Found on the lot where THOMAS PAINE, the religious reformer, was buried. Two very fine trees, which are great bearers, are on the place of the late WM. S. CARPENTER at Marmaroneck, Westchester county, N Y."

The third variety is the Black American, which I know only from the following entry in the catalogue of the Bloomington (Illinois) nursery: "Native, hardy, productive, valuable."

The cultivation of the mulberry is very simple. It thrives upon any ordinary well-drained soil. At full maturity, the trees are as large as an apple tree. The fruit falls as soon as it is ripe, and it is readily shaken off

before it reaches its full maturity. If a soft sod is allowed under the tree, the fruit can be shaken off and picked from the ground. This is the best way of harvesting the mulberry. In Europe, cress is sometimes sown under the trees in late spring to afford a temporary carpet to catch the fruit.

The mulberries can be propagated by cuttings of the ripe wood or of roots. Cuttings start best under glass. Some nurserymen propagate by short cuttings indoors, starting them in February or March. The cheap Russian mulberry stocks, from the west, have supplanted cutting-propagation very largely. The named sorts are grafted upon these Russian roots in winter, with fair success, in the same manner in which apple trees are root-grafted, or they are sometimes crown-grafted, the stocks for this purpose being grown in pots or boxes. Ordinary fall budding in the field is not successful with mulberries, but spring budding gives good results. Spring budding has been employed and recommended certainly for thirty years, but it does not yet appear to be a common practice. S. D. WILLARD, Geneva, N. Y., who grows quantities of mulberries, has several times shown me his stock, which is propagated by spring scion-budding. This is performed just before the foliage is out, or as soon as the bark slips freely. The illustration in the margin explains the operation. The incision in the stock is the same as for the ordinary fall budding. The scion carries one or two buds, and is cut upon one side only. Thi sprepared side is inserted next the wood in the stock, and is held in place by string, as for fall budding.



Scion-budding for the mulberry.

REVIEW.

1. The mulberry is grown for fruit, ornament, hedges, and small timber, as well as for silk. It merits more general attention, especially as a fruit-bearing tree.

2. The fruit of some varieties is excellent for dessert, and it may be used for making jellies and preserves. It is also good food for poultry and for swine.

3. Sixteen varieties are mentioned in this paper as fruit-bearing kinds: New American, Trowbridge, Thorburn, Victoria, Ramsey's White, Downing, Spalding, Black Persian, Black Spanish, Johnson, Hicks, Stubbs, Lampasas, Bigert, Paine, and Black American. Of these, the most prominent are New American, Downing, Black Persian, Hicks, Stubbs.

4. The New American is recommended for the northern states. Downing is almost out of cultivation in the north, but the New American commonly passes under this name. Black Persian is occasionally grown in the south and on the Pacific coast, but it seems to be ill-adapted to our conditions. Hicks is a heavy bearer, of indifferent quality, but valuable for poultry and for swine, especially in the south where it has been most thoroughly tested. Stubbs is perhaps the most profuse bearer of all, and the fruit is large and excellent in quality.

5. The other varieties and types are grown for shade, ornament, and timber. The most unique of these varieties are the Nervosa and Teas' Weeping. The Russian type is valuable for ornamental hedges, especially in

the prairie states, for planting sparingly as single specimens or in groups as ornamental trees, and for small timber on the prairies. The fruit is usually worthless. This type has already given three named varieties of more or less merit: Victoria, Ramsey's White, and Teas' Weeping.

6. The mulberries here enumerated belong to five more or less distinct general types or species,—*Morus alba*, *M. latifolia*, *M. Japonica*, *M. nigra*, and *M. rubra*. The first and the last are the most important in this country for the purposes here discussed.

7. American varieties of fruit-bearing mulberries have developed along independent lines, having come chiefly from *Morus alba* and *M. rubra*, while the fruit mulberry of history is *M. nigra*.

8. The native mulberry, *Morus rubra*, has given us some of the most important varieties, and as it is naturally variable and adapted to our various climates, it is the probable progenitor of the American mulberries of the future.

9. The mulberry is easily grown upon ordinary soils. It is often tender in the north during the first two or three years.

10. The mulberry is propagated by cuttings of the mature wood or the roots, by root and crown-grafting, and by budding with dormant buds in the spring.

L. H. BAILEY.

SPRAYING APPLE ORCHARDS IN A WET SEASON.

Experiments in spraying for apple-scab and apple-worm were made this year in the orchard of JOHN MCGOWAN, a fruitgrower living near the university farm. The orchard consists principally of King and Baldwin apples. Several other varieties are grown, and other experiments than those here recorded were made, but owing to the limited number of trees and the lightness of the crop the results obtained from these were unsatisfactory. But definite results were obtained from the Kings and Baldwins. All notes were taken with the assistance of L. C. CORBETT, assistant in the experiment station, in order that any personal bias of the writer might be corrected.

The summer's work is particularly interesting from the fact that the season was very wet, the rainfall from June 1 to July 1 being as follows:

June.	1	2	3	4	5	9	10	16	17	18	19	22	24	27	30	
Rainfall in inches	0.8	1.11	.76	.32	.08	1.16	.02	.07	.16	.02	.23	.25	.01	.64	.29	Total 5.20

The total rainfall is 1.31 inches above the average for the month. Most of the days during which no rain fell were cloudy and warm, and the atmosphere was moist. The first week in July was also rather wet, but later the rainfall was considerably less. Such conditions are generally supposed to favor the development of the apple-scab (*Fusicladium dendriticum*) and perhaps also other fungi which work upon the trees. The

rains also wash off the materials which are applied to the trees. Professor ATKINSON has examined diseased fruit taken from the orchard in which the experiments were made and has found that a large part, if not all, of the injury done to the apples by fungi was primarily caused by the apple-scab fungus. The leaves were also more or less injured but this was due partly to the action of other fungi as well as the fusicladium. However, the latter may be considered as the worst pest and any treatment which will effectually check it will undoubtedly render the others harmless also.

The life history of the fungus has not been well determined. Mr. FAIRCHILD, of the division of pathology at Washington, writes me that the infections take place earlier in the season than was supposed; in fact that it is probable that the disease often obtains a foothold even before the petals fall from the trees. The experiments made here the past season tend to confirm the statement. The application of some fungicide before the buds of the apple open will probably be as valuable as any later treatments which may be given. When the fungus has once penetrated the plant tissues, there can be no efficient remedies for it. The fungicide should be upon the tree before the spores of the fungus germinate; and those of the apple-scab occasionally seem to be growing even before the opening of the first leaf buds. The apple-scab first appears upon the fruit in the form of grayish, slightly sunken spots. These generally are circular at first but when several grow together their outline is irregular. As the spot enlarges the center becomes quite dark, even black. At the edges may be seen the epidermis or skin of the apple; it is loosened by the disease, and forms a light colored line which plainly divides the diseased from the healthy tissues.

The codlin-moth lays its eggs early in the spring in the blossom end of the apple, before the fruit has turned down. The larvæ, or worms, which develop from these eggs, make the apples wormy. The time for fighting this pest is fortunately the same as that for the apple-scab, and in this fact lies the value of a combination of insecticides and fungicides. As soon as the apples hang down, the arsenite may be omitted, but the use of the fungicide may still be advisable.

The pruning and the spraying of fruit trees are two subjects which are closely related. This is especially true in the case of the apple. Moisture is favorable to the development of the apple-scab fungus. When the tops of the trees consist of a tangled mass of large and small branches, they are much longer in drying out than when they are open. Not only is a shelter given to fungi, but their growth is encouraged, and each tree becomes the distributing center of some disease. The mischief is also aggravated by the fact that it is as difficult for any remedies to gain an entrance as it is for the light and air. It is impossible to spray such trees to advantage, even granting that the fruit borne by them would warrant the expense. The head of the tree should be open so that all parts may be reached easily with the spray.

The actual expense of spraying is also largely increased when the tops of the trees are not well pruned. A well-sprayed apple tree has its leaves and fruit covered with a thin layer of the material applied, so that the poison will be present wherever a spore may fall or an insect feed. If the work is not done in this manner, the tree remains more or less unprotected. It naturally follows that a tree bearing many unnecessary branches will require more material to protect it. But much material is also wasted in

trying to spray through these branches, or past them, in order to reach more important parts of the tree. Again, this extra work requires time. During the spring of the year there is generally plenty of work to be done, and extra help is expensive. It is no small task to spray an orchard, as those who have tried it well know, and everything that will make the work easier is worthy of attention.

PART I.—EXPERIMENTS OF THE SEASON.

Until recently, insecticides and fungicides have been applied separately. The following experiments were made to determine the value and practicability of spraying apple orchards with a combination of insecticides and fungicides. From the good results which have commonly followed the use of Paris green, it was thought possible that it may have some value as a fungicide when used alone. Applications were made to test this point.

The combinations applied were Paris green and the Bordeaux mixture, and London purple and the Bordeaux mixture. Paris green was also used alone. The arsenites were used at the rate of two and one half ounces to 40 gallons of liquid, which is the equivalent of one pound to about 250 gallons. The Bordeaux mixture was made according to the formula:

Sulphate of copper (crystals)	6 pounds.
Lime (unslaked)	4 pounds.
Water	40 gallons.

The sulphate of copper dissolves very slowly in cold water. It is better to buy it in the form of a powder, or to use boiling water, which dissolves it more quickly. Four or five gallons of hot water should readily dissolve enough of the copper sulphate to make 40 gallons of the mixture. It is better to use quick lime, but that which has been air-slaked will also answer the purpose if about one fourth more is used. (See part II.)

The arsenites were added to the mixture just before the applications were made to the trees. The mixtures were carried in the orchard in a barrel holding 40 gallons, and lying horizontally upon a wagon. The pump used was No. 549 of the Deming company, Salem, Ohio. It was secured to the top of the barrel as shown in the cover illustration. A hose, which discharges into the barrel for the purpose of keeping the mixture stirred, may be attached to the pump, but this was not used. The liquids were stirred by means of a stick which was inserted into the barrel through the hole used in filling. A thorough stirring was given before spraying each tree. It was found that two persons working together could do the work most satisfactorily; one drove and directed the spray while the other pumped. The nozzle used was one invented by the owner of the orchard. It throws a fine spray with much force, which makes it well adapted for orchard work.

The amount of liquid applied to each tree averaged about four and one-half gallons per application. The trees are about twenty years old. They are thrifty and in excellent condition. The retail price of the sulphate of copper is about 8 cents per pound, and Paris green is sold for about 35 cents. Adding the cost of the lime at 30 cents per bushel, this makes the actual outlay per tree for material about 5 cents for each application of the combination of Bordeaux mixture and Paris green. If London purple were used it would reduce the cost a little, for this poison should sell for about 20 cents per pound retail. If Paris green is used alone the cost of

each application is less than one cent per tree. Two men should spray from 100 to 125 trees per day and do the work well. Counting the cost of applying at 2 cents per tree, this makes the total cost of each application of the combined insecticides and fungicides 7 cents per tree, or about 25 cents for four applications, this number being perhaps sufficient in even very wet seasons.

Most of the petals fell from the trees June 6 and 7. The first application was made June 13, the weather in the meantime being warm and damp. This application was without doubt delayed too long, for at the time of the second application, June 22, diseased spots could be found both upon the young fruits and upon the leaves in some of the places which were thickly covered with the Bordeaux mixture, thus showing that the work of the fungus began very early in the season. The first application should be made, at the latest, immediately after the blossoms fall, and it is probable that good results will follow one made earlier.

The orchard was sprayed a third time July 1, and again July 22. the mixture in each case being prepared as for the first application.

The apples were harvested early in October and at that time they were carefully examined with regard to the amount of scab and number of worms present. The yield from two to four trees of each lot sprayed was counted and graded. In most cases all the apples borne by the tree were examined, but occasionally only a portion sufficiently large to give a fair estimate of the character of the yield. The apples were divided into four grades as follows: 1st, those entirely free from scab; 2d, ranking as first-class, or those whose market value has not been affected by insects or fungi, although attacked; 3d, ranking as second-class, or evaporating apples, those whose market value had been more or less reduced by insect or fungous injuries, the apples as a rule being smaller than the above, but not seriously misshapen; 4th, cider apples, or all those remaining after the preceding grades had been removed. The apples of each grade were counted, as was also the number of wormy ones borne by each tree. The following table shows the result. The numbers represent the average of the results obtained from the different trees:

Variety.	Treatment.	Average per cent 3d and cider apples.	Average per cent gain as compared with check.	Average per cent wormy.	Average per cent gain.
King	Check	89.7		25	
"	Bordeaux and Paris green	55	34.7	1	24
"	Bordeaux and London purple	59	30.7	3	22
"	Paris green	72	17.7	2	23
Baldwin	Check	74		38	
"	Bordeaux and Paris green	52	22	9	27
"	Bordeaux and London purple	67	7	15	23
"	Paris green	58	16	4	34

It will readily be seen from the large proportion of poor fruit shown by the table that the season was one which would put to a severe test any application that might be made. Nearly nine tenths of the King and three fourths of the Baldwin apples on the unsprayed trees had but little market value, and from twenty-five to thirty-eight per cent. of them were wormy. Figure 2 is a photograph of an average lot of untreated King apples. These untreated apples are smaller than the treated ones,

although this fact may not be noticed at first glance in the much reduced illustrations. But the gain in size and uniformity in Figs. 3 and 4 is considerable.

The combination of Bordeaux mixture and Paris green reduced the per cent. of scab in both Kings and Baldwins to a trifle more than 50 per cent.

The combination containing the London purple was not so effective, for 59 per cent. of the Kings and 67 per cent. of the Baldwins were badly injured. Fig. 3 is a fair representation of apples treated with this combination.

The action of the Paris green is particularly interesting. When used alone it reduce the injury from scab upon the King apples 17.7 per cent., upon the Baldwins 7 per cent. This unequal gain may probably be explained to a certain extent by the fact that the Baldwins were not so severely attacked. When used with the Bordeaux mixture upon the Kings a gain of 4 per cent. stands in favor of the Paris green when compared with the London purple, while in the case of the Baldwins the gain is 15 per cent. This would go to show that Paris green possesses marked fungicidal properties, but it is not so valuable in this respect as the Bordeaux mixture (Fig. 4).

By comparing Figs. 2, 3, and 4, it will be seen that the sprayed apples are decidedly larger than those not treated. This may possibly be but the natural variation in the size of the fruit borne by different trees, but since the unsprayed trees bear uniformly smaller fruit it is scarcely probable that the applications were not in some way connected with the increase in size. And this agrees with results obtained in Ohio during 1891 by W. J. GREEN. He found that "Aside from the inferior appearance of scabby fruit, the effect of the scab is to retard the growth of both foliage and fruit; hence, scabby apples are smaller than those free from scab. The difference in size between apples that are affected with scab, and those that are free from it is not the same with all varieties, nor with any given variety in different localities. That the difference may often be considerable is shown by some comparisons between scabby Newtown Pippins and those that were free from the disease. One bushel of that variety that was free from scab was found to contain 202 apples, while the same quantity of scabby apples contained 317 apples. The average weight per apple was 4 and $2\frac{1}{2}$ ounces respectively. This comparison was between extremes, but those of the second class were, in size, far below those that were free from scab. It is no doubt true that scab may cause a diminution in size of fifty per cent., but in most cases the loss is below that figure. In all cases scab hinders development, but not always in proportion to the amount found upon the fruit. Wherever scab is present at all, either upon fruit or leaves, the effect must be considerable in arresting the development of the fruit."

The effect of the applications upon the larvæ of the codlin-moth was very marked. When the Paris green was applied alone it reduced the injury from 25 per cent. to 2 per cent. in the case of the King apples. The Baldwins show a marked difference also, the reduction being from 38 per cent. of wormy apples to only 4 per cent. When applied with the Bordeaux mixture upon the King apples, the per cent. of wormy fruit was even less than when the Paris green was applied alone; but the reverse is true in the Baldwins. The experiment indicates that the beneficial action of

Paris green as an insecticide is not materially affected by the Bordeaux mixture when the two are applied together.

The results obtained when London purple or Paris green was added to the Bordeaux mixture indicate the comparative value of such combinations. In the King the number of wormy apples was reduced to 1 per cent. by the Paris green and 3 per cent. by the London purple. The Baldwins show a reduction to 9 per cent. by the Paris green and to only 15 per cent. by the London purple. In each case the result is in favor of Paris green.

The foliage of the trees was uninjured, except in the case of the Paris green applied alone. Some trees, and parts of trees, to which this had been applied, looked thinner than the rest of the orchard during the latter part of the season. The leaves were undoubtedly somewhat injured by the Paris green but not sufficiently to weaken the trees to any extent. The cause of the injury is undoubtedly due to the amount of arsenic which entered into solution. This was found by analysis to be about one half of one per cent. (.63) of the total amount. The addition of a little lime would have destroyed all caustic action, for no injury could be seen where the Bordeaux combinations were used. A sample of London purple has been analyzed by the station chemist. It was found that about 50 per cent. of the arsenic was soluble and it is this dissolved arsenic which injures foliage. On account of its caustic properties the London purple was used only in connection with the Bordeaux mixture.

PART II. THE PREVALENCE OF APPLE SCAB.

Early in October a circular was sent from this station asking for information regarding the degree in which the varieties of apple were attacked by the scab fungus. The varieties were to be divided into three classes: first, those whose market value is practically ruined every year, as the Fameuse, or Snow apples; second, those whose market value is not seriously affected, as the Baldwins; and third, those which are entirely free from scab. The division was to be based upon the amount of scab found upon the fruit. Many growers responded. Although the data are not so complete as might be desired, still the resistant powers of many varieties are shown in the tables given below. The matter is a difficult one to study and it is hoped that apple-growers, in whose interest this work is being done, will watch the disease next summer and report any results that may be of interest in time for publication in a succeeding bulletin. The newer varieties should receive particular attention, for among them there are undoubtedly some that withstand the attacks of the scab much more than others; it will be interesting to know whether they will remain so. Some parts of the trees also appear to be more injured than others; in some varieties the fruit suffers more than the leaves, and in others the reverse is true. Location also influences the amount of scab present in an orchard. It is the common opinion that the disease is worse in low, wet places; but all growers do not agree with this statement. The character of the soil is another important factor to be considered. Is the disease as serious upon well drained land as upon that which is not drained? Are there any neglected trees or orchards in the neighborhood which might explain the presence of the scab fungus in an orchard or certain parts of an orchard? To what extent do the amount and the time of rainfall

affect the prevalence of the disease? These and many similar questions still demand the attention of apple-growers, and any notes that may throw light upon this subject will receive attention if reported to this station.

[The tables referred to are so long and at the same time so inconclusive that it is not deemed worth while to reproduce them.—*Secretary.*

It is difficult to draw conclusions from the above table. Many of the varieties are mentioned only once and this is not sufficient evidence to show their power of resisting the attacts of fungi. The system of tabulation does not show accurately the comparative value of the different varieties, even those which have been reported by several growers. Taken as a whole, however, the table shows a gradually increasing susceptibility to injury as the list is followed from the first to the last.

Twenty-one varieties have been reported in the "Free" columns only; but of these not one was reported more than once, so it is obviously unfair to say that there are varieties which are not subject to the attacks of fungi. In going down the list it is seen that as soon as more than one observer mentions a variety it also falls into another column, showing that one observation is insufficient. Many varieties are found in the three columns, but here fairly accurate conclusions may be drawn by a comparison of the figures. It may be assumed that the Baldwin, Seek-no-Further, Astrachan, and some others are comparatively free from scab, while the Wine Sap, Early Harvest, Red June and others are much injured. Many varieties are placed high on the list because some observer reported them free in a certain locality, and still the large majority of reports place them in one of the two remaining columns.

Following the above is a long list of varieties which were mentioned only in the column marked "Not seriously affected." No conclusion can be drawn from this list. Where more observations have been made the following varieties may be said to be fairly free: Lucy Pew, Roman Stem, Rhode Island Greening, and Rawle Janet, although the last two are also reported in the first column, those "Habitually badly affected." Likewise Belmont, Huntsman, and Fameuse may be said to be considerably injured. The next varieties which may be mentioned are Wine, Carolina June, Ortley, and White Winter Pearmain, these being the last four on the list. Although they stand so low, it may be doubted if they are really more susceptible than the Fameuse, for instance, although the latter is much higher in the scale.

"From a number of the experiments in the preparation of fungicides, the following conclusions may be drawn:

"1. In the Bordeaux mixture prepared with quick lime a small quantity of copper always remains in solution. This amount often escapes notice, but it may be determined with the aid of electricity. The quantity of lime used affects the amount of copper in solution and when an excess of lime is used only small traces of copper can be recovered.

"2. The quantity of copper which can remain in solution is considerably larger when slaked, or somewhat carbonated, lime is used, and when it is added directly into the solution of the sulphate of copper. When insufficiently slaked lime is used the amount of copper which can remain in solution is sometimes considerable, although the liquid is decidedly alkaline.

"3. The copper is precipitated in the Bordeaux mixture in the form of the hydrate, basic sulphate, and the double basic sulphate of copper and

calcium. It seems that a small amount of copper is held in solution in this last form, one rich in the sulphate of copper.

"A number of experiments have also been made to determine which of the copper salts found in the Bordeaux mixture can be dissolved by atmospheric agents.

"The hydrate of copper was separated as already described, and thoroughly washed. It was then put into a small amount of distilled water. Through this mixture a stream of dried carbonic acid gas was passed for a few minutes and the liquid was again filtered. The filtrate, when tested for copper, revealed considerable quantities of the metal. After a short time the solution became turbid and soon deposited almost all the dissolved copper, undoubtedly because of the rapid decomposition of the bicarbonate which had formed at first.

"Similar experiments were made with the basic sulphate, after it had been entirely freed from the sulphate of calcium and thoroughly washed. It was then treated with a solution of the hydrate of potash. Carbonic acid gas was again applied, and in this case it caused the solution of much greater amounts of the copper. The filtrate in addition showed also a remarkable quantity of sulphuric acid. The liquid again became turbid, but much larger quantities of copper remained in solution. It seems to me that this circumstance can be explained by admitting that the carbonic acid gas acted upon the basic sulphate causing the formation of the carbonate of copper, which in part remained insoluble, and in part passed into solution on account of the presence of the gas, and the sulphate of copper.

"Copper in the form of the sulphate should be more efficacious than when it is precipitated as a hydrate, but the conditions which would cause a larger amount of it to be formed must still receive careful study."

SUMMARY.

1. The apple-scab fungus, *Fusicladium dendriticum*, attacks apple trees very early in the season, even before the petals fall to the ground.
2. The first application of a fungicide should be made early, no later than immediately after the petals fall; an application made just before the buds open would probably be of value.
3. The time for combating the apple-worm is immediately after the petals fall, and the treatment should be repeated once or twice until the apples begin to hang down.
4. Apple trees should be pruned so that all parts may easily be reached by a spray; well pruned trees allow free access of light and air among their branches, which prevents fungi from obtaining so strong a foot-hold.
5. The injury done by the apple-scab fungus was decidedly reduced where the Bordeaux mixture was used.
6. When Paris green was added to the Bordeaux mixture the fungicidal action of the combination was more marked than when London purple was used in place of Paris green.
7. Paris green has a certain fungicidal value, but in this respect it does not nearly equal the Bordeaux mixture.
8. The value of Paris green as an insecticide does not appear to be materially affected, whether it is applied alone or in combination with the Bordeaux mixture.

9. The insecticidal value of Paris green when used with the Bordeaux mixture was greater than that of London purple when similarly applied.

10. More applications are required during a wet season than during a dry one; during wet weather they should be repeated every seven to ten days.

11. The results obtained this season from the application of a combination of the Bordeaux mixture and Paris green or London purple show that the use of such a combination is valuable and practicable for the treatment of the apple-scab fungus and the apple-worm, even in a wet season.

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12. The apple-scab is found in all regions in the United States from which reports have been obtained.

13. It is probable that none of our commonly cultivated apples are in all seasons free from scab.

14. Some varieties are much more subject to the disease than others.

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15. In the preparation of the Bordeaux mixture, 13.21 parts of slaked lime are equivalent to 10 parts of quick lime.

16. More copper appears to remain in solution when slaked lime is used than when the lime is fresh.

17. The quantity of copper remaining in solution diminishes rapidly as the liquid is allowed to stand.

18. The action of heat is favorable to the decomposition of copper compounds remaining in solution in the Bordeaux mixture.

19. The copper is precipitated in the Bordeaux mixture in the form of hydrate, basic sulphate, and the double basic sulphate of copper and calcium.

20. It is probable that the precipitated copper compounds are affected by the carbonic acid gas of the atmosphere. The solvent action is particularly strong when the copper is in the form of the basic sulphate.

E. G. LODEMAN,
Assistant in Horticulture.

SUNDRY INVESTIGATIONS OF THE YEAR.

THE DETERMINATION OF SUGAR IN THE TOMATO.

This determination requires some special precautions; the possible action of the organic acids present, on polarized light, precludes the use of the polariscope, and the possible action of other reducing substances than sugar on the Fehling solution is likely to render the results by this method too high.

These possibilities may perhaps account for the different results obtained by different analyses of the sugar in this fruit, although it is true that there may be wide variations in the actual proportion of sugar in different varieties.

In the report of the Maryland experiment station for 1889, p. 67, are the results of the determinations of sugar in 65 varieties, the percentage ranging from 1.76 to 3.52; one variety gave 7.00 per cent. The determinations were made in the aqueous extract directly, with Fehling's solution used acording to the volumetric method. In the report of this station for 1891, from 3.89 to 5.12 per cent. of sugar is reported, as obtained by H. Snyder on eight samples; in these determinations the extract was examined by the polariscope. Two analyses by Italian chemists gave respectively, 1.74 and 3.7 per cent.

In the case of nearly half of the analyses made at the Maryland experiment station the sum of the percentages of ash, sugar and malic acid exceeds the total per cent. of dry substance; it is thus indicated that some of these determinations of the constituents of the dry substance are too high; and as other substances besides these three are in all probability present in this dry substance, the error is even greater than thus indicated.

Some study has been devoted to the method of determining sugar in this fruit, and the matter is still under investigation. The following is given as a preliminary report only.

It was hoped that the fermentation method could be applied; but as results even on samples of pure glucose were unsatisfactory, its use was given up. For all the determinations reported below, the fruit was dried at 100°, the dry residue was powdered, and then extracted for the sugar by boiling water when this was the extracting agent used, or by 90 per cent. alcohol in the apparatus used in this laboratory for continuous extraction of fat by ether. The aqueous extract was so dark colored that a volumetric determination by the Fehling solution could not be made; the alcoholic extract was much less highly colored. This solvent was used in hope that it might extract less of other reducing substances than sugar, than water would take up. The gravimetric method, in which the copper reduced from the cuprous oxide by hyrogen was weighed, gave very satisfactory results.

The results obtained are given in the following table:

Number of sample.	Dry substance.	Sugar, Volumetric det.	Sugar, Garvimetric det.	Acid.
1	5.58	.33		.33
2	6.56	.57		.44
3	5.71	.43		.44
4	6.49	.56		.35
5	6.04	.38		.72
6	4.97		.69	1.73
7	3.89		.36	.58
8	5.72		.93	.57
9	5.70		1.01	.36
10	5.26		1.13	.34
11	6.17		1.09	.60
12	6.10		.89	.45
13	5.52		1.07	.54

The acidity was determined by means of a standard solution of potassium hydroxide, and calculated as malic acid. It seems certain that the volumetric results were too low. The gravimetric results were obtained with the alcoholic extract; duplicate results on the same extract agreed closely. It will be noticed that one very low result on sugar in sample 6, was accompanied by a very high per cent. of acid.

G. C. CALDWELL.

GOLDEN ROD WEEDS.

Complaints having been made in certain quarters in regard to the tendency of some of the golden rods to become more or less troublesome weeds, this note upon the subject has been prepared.

The golden rods constitute the genus *Solidago* of the botanist, one of the largest and most important genera of the sunflower family. They are all late summer or autumnal blooming plants, bearing clusters of small flowers, usually of a yellow or golden color. The roots are perennial, but the stems, for the most part slender or wand-like in form, are annual and herbaceous, or somewhat woody in mature plants.

About eighty species of golden rod are known. These vary in height from six inches or less in the Alpine variety of *Solidago virgaurea*, to eight feet or more in the large variety of *Solidago serotina*. They also differ more or less in the habit and general appearance of the plants, in the form and size of the flower clusters, in the size and texture of the leaves, and in other ways.

Nearly all the golden rods are attractive plants, chiefly on account of the rich, warm, golden color of the flowers. The high esteem in which they are generally held has led to a widespread proposal that the golden rod should be adopted as a national flower. Whether some particular species should be chosen, or whether any one of the eighty species might be regarded as answering all the requirements of the case, is a phase of the subject which has thus far received but little consideration.

The golden rods are nearly all natives of eastern North America. Only a single species, *Solidago virgaurea*, is native to Britain and continental Europe. The number of species known to be native to the state of New York was placed at twenty-two by Dr. TORREY in 1843. Prof. DUDLEY admits in the Cayuga Flora sixteen species as growing wild in the basin of Cayuga lake. These are all found in the vicinity of Cornell university. Within one hundred miles of the city of New York twenty-five species have been recorded by the Torrey Botanical club. In the state of New Jersey there are twenty-four species, and in the state of California only seven. In the whole of North America north of Mexico, Dr. Gray includes seventy-eight species. These figures give a general notion of the natural distribution of the golden rods and the relative frequency of their occurrence in different sections.

But little attention has been given to the cultivation of the golden rods in this country, largely owing no doubt to their abundance as wild plants. In the old world, on the other hand, where as stated only a single species is known, a considerable number are cultivated for ornamental purposes. In Nicholson's Dictionary of Gardening fifteen species are named as cultivated plants in England; but it is stated that as "they are of a coarse habit they are mostly confined to shrubberies and borders." In the botanical garden of the University all the golden rods native in the Cayuga Flora are cultivated by the botanical department for scientific purposes; and it is of interest to note that nearly all show a marked tendency to respond to the influence of cultivation in the direction of amelioration and improvement.

There is no tendency of the golden rods as a whole to become weeds, but a few species are regarded as intrusive and troublesome in some sections. In Halsted's check list of American weeds ten species are included;

in Darlington's American Weeds only a single species is specially named. In the state of New York, especially in the central counties and in the dairy regions, about four species have attracted attention on account of their habits as weeds. These may be named and described as follows:

1. *Solidago nemoralis.* Usually about a foot in height, the foliage of a grayish-green color. The flowers begin to appear in August—the earliest of the golden rods. This perhaps more than any other species has assumed a pronounced weed-like character, in certain soils and exposures over a wide extent of territory. As a weed it is common in upland pastures, especially in cold and sterile soils. In such situations it drives out grasses and other desirable forage plants almost completely. It may be banished by subjecting the soil to hoed crops for a year or more, and by the proper use of fertilizers. In very poor soils, where this golden rod has secured a firm foot-hold, it is probable that the cost of eradication would exceed the value of the land for farming purposes. The intrusion of this weed into fields not already invaded should be carefully guarded against.

2. *Solidago rugosa.* Usually a larger plant than the last, but quite variable as to size. The stem is very leafy, and both stem and leaves are rough with short and stiff hairs. Like No. 1 it is capable of invading fields and pastures and driving out all desirable forms of vegetation. It is, perhaps, less likely to be found on very poor soil.

3. *Solidago canadensis.* One of the largest of the golden rods, the rough, hairy stems often six feet in height. Old plants, after the flowers have faded, are very weed-like in aspect, but in its prime is a stately and beautiful species. Common on the borders of fields and pastures, which it sometimes invades more or less abundantly. Less likely than either of the first two to overrun the soil completely, but is very persistent when once established.

4. *Solidago lanceolata.* Smaller than No. 3, the stems being usually two to three feet in height. Common especially along the banks of streams, and in moist soils, and is more or less troublesome along the borders of meadows. It also invades cultivated fields and is more likely than any other golden rod to become a troublesome weed in such situations, largely owing to the fact that its power of propagation by underground stems is greater than in other species.

So far as is known, the different species above mentioned have nowhere received distinguishing popular names, but all are included under the general name of golden rod.

A. N. PRENTISS.

A NEW ANTHRACNOSE OF THE PRIVET.

A few twigs of the privet (*Ligustrum vulgare*) received from Penn Yan having the appearance of blight were communicated to me by Prof. BAILEY.

Fig 1

From 12 to 18 inches or more of the terminal portion of some of the twigs was dead, the point where the dead portion joined the healthy presenting the depressed line observable on twigs of pear and apple affected with the blight. The resemblance to blight, however, was only superficial and confined to twigs in the final stage of the disease. Other twigs presenting an apparently healthy terminal portion were found to be diseased at a point about 12 to 18 inches from the end where a depressed area of diseased tissue was observed, oblong in outline, the longer diameter being parallel with the longitudinal axis of the stem. A comparison of the different specimens showed that this diseased area, quite small primarily, and seated only upon one side of the twig, gradually increased in size until eventually it extended entirely around the twig completely girdling it. The supply of nutriment thus being cut off from the terminal portion of the twig, death of that portion followed.

Seated in the original diseased areas, whether extending partly or entirely around the stem, are minute black elevated points which can be seen with the unaided eye. Figure 1 *a* and *b* represent portions of twigs, *a* with the diseased area extending partly around the stem, while *b* is girdled. In the diseased areas are shown these small black elevations. The disease is produced by a fungus which grows within the stem. These black elevated points are centers where pustules of the fungus are developed, containing its reproductive bodies, or spores.

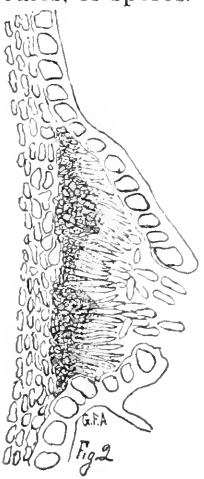


Fig 2

Figure 2 represents a very thin section, across one of these pustules, magnified to show the structure of the pustule and the form of the spores. The growth of the pustule has ruptured the epidermis of the stem. In the opening between the broken parts of the epidermis are shown some of the spores. Beneath these are numerous parallel short fruiting threads, or basidia of the fungus, at the end of which the spores are developed. The basidia can be seen to arise from the blackened stroma of the fungus which consists of quite a compact association of irregular cells. The black color of the pustules comes from the stroma.

Following the analogy of other anthracnoses these spores falling upon other stems would spread the disease. The practical question is, of course, how to prevent the spread of the fungus, or the starting of the disease another year. The suggestion might be made to trim the hedge with the shears below the affected parts of twigs, and burn the trimmings. It might also be well in the spring just before the buds swell to thoroughly spray the hedge with the Bordeaux mixture to kill any spores which may have remained during the winter.

Method of separation of the fungus.—To study the development of the fungus it was necessary to separate it from other common forms of fungi

as well as bacteria which always find a lodgment in and upon dead plant tissue. Since all these forms are microscopic the separation involves a method of procedure familiar only to specialists, and as such beautiful results were reached in the separation of this fungus it suggested a graphic presentation of the method in connection with the study. The method used was the same as that which KOCH developed so admirably for the separation of bacteria, and consists in the dilution of the organisms in several quantities of a warm liquid substance which, when spread out in a thin layer and cooled, solidifies and holds each germ firmly fixed at one point in the dilution. This substance is usually some gelatinous base, as gelatine, or agar-agar, containing beef broth and peptone to furnish food for the organisms. In a few days after cooling the dilutions, in the thin layer each germ, by growth, has produced a colony which can be seen with the unaided eye.

Three glass tubes containing a small quantity of liquid nutrient agar-agar were placed in a water bath at 43° centigrade. This temperature is sufficient to keep the agar liquid, while it is not hot enough to kill the organisms. Now several thin shavings through the fungus pustules on the stem of the privet were transferred to tube No. 1. This was shaken gently to distribute the germs evenly through the liquid. Now a small quantity of the liquid in No. 1 containing the germs was transferred to tube No. 2, making the second dilution, and from No. 2 to No. 3, making the third dilution. Experience enables one to judge quite accurately in making the dilutions so that we estimate the dilution sufficient to cause each germ to lie separately at different points in the liquid agar, at least in dilution No. 3.

Each of these dilutions was then poured into a Petrie dish,* and allowed to cool in a thin layer over the bottom. No germs could then be seen in the agar, since they are microscopic and lie singly. The dishes were piled away for a few days. During this time each germ grew and produced a colony which was visible to the unaided eye. The plates or dish cultures were now photographed natural size and the result is reproduced in Plate 1. In No. 3 it will be seen that nearly all of the colonies are separate. The snowflake-like colonies are those of the desired fungus. The small, compact, circular ones are those of bacteria. One large compact colony is that of a common fungus.

In Nos. 2 and 1 the fungus colonies are crowded, and have not made such good growth. The colonies of bacteria are more numerous also, and it would be very difficult to obtain a pure culture of the fungus in either of those dilutions. If the dilutions were not numbered it would be an easy thing to determine their number from the size and number of the colonies. The very large compact colony in No. 2 is that of a motile bacterium.

Pure culture of the anthracnose.—Pure cultures of the fungus could now be started by transplanting with a flamed platinum needle portions of the fungus colonies from No. 3 into a culture tube of nutrient agar. The photograph was taken after these plantings were made which accounts for the broken appearance of some of the colonies.

From the point of inoculation in the culture tube, where the transplanting was made, the fungus threads grow out through the upper surface of the agar radiating in all directions. In a few days minute black bodies appear seated here and there upon the mycelium. These resemble the

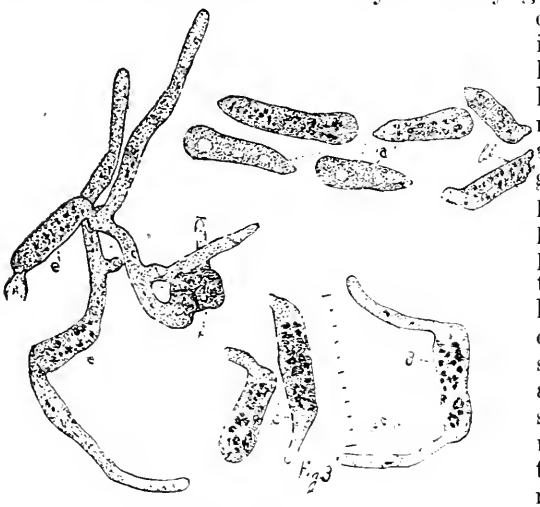
* A Petrie dish is composed of two shallow glass vessels, one about three inches in diameter which serves as the bottom, the other of a little greater diameter, which is inverted over the first one for a cover.

stroma at the base of the pustules on the stem, but in the artificial cultures do not seem to be especially concerned in the production of basidia and spores, since but a few are developed in connection with them.

Numerous basidia and spores are produced, however, all along the threads and a mass of them at the point of inoculation. In a few days more many fungus threads arise above the agar and produce a fluffy white growth upon the surface, nearly obscuring the black points.

No pigment was noticeable in these cultures. New cultures were then started by transplanting portions of agar the size of a small pea with a mat of mycelium and spores to fresh culture tubes. In the fresh agar the growth took place in the same manner as in the first tubes, but upon the surface of the transplanted portions a faint pink pigment appeared, similar to that developed in some species of *Glœosporium* and *Colletorichum*.

Cell cultures were made in order to observe with the microscope the different phases in germination of the spores and growth of the fungus. Liquid agar containing a dilution of spores from one of the culture tubes was poured upon a sterilized cover glass which was then inverted on the ring of the cell. Figure 3, *a*, represents some of the spores in the cell culture. They are oblong, usually pointed at one end, nearly cylindrical, and either straight or slightly curved. The appearance of the contents of the spores varies. Sometimes the protoplasm is nearly homogeneous with one or more vacuoles, or it may be finely granular, with no vacuoles, or quite coarse granules may be irregularly distributed in the homogeneous protoplasm. The latter condition is a very common one before germination, and the behavior of these granules has suggested that possibly they may be stored products to be used during the process of germination and the early growth of the mycelium. It does not seem there could be any need of such stored products for spores in artificial cultures where the spore lies in a rich nutrient media. But they might serve the spores a good purpose in natural conditions where the spore lies upon the surface of the plant and most often produce considerable growth of mycelium before the thread reaches nutritive tissues.

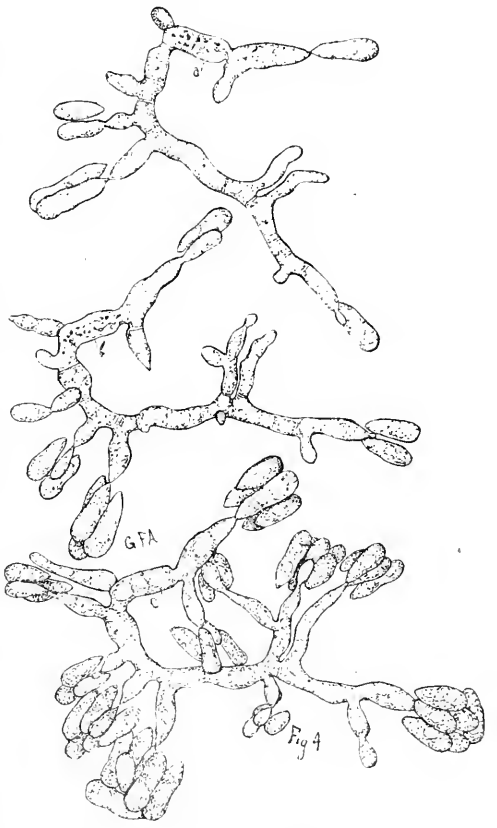


In germination one or more germ tubes arise from the spore usually at one side of the ends. Figure 3, *b* and *c* represents different stages in germination. The coarse granules are quite numerous, and in *d* some of them have moved out into the forming mycelium. Figure 3, *e* represents a further development of mycelium and also a further distribution of the granules in the threads.

Figure 4, *a*, *b*, and *c* are three camera lucida sketches of the growth from a spore which was sown December 14, at 12:35 P. M. *a* represents the growth which had taken place in exactly 24 hours, being sketched at 12:35 P. M., Dec. 15. *b* was sketched from the same object at 3:15 P. M.

on the same day, and *c* at 11:45 A. M., Dec. 16. The spores are therefore developed with great rapidity under favorable circumstances. In the same culture were other spores which developed a much greater extent of mycelium and number of spores. This group was chosen because of its limited extent, being thus more convenient to sketch.

During the growth and production of spores the coarse granules gradually disappear. As the culture ages the mass of spores becomes greater at the center of each group of mycelium. In a few days spore production seems to cease and then long, sterile mycelial threads grow out to a considerable distance.



At the same time there are usually develcped buds or gemmæ, at the ends of certain threads. These are colorless at first and may be detected by their irregularly oval outline, and greater diameter than the parent thread. They soon acquire a dark brown color, sometimes become septate, or bud into rudimentary sclerotia. One of these developed quite early in the culture as shown at x, figure 3.

Spores were also sown on sterilized bean stems. The fungus grew readily and produced numerous spores during a few days when the threads assumed a dark brown color and grew in great profusion over the surface of the stems. Frequently the threads associated themselves into strands, or compact wefts of parallel threads several layers deep. Within these wefts and strands were developed numerous bodies suggesting pycnidia or perithecia, rotund in form, the interior cells hyaline and with rich protoplasmic contents, the peripheral cells dark brown in color.

In some cases these measured 80 to 100*, and frequently the depth of the weft of dark mycelium in which they were seated exceeded this measurement.

Late upon the surface of this growth free threads arose in a procumbent, assurgent, or nearly erect position. All of this development on the bean stems took place in ten days. This culture is very suggestive of the probable development cycle of this *Glœosporium* and related forms. It probably presages the development of an ascigerous stage; whether or not that ever actually takes place is yet to be determined. The blackening of the stroma in the pustule on the stems of the privet is probably

*These measurements are in terms of the micromillimeter.

analogous to the dark weft of mycelium developed over the bean stems in the culture. In this respect the fungus resembles the *Glœosporium* of ripe rot of apples.

In the report of the mycologist, Dept. Agr., 1887, p. 348, there is noted what seemed to be an immature pycnidial stage of *Glœosporium fructigenum*. On apples, affected with *Glœosporium fructigenum*, which were kept until midwinter, Miss Southworth notes one conceptacle in connection with the stroma containing two asci and undeveloped spores, but the culture was so badly contaminated with other forms that it was thrown away. The culture being contaminated there might be some doubt of its genetic connection with the *Glœosporium*, but all this strengthens the possibility that several anthracnoses in the future will be known as conidial stages of some more highly organized form.

The result of these cultures is to impress one with the close relationship of this *Glœosporium* on the privet to the *Glœosporium fructigenum* on apples. If it were the same species, the cultivation of the privet would then bear a new and important relation, perhaps, to the spread and propagation of the ripe rot of apples. There are points of difference, however, so far as the two species are at present known, sufficient to characterize it as a hitherto undescribed species, and I propose for it the name *Glœosporium cingulatum*, or the *girdling anthracnose*.

Gœlosporium cingulatum ns. p. Affected areas light brown, either oblong and on one side of the stem or later completely girdling it. Acervuli 100 to 150 in diameter, rupturing the epidermis, in age black from the dark stroma lying in the base or extending irregularly up the sides frequently forming a pseudo-pycnidium. Basidia numerous, crowded, simple, hyaline or when very old perhaps faintly fuliginous. Spores oblong, or elliptical, straight or little curved, usually pointed at the base. From pustules on the stem they measure 10—20x5—7; in artificial cultures they are frequently much larger, but when crowded in the media, or when the nutrient substances are nearly exhausted, they may be considerably smaller—on stems of *Ligustrum vulgare*.

This is quite distinct from *Glœosporium ligustrinum Sacc.*

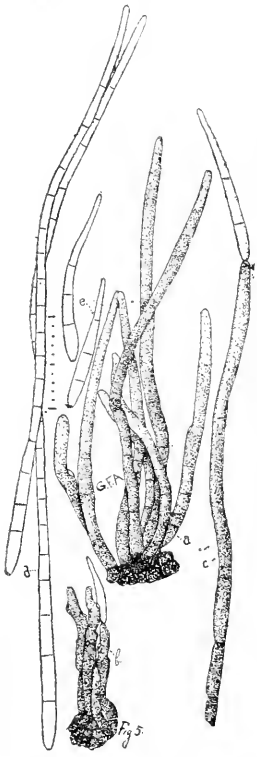
NOTE ON THE CERCOSPORA OF CELERY BLIGHT.

Late in September, specimens of celery affected by "celery blight," sent by H. C. Townsend of Wappinger's Falls, Dutchess county, were communicated to me by Mr. Turner of the New York weather service. The disease was determined as due to the fungus *Cercospora Apii* Fres. A short note on the disease was then published in the Crop Bulletin of the New York weather service, for the week ending Sept. 24, 1892. It has long been known in Europe and has been recorded several times in various parts of the United States during the past several years. It sometimes occasions quite serious injury to the celery crop, in some cases materially lessening the product and also rendering the diseased plants less desirable for market.

Halsted of the New Jersey experiment station shows that the disease can be held in check by the use of the standard carbonate of copper and ammonia mixture applied with a knapsack sprayer.

The object of this note is chiefly to call attention to some confusion which exists concerning certain morphological characters of the fungus.

Like all *Cercosporæ* the vegetive threads of the fungus usually grow largely in the interior of the leaf and when the nutriment at the affected spot is nearly exhausted, clusters of fruiting threads arise from the vegetive ones, and issuing from a stoma of the leaf bear elongated spores at their ends. Two clusters of the fruiting threads of *Cercospora Apii* are shown at *a* and *b* in figure 5, while *c* represents a single fruiting thread with a spore still attached, and free spores are shown at *d* and *e*.



The fungus was first described by Fresenius. The description given by Saccardo represents the form developed under normal conditions, the hyphæ measuring 40—60x4—5 and the spores, or conidia, 50—80x4. The form of the conidia is given as obclavate, *i. e.*, the base or end at the point of attachment with the hyphæ is greater in diameter than the distal extremity. The conidium *in situ* at the end of the hypha, figure 5, *c*, shows this character well. It was also observed in numerous other cases. Furthermore the free or abjointed conidia nearly always present a well defined scar at the larger end as shown in *d* and *e*, figure 5. This scar indicates the place of attachment to the hypha, the corresponding scar on the hypha being at the end or at one of the geniculations as shown in *a* and *b*, figure 5. The explanation of several scars appearing on a single hypha is that after a conidium is abjointed from the end, the hypha then grows out at one side of the scar and bears another conidium at the end, and so on. These scars at the base of the conidia enable one to determine their form even when they are not attached to their parent hyphæ.

In the report of the mycological section for 1886 is a short note on the distribution of this fungus in the United States. The form of the conidia is not given in the text, but they seem to be inverted in the illustration where they are shown to be attached by their small ends to the hyphæ. Figuring them thus is equivalent to calling them clavate with reference to their relation to the hyphæ which is contrary to the original descriptions and also to fact.

In the report of the New Jersey station for 1891 (l. c.) the conidia are described as club-shaped. No figure is given and we infer that the writer used the term "club-shaped" without any reference to their relation to the hyphæ.

Under normal conditions the fungus is confined to well defined spots on the leaf with an irregular, slightly raised border. During excessively wet weather, as the leaf tissue is dying, it may spread to portions of the leaf where the spots are not so well defined. Such conditions also induce a much longer growth of the tufts of hyphæ and their conidia. Figure 5 *a* and *d* represent such forms in comparison with *b* and *e* developed under normal conditions. The measurements including such variations are as follows: Hyphæ 50—150x4—5; conidia 50—280x4—5. The figures* are all

*All the figures where the scale is shown are drawn with the same combination, the objects being magnified 30 times more than the scale.

drawn to the same scale, using compensation ocular No. 6 and objective 4mm, Zeiss, with aid of camera lucida. The micrometer scale of this combination is also projected by the side of the figure.

GEO. F. ATKINSON.

THE BLACK PEACH APHIS—*Aphis persicæ-niger*.

Order *Hemiptera*; family *Aphididæ*.

A small brownish-black plant louse often appearing in great numbers upon the leaves, twigs, and roots of young peach trees, frequently dwarfing and often causing the death of the tree.

The object of this article is to call the attention of peach-growers to the fact that a very serious insect pest is being introducod into our state upon nursery stock purchased in other states. A correspondent in Niagara county has introduced the pest into his orchard of twenty acres by filling in the places where trees had died with infested trees received last spring from a nursery in Delaware. A few infested trees which were left over were trenched near some pits just planted; the pest soon found its way to the young seedlings, and by midsummer nearly every seedling had succumbed to the attacks of the aphids. So far as we know this is the first instance of the occurrence of this insect in our state, but probably other growers have suffered previously more or less in other localities without knowing the cause.

The insect is very common throughout the whole of the great peach-growing districts of New Jersey, Delaware, Maryland, and Virginia. Growers there say it is more to be dreaded than the borer (*Sannina exitiosa*), and in destructiveness it ranks next to the fearful mysterious disease of peach yellows. Trees less than three years old suffer the most. In 1890, nearly 100,000 in a single nursery in one of these states were killed in two or three weeks' time, while many other large nurseries were either entirely destroyed or very badly affected, and many orchardists were compelled to replant hundreds of trees. Nurserymen and those who are starting peach orchards, can thus see what fearful havoc may result if this pest is once introduced among their trees.

Indications of the presence of the pest.—As the pest often confines its attacks almost entirely to the roots of the trees, its deadly work frequently appears when there is nothing to indicate the existence of an insect as its cause. A stunting or dwarfing of the young trees is one of the most marked symptoms of the presence of the pest. Sometimes three or four year old trees are but little larger than when first set. The foliage of such trees presents a yellowish-green sickly appearance. Rarely a tree after languishing a year or two recovers and makes a good tree. Under favorable conditions the insect may appear in great numbers on the tree above ground and its growth be nipped while yet in the bud; the growing shoots dry up and the young tree soon dies.

Its past history.—This insect has been known to the peach-growers of the Atlantic states for more than a quarter of a century. From 1860 to 1875 it was particularly destructive to Maryland. In 1874 it is first recorded as appearing above ground in destructive numbers. While investigating the peach yellows in 1887, Mr. E. F. SMITH came across the insects upon the roots of the trees; and as yellows had by some been attributed to this aphis, Mr. SMITH made many observations on the pest, from which we get most of our knowledge of its life history and habits. The severe outbreak of 1890 has already been noted. Two or three years

ago the pest was carried into the Michigan peach district on nursery stock from the east. It seems not to have gained a foothold among the California orchards as yet; the board of horticulture of that state is fully alive to the importance of the pest, and it is on the alert to prevent its introduction.

Its classification.—This insect is one of the true bugs belonging to the same family—the *Aphididæ*— as the grape phylloxera, the grain aphis, the hop louse, and many other well known plant-lice pests. Scientifically the insect is known as *Aphis persicæ niger*—the Latinized form of the common name, black peach aphis. This name was given in 1890 by Mr. E. F. SMITH, who after comparing it with descriptions of allied known species became convinced that the species was new and so described it. Mr. SMITH believes that the insect is a native species, as he found it common on the roots and branches of the wild plum, Prunus chicasa, thus indicating that this may be its original food plant.

The appearance of the insect.—The pest appears in two forms, the more common form without wings (Fig. 1), and a form occurring in limited numbers provided with four ample wings (Fig. 2). The adult wingless insect is a little less than one tenth of an inch in length and of a dark shining brownish-black color with portions of the legs yellowish. Figure 1 shows the shape and general appearance of wing-

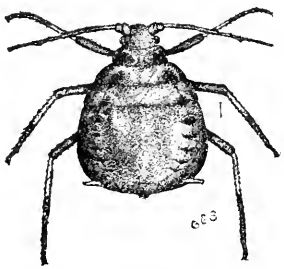


FIG. 1.—Wingless viviparous female.

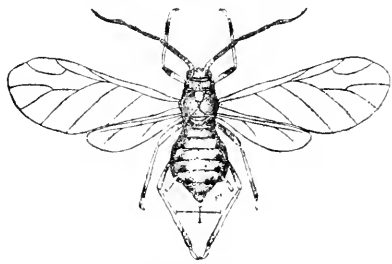


FIG. 2.—Winged viviparous female. (After J. B. Smith.)

less form; the hair line at the right represents the natural length of the body. Two very short tubercles called honey-tubes project from the caudal end of the abdomen. The beak lies along the breast of the insect when at rest but when feeding it is placed against the leaf at right angles to the body, and four fine bristles moving in a groove of the beak are forced into the tissues and the sap is pumped through this apparatus into the body.

The adult winged forms have the long transparent wings carried roof-like over the side of the body when at rest. These forms also differ from the wingless ones in being slightly longer and more slender, and in having longer antennæ and honey-tubes, as is shown in figure 2; the lines beneath the figures represent the natural size of this form.

In its younger stages the insect resembles the adult, but is lighter in color. All the forms thus far observed are females; often plant-lice breed freely for many generations or even years without the appearance of males, nothing but the agamic females being produced.

The life history of the insect.—Plant-lice present more varied, peculiar, and interesting phases in their life histories than do most other insects. The mother is often viviparous, that is she brings forth her young alive; the little louse may be seen kicking to free itself from the

mother who is perhaps calmly walking about or feeding. Many generations of these agamic females may be produced in succession, and it requires only eight or ten days for a generation. And further, as one mother may give birth to one hundred young at the rate of four or five a day it is easy to see with what astonishing rapidity these insects may often multiply.

The black peach aphis breeds thus agamically all the year round, and no eggs nor males have been found. Only the wingless forms occur upon the roots where they breed freely and are to be found at all seasons of the year, often a foot or more beneath the surface even in stiff clay soils; sandy soils are however preferred by the pest.

Early in spring as soon as the buds begin to swell, some of these root forms make their way to the surface and to the branches. Here the winged form develops and flying to new quarters founds other colonies, thus spreading the pest. These branch forms are the most numerous from April to July. About midsummer most of these make their way to the ground and to the roots. Usually a few specimens remain on the leaves throughout the summer and autumn and even through the winter. Our correspondent in Niagara county wrote us November 24, that although it had frozen hard twice, the aphids were as lively as ever on the branches. These individuals which thus hibernate upon the branches with those which come from the ground form the nucleus for the early spring broods.

This pest is often accompanied by a small yellow ant which has been seen transporting the aphids to places of safety. It is believed that the distribution of the root forms is thus facilitated by the ants, and they may also aid in getting the aphids to the surface in the spring. The aphids repay the ants for their assistance by secreting a sweet liquid called honey dew upon which the ants feed.

The root forms mostly congregate on the tenderest roots, but some are to be found on all parts of the root system. Many of them still cling to the roots when the trees are dug up, and they are thus often transported great distances on nursery stock. The pest then readily acclimates itself to its new home and soon spreads throughout whole nurseries or orchards.

Above ground the insects attack the swelling buds in the spring, and later their increase in numbers crowd them onto the twigs and leaves. As each little aphis begins to suck the sap as soon as it leaves the body of the mother, the result of so many hundreds of these little pumps working almost continuously upon both roots and branches must be a speedy check to the growth of the tree.

Methods of preventing the ravages and spread of this pest. If this pest once gets a good foothold in a nursery or young orchard, it will prove a difficult insect to fight. Those individuals that infest the branches are easily reached and have been found to succumb readily to either kerosene emulsion or a strong decoction of tobacco.* The emulsion should be

*To make the emulsion, thoroughly dissolve ½ pound of hard or soft soap in 1 gallon boiling water. While this solution is still very hot, add 2 gallons kerosene and quickly begin to agitate the whole mass through a syringe or force pump, drawing the liquid into the pump, and forcing it back into the dish. Continue this for five minutes or until the whole mass assumes a creamy color and consistency which will adhere to the sides of the vessel, and not glide off like oil. It may now be readily diluted with cold rain water, or the whole mass be allowed to cool when it has a semi-solid form, not unlike loppered milk. This stock, if covered and placed in a cool dark place will keep for a long time. In making a dilution from this cold emulsion, it is necessary to dissolve the amount required in three or four parts of boiling water, after which cold rain water may be added in the required quantities.

The tobacco decoction is made by steeping 5 pounds of tobacco stems in 3 gallons of water for 3 hours; then strain and dilute with enough water to make 7 gallons. The decoction is now ready for spraying without further dilution.

diluted with nine or ten parts of rain water, the 3 gallons of the formula thus making about 30 gallons to be used in spraying. This diluted emulsion will probably prove the most effective, although the tobacco has been used with equal success in some instances. Care should be taken in the preparation of either insecticide; many of the reported poor results from the use of insecticides is due to their not being properly prepared and used.

As it is the young trees that usually suffer, either insecticide can be easily applied with a knapsack sprayer or small force pump. Apply in as fine a spray as possible and drench the trees. In rare cases a second application a few days later may be necessary. The best time to spray is in April or May when the branch forms are the most numerous.

The root forms will not be reached by this method, hence the relief obtained in this way is only partial. There is on record no experiments in the destruction of this form and we have had no opportunity to make any, but we suggest the use of very liberal quantities of the diluted kerosene emulsion on the surface of the soil over the roots just before or during a rain. This suggestion is based on the results of experiments with a species of white grub, the larvæ of *Allorhina nitida*, an insect closely related to the common May beetles of the genus *Lachnosterna*. The lawns about the capitol at Washington being badly infested by these white grubs in 1888, afforded an opportunity to try the effects of a dilute kerosene emulsion applied upon the surface. After applying the emulsion the lawns were thoroughly drenched with water to help to carry the oil into the soil. The result was very satisfactory; after a few days the grubs appeared sick, and a month later no live ones could be found.

If the aphids on the roots of the trees can not be reached by an application of the emulsion as described above, the trees should be removed at once, burned, and the ground left unoccupied for several months or used for other purposes. The insect could thus be starved out as it is not known to feed upon any other cultivated plants except rarely the plum.

In the discussion thus far of preventive measures it has been supposed that the pest had already gained a foothold in the nursery or orchard. However, to many peach-growers in the state the pest is as yet unknown, and they will desire to know how they can prevent its getting a foothold among their trees. Growers who raise all their own trees from pits will not be troubled with the pest unless careless neighbors introduce it on stocks purchased in infested regions.

If it seems necessary to purchase nursery stock elsewhere, and especially in regions known to be infested, it should be quarantined and very thoroughly treated with an insecticide immediately upon its arrival. Dip each tree in either the diluted kerosene emulsion or the tobacco decoction made as described above for use against the branch forms. As the insecticide acts very quickly, the tree need remain in it but two or three minutes. This method it is believed will effectually destroy all aphids that may be on the trees.

Another method which would doubtless be equally effective is the one used largely in California where the law requires that all trees, plants, cuttings, grafts, buds, seeds, pits, or scions coming into the state shall be disinfected upon arrival. The disinfection is done by fumigating the trees, etc., with hydrocyanic acid gas, a deadly poison. In fumigating, the trees, etc., are placed in an air-tight tent or box, and for each 100 cubic

feet of space in the box or tent one ounce of fused cyanide of potassium (58 per cent.), one fluid ounce of sulphuric acid, and two fluid ounces of water are used. The cyanide of potassium is placed in an earthenware vessel, the water poured over it, the sulphuric acid then added, and the box or tent closed tightly immediately and kept closed for at least forty minutes.

Every peach-grower should take sufficient interest in the welfare of his own orchard and that of his neighbor to treat in one of the above ways all peach stocks purchased in localities where the pest is known to be present, as in New Jersey, Delaware, Maryland, or Virginia. If this be thoroughly done our peach orchards will have one less serious insect foe to fear. And the growing nursery industry of New York state, which now has nearly 500 acres devoted to peaches, constituting nearly 15 per cent. of all the peach stocks grown in the United States, will not suffer as it would were it known that this pest is liable to accompany the trees sent out.

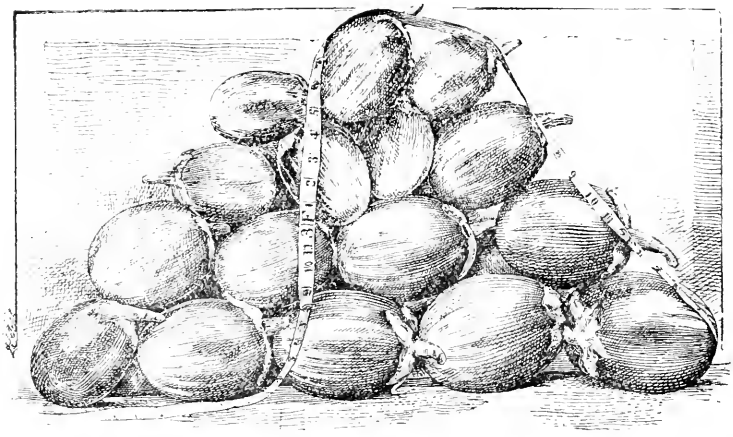
MARK VERNON SLINGERLAND.

THE BEHAVIOR OF SOME EGG-PLANT CROSSES.

In 1889, three crosses were made among egg-plants, one cross being between Round White and Black Pekin, one between Giant Round Purple and White Chinese, and the other between Long White and Black Pekin. In every case, the parents were very unlike, both in shape and color of fruit, and in color of plant. A number of plants were grown from these seeds in 1890, and the characters of the resulting offspring were fully explained and figured in Bulletin 26, March, 1891. The present report deals with the second generation, grown in 1891.

The cross which we called A was made between Round White and Black Pekin. The Round White is a small green plant which bears small oblong, clear white hard fruits. The Black Pekin is a large, dark purple plant which produces very large, nearly globular and very dark purple fruits. One fruit was obtained in 1889 as a result of crossing these two varieties. The seeds of this fruit gave in 1890 a series of plants which were almost exactly intermediate between the parents in size and other characters. The young shoots were much like the pistillate parent—Round White—but as they became older, the upper surface of the stems, the petioles, and the veins of the leaves assumed the purple tinge of the male parent. In form and size, the larger part of the fruits seemed to vary in the direction of the pistillate parent, many of them being decidedly ovoid in form and very small. A few were larger, and had somewhat the form of the staminate parent. Frequently the same plant would produce mature fruits two inches and others five inches in diameter. In color the fruits were purple while young,—first month or so,—usually dark purple with lighter apex. In some instances this color was retained till time of edible maturity; but as a rule, the dark purple changed to a dull greenish hue, and the light apex became metallic gray with a faint tinge of purple, and streaks of grayish-purple extended toward the base. The accompanying figure shows the extent of variation in 1890, or a fruit of every type obtained.

From the first brood of this cross, 1890, eight fruits were selected or again crossed, as parents for succeeding crops. These fruits were essen-



Extent of variation in the "A" crosses. (1890.)

tially alike in color and shape, as shown in the above illustration. These eight fruits, which were the parents of the plants discussed below, were as follows:

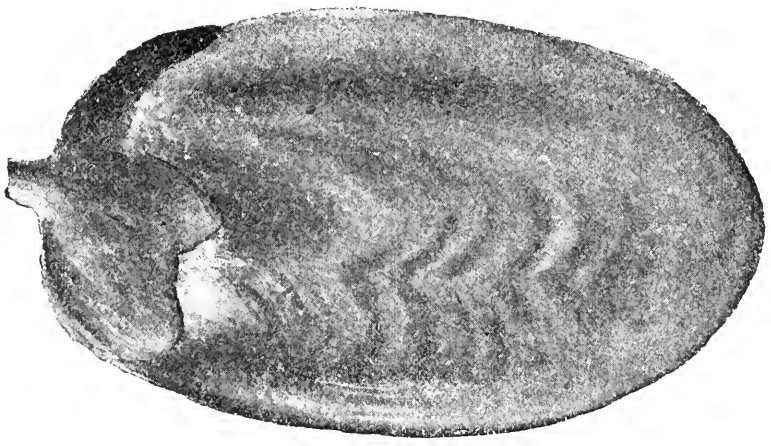
A1. Pollinated with another flower on the same plant.
A2. Pollinated by Round White (original pistillate parent).
A3. Pollinated by Black Pekin (original staminate parent).
A4. Same as A3.
A5. Pollinated with another flower on same plant, as in A1.
A6. Same as A5.
A7. Pollinated by Round White, as in A2.
A8. Selection, not artificially pollinated.

From these eight fruits, 1,405 plants were grown at Cornell in 1891.* The behavior of these plants is indicated by the table which closes this article. It is interesting to note the influence of Black Pekin in A3 and A4, into which this variety has twice entered as a staminate parent. All the plants, 203 in number, were purple in foliage and like Black Pekin in habit; and most of the fruits were solid purple, although a few striped fruits still showed the influence of the Round White two generations back. The ones into which the Round White entered twice—A2 and A7—do not show so strongly the marks of the double infusion of blood. In A2, there were a few more plants with green than with purple herbage and the green ones were more productive than the others; these are marks of the Round White, and it may also be said that even the purple plants were of a light cast and that nearly all showed the influence of the dwarf habit of Round White. A7, the other Round White cross, produced a lot of small plants, but they were unproductive, and much over half of them had purple herbage.

Three of these lots—A1, A5, A6—were from fruits pollinated by a flower on the same plant. These, then, according to popular notions, should produce uniform plants; but with that sublime contrariness which is so characteristic of most of our results of crossing, these lots gave as variable progeny as those which had better right to such possessions. In fact, the

* Duplicates of all these egg-plants have been grown in Maine by Professor W. M. Munson, who will soon report upon them.

lot A1 was probably the most hopelessly mixed of any in the entire list. The fruits ranged from pure white to green with white stripes, purple striped, light solid purple, and very dark purple; and the mature fruits varied from the size of an egg to that of Black Pekin. About equal numbers of the 175 plants were green and purple. A5 was nearly as badly mixed, and some plants appeared which had the peculiar spreading habit of early dwarf purple, a variety which had never entered into any of the



A mongrel egg-fruit. (1891.)

crosses. A6 showed wide variations also. A8, which was simply a selection and had not been artificially pollinated, was about as variable as the rest.

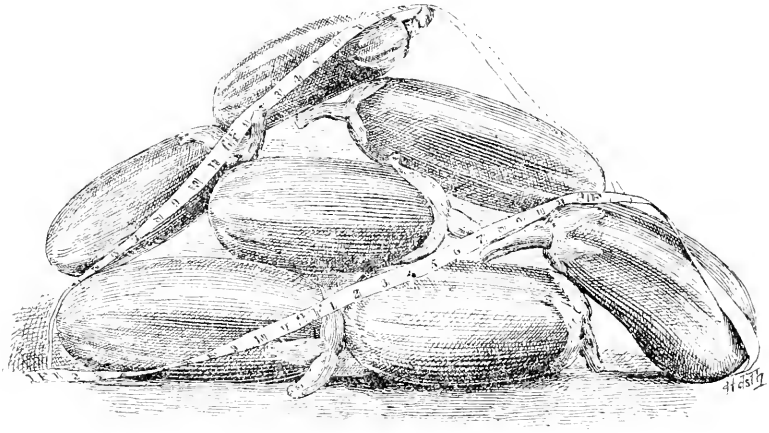
Some of the fruits of these crosses were exceedingly handsome, especially one which appeared in A1 and another in A2. The engraving on last page shows one of them, but no black and white print can do justice to it. White and purple bands were laid on the fruit in alternate waves which seemed to run off the fleshy calyx lobes and to flow down the fruit. Efforts have been made to perpetuate these remarkable types, but they are now lost. Every new attempt at crossing reminds me that the chief value of the operation is the infusing of new vigor into offspring rather than the origination of new types.

As a whole, 543 of the 1,405 plants produced perfectly green foliage, showing the effect of the Round White. Most of the fruits produced by these eight samples were of an indifferent and ill-defined color, and were utterly worthless for market. In productiveness, the purple herbage plants were ahead of the green ones, although the green parent—Round White—is more productive than the Black Pekin. Of the 729 plants which gave sizable fruits before frost, 454 were purple and 275 green. In habit, the A crosses were also very various. The Round White seemed to exert a great influence upon the stature of the plants, but the purple color of Black Pekin appeared to be more potent than the green of the other.

Series B came from a cross of giant Round Purple and White Chinese. The former has purple herbage and a very large purple fruit, while the latter has green herbage and a long club-shape white fruit. So far as beauty of form and color is concerned, this series was by far the most

promising of the three crosses. The plants in this series, as in the former, were as a rule intermediate between the parents. Much of the vigor of the pistillate parent was transmitted to the offspring, but the leaves were smaller and less distinctly lobed.

In form the fruits, as a rule, resembled the staminate parent—White Chinese, but they were of greater diameter. The color at edible maturity was rich dark purple, with lighter apex. When fully mature—that is when left for the seed to ripen—the light purple apex became gray, then yellowish like the staminate parent, while the dark purple body of the fruit became dull green. The full extent of variation in this series is



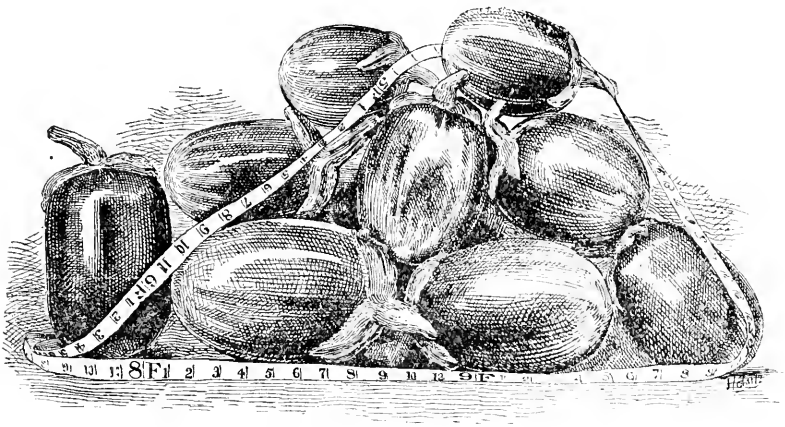
Extent of variation in "B" crosses. (1890.)

shown in the illustration. Eight of these fruits grown in 1890 were selected or again crossed for planting in 1891. These B lots originated as follows:

B1. Pollinated by Giant Purple (original pistillate parent.)
B2. Pollinated with another flower on the same plant.
B3. Pollinated by Giant Purple, as in B1.
B4. Pollinated with another flower on the same plant, as B2.
B5. Pollinated by Giant Purple as in B1 and B3.
B6., B7., B8. Selections, not artificially pollinated. These were attractive fruits of a purple color and lighter apex, tending to be striped.

The offspring of these fruits—479 plants—showed a wide variation in color of herbage, many of them being green, although the greater part of them were purple. As a whole, however, these plants were comparatively uniform in size and habit, and could be distinguished from the A and C series at a considerable distance. The plants were low and bushy, but erect, mostly with a grayish purple tinge when seen in mass. B2, which was pollinated from another flower on the same plant, gave as various fruits as the others. Of eighteen large fruits of it, one was very black purple, six were light purple, and one was purple-striped, nine were green-and-white striped, one was pure white. It is strange, too, that one of the plants of this lot had the peculiar habit of Early Dwarf Purple, a variation also found in one of the A series (A5) which had been similarly

pollinated. The lots into which the original pistillate parent, Giant Purple, was again impressed—B1, B3, B5—showed very variable offspring, although there were large numbers of purple and purple striped fruits in the progeny. B3 and B5 were very much alike in habit, color and fruit. There was comparatively little variation in any of the B lots.



Extent of variation in "C" crosses (1890.)

Series C originated from a cross of Long White by Black Pekin. This series then, is much like A in parentage, except that the pistillate parent has longer fruit. The effect of the staminate parent in giving color to the foliage was more marked than in series A. In no case was there an absence of the purplish tinge of Black Pekin, and frequently the color was nearly as deep in the parent. The fruit was of intermediate color, but with the purple predominating. In form, a few of the fruits resembled the staminate parent; and many resembled the pistillate parent, while others were wholly distinct.

Four fruits were again crossed or selected in 1890 from this series:

C1. Pollinated by another flower from same plant.
C3. Pollinated by Black Pekin (original staminate parent).
C4. Selection, not artificially pollinated. Seen at the extreme left in the illustration. It was very angular at the ends, purple with a metallic-gray apex.

In these lots, the fruit pollinated from the same plant, C1, gave a variable and very unproductive offspring. C3, into which Black Pekin has gone twice, gave only purple fruits. C4 was the one which we particularly desired to fix, for the original fruit had strong points of merit. This fruit gave us 169 plants, none of which, however, were like the parent, and none seemed to possess superior merits. Only 31 of the plants from it produced fruits before the frost, and of these five had green herbage and 26 purple herbage. All the C plants were very tall in 1891, mostly dark in foliage, and late.

The result of all this experiment with secondary crosses and the second generation of primary crosses, numbering 2,126 plants, shows that they were exceedingly variable, that pollination from the same plant did not fix the types, that very few novel and promising types appeared, that the white and purple colors tended to unite to produce striped

fruits, and that the greater part of the crop was unsalable because of the nondescript colors of the fruits. And all this only emphasizes the fact which we have learned with many other plants, that crossing for the purpose of producing marked novelties for propagation by seed is at least unsatisfactory.

The following table showing the numerical measures of this variation may interest those who are curious concerning plant variability.

Variation in egg-plant crosses.

Samples.	Whole number of plants.	No. with green herbage.	No. with purple herbage.	Whole number of fruitful plants.	Number fruitful plants with green herbage.	Number fruitful plants with purple herbage.	Number frts. dark as Black Pekin.	Number frts. light purple.	Number frts. purple striped.	Number frts. green with white stripes.	No. frts. white.	Remarks.
A1	175	83	92	92	43	49	8	20	20	28	26	Mostly a good lot but very variable.
A2	102	82	21	78	65	13	....	....	....	.....	....	Shows a tendency to revert to Round White; none of the purple plants so dark as in A1.
A3	86	0	86	68	0	68	....	....	....	.....	....	Much like Black Pekin, although there are some green-striped fruits.
A4	117	0	117	97	0	97	....	....	....	.....	....	
A5	291	119	172	136	55	81	....	....	....	.....	....	Some plants are low and diffuse like Early Dwarf Purple, but its fruits are different.
A6	216	89	127	121	54	67	....	....	....	.....	....	Plants very various.
A7	244	101	143	76	32	44	....	....	....	.....	....	Plants small and unproductive.
A8	174	69	105	61	26	35	....	....	....	.....	....	
B1	49	....	....	22	2	20	4	4	15	2	0	Fruits long, like Long Purple
B2	30	....	....	12	8	4	1	6	1	9	1	Mostly tall, but one plant with habit of Early Dwarf Purple.
B3	96	....	....	36	0	36	0	0	36	0	0	Plants remarkably uniform in size and appearance. Grayish in color, with light purple tinge.
B4	2	....	....	1	.....	.....	0	1	0	0	0	
B5	79	....	....	34	0	34	15	15	6	0	0	Like B3.
B6	42	....	....	4	1	3	0	0	2	1	0	Like B3, but plants somewhat smaller.
B7	73	....	....	6	2	4	0	6	0	2	0	Plants like B6.
B8	108	....	....	17	9	8	0	4	5	4	0	Like B6 in aspect.
C1	39	....	....	3	1	2	3	0	0	0	0	
C3	34	....	....	15	0	15	....	....	....	.....	....	Mostly tall, but occasionally a low plant.
C4	169	....	....	31	5	26	....	....	....	.....	....	Occasionally a low plant.

FERTILIZERS FOR GRAPE CUTTINGS.

It is often a very serious question with nurserymen what fertilizers they shall use to produce the largest and best grape-vines, especially in the dryer seasons when growth is small. Two years ago we undertook an experiment in this direction, and T. S. HUBBARD of Fredonia, N. Y., a well-known nurseryman, gave us 10,000 cuttings of Concord with which to make the test. These cuttings were divided into ten equal lots and each lot was set in the spring of 1891 upon a plot 10x25 ft. The cuttings stood 3x12 inches apart. The plots were arranged in two rows, and they received treatment as follows in 1891 and 1892:

1. Check (no fertilizer).
2. Cotton-seed hull ashes (4 lbs. a year)
3. Muriate of potash (2 lbs. a year).
4. Nitrate of soda (2 lbs. a year).
5. Sulphate of ammonia (2 lbs. a year).
6. Cotton-seed meal (4 lbs. a year).
7. Bone flour (4 lbs. a year).
8. Stable manure (40 lbs a year).
9. Bradley's superphosphate (4 lbs. a year).
10. Check (no fertilizer).

These fertilizers were applied May 14, 1891, and June 23, 1892. They were sown upon the ground and found their way under the surface at the regular hoeings. The soil upon which these cuttings were grown was a poor and very hard gravel. This soil was selected because it had received no fertilizers in recent years and because the results of the different materials would be undisguised by the heavy growth which would be given by a good soil. The early season of 1891 was very dry and many of the cuttings did not start. Later in the season the remaining plants made a fair growth but no difference could be seen in the plots. It was evident that the fertilizers had not yet reached the roots of the plants. But in 1892 the effect began to be marked early in summer, and it was evident that plot No. 4—nitrate of soda—would distance all the rest. Final observations were made October 19, when it was found that plot No. 4 was best and No. 5 second. These plots gave easily fifty per cent. more growth than any of the remaining eight. No. 2—cotton-seed hull ashes—was the best of the remaining plots, although its advantage was slight. Between the other seven there were no obvious differences.

Plot 4—nitrate of soda—was conspicuously darker in foliage than any other throughout the season. The vines matured well, although the yellow leaves still hung to the plants in the middle of October. Plot No. 5—sulphate of ammonia—was perhaps ten per cent. below No. 4 in amount of growth, and the wood was not so well ripened as in the other.

THE BLACK-KNOT OF THE PLUM AND CHERRY.

THE NEW YORK LAW.

The black-knot is a serious disease, attacking the branches and twigs of the plum, sour cherries, and sometimes sweet cherries. It is also common upon wild choke-cherries from whence it spreads to the orchards. The most prolific source of the disease, however, are the neglected hedge-rows of plums and Morello cherries along road-sides and about old buildings. Sometimes black-knot will be noticed sparingly in a community for several years before it seriously attacks cultivated trees, and this fact has caused people to become indifferent to it; but sooner or later it will spread and become a most pernicious evil. Plum-growing is abandoned in some parts of the Hudson river valley because of the incursions of black-knot, and a similar fate is likely to overtake any community which neglects it. It is the duty of every citizen to exert himself toward the extirpation of this pest, and New York and Michigan now have laws to compel its removal.

Black-knot is a fungous disease, and the only reliable treatment yet known is to cut off the knots and burn them. This operation should be done just as soon as the leaves fall, at the latest. Good plum-growers inspect the trees once or twice during the summer if black-knot is feared. Always burn the knots; if they are not destroyed the spores of the fungus will still develop, even after the knot is cut from the tree. The old knots often contain worms, but these only burrow in the spongy tissues; they do not cause the disease.

The following is the New York law. Every citizen should support it:

SECTION 1. It shall be unlawful for any person knowingly or willfully to keep any plum, cherry or other trees infected with the contagious disease or fungus known as the black-knot; that every tree so infected is hereby declared to be a public nuisance, and no damages shall be awarded in any court in this state for entering upon premises and cutting away or severing the diseased part or parts of any tree so infected and destroying the same, or cutting down or removing such infected tree altogether, and destroying the same, if done in accordance with the provisions of this act.

§ 2. In any town or city in this state in which such contagious disease exists, or where there is good reason to believe it exists, or danger may be justly apprehended of its introduction, it shall be the duty of the supervisor or mayor of any town or city, upon the application made in writing and signed by at least three free-holders, who are residents of said town or city, to appoint forthwith three competent free-holders, who shall be fruitgrowers, of said town or city as commissioners, who shall hold office during the pleasure of said supervisor or mayor, and such order of appointment and of revocation shall be entered at large on the town or city records.

§ 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 town 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 town or city.

§ 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 the disease known as the black-knot exists, or is supposed to exist, within the limits of their town or city, to proceed without delay to examine the trees supposed to be infected, and if the disease is found to exist a distinguishing mark or marks shall be placed upon that part or those parts of every tree so infected, which, in the judgment of the commissioner or commissioners, should be removed and destroyed, or if in the judgment of such commissioner or commissioners, any tree so infected should be entirely removed and destroyed, then the trunk of such trees shall be thoroughly girdled, and a written notice given to the owner personally, or by leaving the same at his usual place of residence, or if the owner be a non-resident by leaving such notice with the person in charge of such trees. The notice shall contain a simple statement of the facts as found to exist, with an order to effectually remove and destroy by fire the part or parts of every tree so marked and designated, or every such tree entire which shall be so girdled, as the case may be, within ten days from the date of the notice above required. Such notice and order to be signed by the three commissioners, or any two of them.

§ 5. Whenever any person shall refuse or neglect to comply with the order mentioned in the last section, it shall become the duty of the commissioners to carry out the directions of said order, and forthwith to remove and destroy by fire every tree, or part of a tree, so girdled or marked, as aforesaid, employing all necessary aid for that purpose; the expenses for such removal and destruction to be a charge against the town or city; and for the purpose of such removal and destruction, the said commissioners, their agents and employés, shall have the right and authority to enter upon any and all premises within their town or city.

§ 6. If any owner, or if such owner be a non-resident, then if any person in charge of such trees, neglects to remove and destroy by fire every tree, or part of a tree, so found to be infected and marked, or girdled, as aforesaid, after notification, and within the time hereinbefore prescribed, such person shall be guilty of a misdemeanor and punished by a fine not exceeding twenty-five dollars or by imprisonment in the county jail not exceeding ten days, or both, in the discretion of the court; and any justice of the peace of any town or city, in which said offense shall be committed, shall have jurisdiction thereof; and all such fines so collected shall be turned over to the supervisor of said town, or other proper officer, to be placed by him in the contingent fund of said town or city.

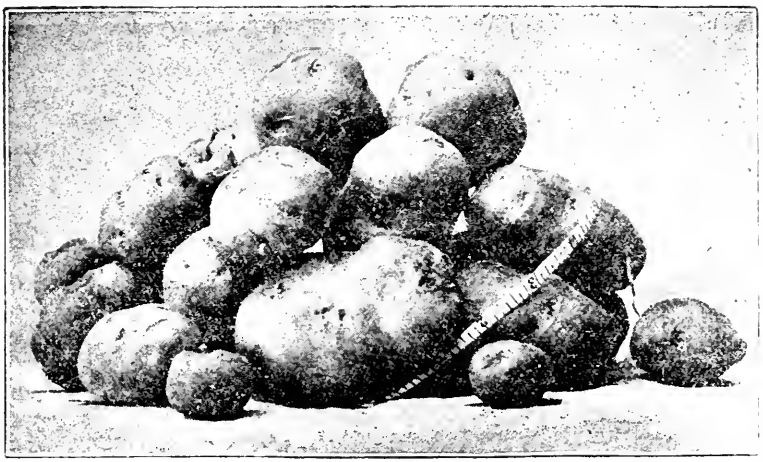
§ 7. The commissioners shall be allowed for service under this act two dollars each for each full day and one dollar each for each half day, and their other reasonable charges and disbursements hereunder, to be audited, as well as any other charges and disbursements under this act, by the board of town auditors or proper city officers, to be paid to such commissioners as other town or city accounts are paid. Such fees and all reasonable charges and disbursements of said commissioners, in each case may be recovered by the town in the name of the supervisor, and in cities in the name of the city, from the owner of the diseased trees, on account of which such fees, charges and disbursements become payable or were incurred.

§ 8. This act shall take effect immediately.

Approved by the Governor, May 12, 1892.

THE WILD POTATO OF THE MEXICAN REGION.

About 1878 Dr. W. J. BEAL of the Michigan Agricultural College received from the Harvard botanic gardens a few tubers,—the largest about an inch in diameter—of a wild potato from Mexico. This potato has been grown since that time at the Michigan college, and we have grown it here two or three years, from the Michigan seed. The tubers are gradually improving, and in 1887, when I made a report upon this potato,* the best tubers measured three inches in length. The largest tubers now reach over four inches in length, and the number of small potatoes in the hills seems to be lessening. The illustration shows an average sample of this potato as dug in our gardens this year. The tubers are brown, with deep eyes, and tend to be flattened. They keep well. The flesh is very yellow. When cooked, the flavor is rich and possesses a slight aroma which is not present in the common potatoes. The plants usually produce balls freely.



Mexican Wild Potato.

This potato is, probably, the *Solanum tuberosum* var. *boreale* of GRAY, although it has the interposed small leaflets which that plant is supposed to lack. It occurs in a wild state from the Montezuma valley, Colorado, to New Mexico southward in the mountains in Mexico. This wild potato of the north appears to have been first brought to notice in 1856 by Dr. A. J. MYERS of the United States army, who found it in westerm Texas. He sent specimens to ASA GRAY, who named it *Solanum Fendleri*, in honor of AUGUSTUS FENDLER, an early botanical explorer of the southwest. Dr. GRAY afterward considered it to be only a geographical variety of the potato and renamed it *Solanum tuberosum* var. *boreale*. The account of the plant as seen by Dr. MYERS, contains the following reference to the tubers: "The tubers, though small, being rarely so large as a hickory nut, have been gathered, cooked, and eaten by officers and soldiers, and they proved both palatable and innocent." This plant was grown in 1888 by

*Bull. 31, Mich. Expt. Sta. 87.

the Colorado experiment station from wild Colorado tubers. The tubers under cultivation were "quite large relatively to the other forms [samples of *Solanum Jamesii*], oblong in shape, and of a dark brown color." Several crosses were made in Colorado upon this wild potato from pollen of common potatoes, but I am not aware that any subsequent report has been made upon them. The Wild Mexican potato has been grown by several experimenters for a number of years. Their reports would be interesting.

DO FERTILIZERS AFFECT THE QUALITY OF TOMATOES?

There is much discussion concerning the supposed effects of different fertilizers upon the quality—solids, sugar, acids—of tomatoes. Samples of tomato fruits were taken September 6 from various fertilizer plots for chemical examination. In the following table each entry or sample means a single fruit. The fruits selected were well colored and of medium size and ripe enough for dessert use. All the samples are Ignotum.

Do fertilizers modify quality of tomatoes?

Samples	Field treatment.	Selection of samples.	Solids.	Sugar.	Acid.
1	Nitrate of soda, 1 lb.	3 fruits from 3 plants	5.57%	1.41%	.44%
1a	" " "	" " "	6.07	.....	.47
1b	" " "	" " "	5.72	.94	.57
3	Muriate of potash, 1 lb.	2 fruits from same cluster	5.88	.....	.38
3a	" " "	" " "	5.42	.....	.37
4	Nitrate soda, 1 lb., Bone black, 2 lbs.	2 fruits from 2 plants	5.26	1.15	.34
4a	" " " "	" " "	6.17	1.47	.59
5	Nitrate soda, 1 lb., Muriate potash, 2 lbs.	5 and 5a from one plant	4.97	.69	.....
5a	" " " "	5b from another plant	4.90	.92	.75
5b	" " " "	" " "	5.54	1.22	.....
6	Bone black, 2 lbs., Muriate potash, 1 lb.	2 fruits from 2 plants	5.76	.....	.44
6a	" " " "	" " "	5.90	1.01	.36
7	Nitrate and Muriate, 1 lb. each	2 fruits from 1 plant	6.49	.....	.35
7a	Bone black, 2 lbs.	" " "	6.10	.89	.45
8	Check (no fertilizer)	2 fruits from 1 plant	5.52	1.07	.54
8a	"	" " "	5.40	.....	.38
9	Nitrate soda	9 and 9a from one plant	5.71	.....	.41
9a	"	9b and 9c from another plant	3.89	.97	.58
9b	"	" " " "	5.77	.....	.39
9c	"	" " " "	5.58	.....	.33
10	Check (no fertilizer)	.....	6.56	.58	.44
11	Nitrate soda, applied June 20, July 21, Aug. 8, Aug. 26	.....	6.04	.....	.72
12	Stable manure	2 fruits from 2 plants	5.91	.....	.51
12a	" "	" " "	5.97	.90	.37

The fertilizer plots from which these fruits were taken are of two series. The samples 1 to 8 are from a general test to determine the values of nitrogen, potash, and phosphorus, alone and in combination. Six plants constituted a plot, and the fertilizers were sown on the surface June 20. The yields of these plots are shown in Table IV, page 195, of our last tomato bulletin (No. 45).

Samples 9 to 11 are from a series of plots designed to determine the relative merits of single and intermittent applications of nitrate of soda

(Tables I, II, III, Bulletin 45). These plots contained 15 plants each. Samples 9 to 9*c* are from a plot which received a single application of nitrate of soda of 3 lbs. June 20; No. 11 received the same total amount in four applications.

Samples 12 and 12*a* are from a plot to which a liberal dressing of good, fine stable manure was applied.

The soil in all these plots is a fairly good, dry and high gravelly loam.

It is plain from these figures that there was no uniform variation in the quality of the tomatoes. The differences are as wide between different fruits of the same plot as between the different plots. The variations in sugar in the samples from the same plot are well shown in 5, 5*a*, and 5*b*, in which the readings run from .69 to 1.22. We hope to repeat the experiment the coming season.

THE VETCH OR TARE AS AN ORCHARD PLANT.

Orchard lands are nearly always benefited by some cover or mulch during a part of the year, especially during fall and winter. One of the values of sod lies in the protection of the soil, but a sod can not be obtained in a single season. If orchards can be cultivated in spring and early summer and then protected with some growth which will shade the soil and keep it moist during the remainder of the warm weather and afford some protection from frost during winter, the best results will undoubtedly be obtained, as a rule. This cover crop should also afford fertilizing materials to the soil when turned under, and greatly improve the mechanical character of the soil, as well.

The leguminous plants—those belonging to the clover family—at once suggest themselves because they are rich in nitrogen, and may therefore serve both as cover and fertilizer. We have tried mixed beans and field peas, but there are objections to both, although either one is probably better than weeds or bare ground. This year we have tried the European vetch or tare (*Vicia sativa*), seed of which we obtained of J. M. THORBURN & Co., New York. This plant is grown for forage in England. A half bushel of seed was sown June 16 upon five eighths of an acre of heavy clay loam. It was sown broadcast upon a freshly prepared surface, and well dragged in. The seed could have been sown later with equally as good effect, no doubt, and the cultivation of the orchard could have been continued for ten days or two weeks longer. The young trees of pear, plum, and apricot have made an excellent growth this year among the vetch. The vetch started somewhat slowly and the seeding seemed to have been too thin; but by the middle of September the ground was covered thickly. Frost came October 1, but the vetch was not injured and it continued to grow until the middle of the month, and remained green still longer. It made a remarkable cover, growing knee high in a dense mat and everywhere completely covering the ground. It began to flower in September, but no seeds ripened except upon a few poor spots. Upon light soils, seeds would probably form freely, but the plant is an annual and is not likely to become a weed. The roots do not extend deep. With the approach of hard freezing weather, the stalks fell upon the ground, where they now lie like a thin even covering of old hay. The stems are soft and can be easily plowed under in spring and will soon decompose; and they will not keep the soil wet too late in spring, which is an important

point upon clay soils. On the whole, we are much pleased with the vetch as an orchard plant, and shall use it again.

Samples of this vetch including four to six inches of the roots, gave the following fertilizer analysis:

	Original substance.	Dry substance.
Nitrogen	.65 per cent.	3.10 per cent.
Phosphoric acid (P_2O_5)	.146 "	.70 "
Potash (K_2O)	.475 "	2.28 "
Water	79.15 "	

Compared with clover, the fertilizer value is high. The following are summaries of several analyses of red clover:

	Dry substance.
Nitrogen	2.05 per cent.
Phosphoric acid	.66 "
Potash	2.24 "

SUBSTITUTES FOR GLASS IN GREENHOUSE ROOFS.

There is much inquiry for some cheap substitute for glass for greenhouses, and various preservative preparations are recommended for the treatment of cloth and paper to be used in roofing. We have tried paper one season and cloth two seasons, and find both to be entirely unsatisfactory for a winter roof in this climate. They are cold, dark, and not durable For summer or late spring use, oiled muslin is fairly satisfactory. Plants which require a heavy shade in summer can be grown to advantage under such a roof. In the summer of 1891 we found a cloth-roofed house to be an excellent place for flowering the tuberous begonias. Cloth roofs, with ordinary oil treatment, last less than a year, and paper is so easily torn and punctured by drifting twigs that we consider it nearly useless for roofs. It will also tear after a short time by a heavy wind from the inside if a door or ventilator chances to be open. The cost of a few annual roofs of this character will pay for a glass roof. Even if the cloth were to last for two or three years, it would soon become very dark from a collection of dirt and the growth of mildew.

Our first experience with these covers was the use of paper in the fall of 1890. The paper used was a thin, white, stiff, architect's drafting paper known in the trade as "Economy." This was laid over the sash-bars and was held down by the caps used for holding butted glass. It was then thoroughly saturated with raw linseed oil. It had been in place but a short time when an ambitious cat attempted to walk over it, and made a hole at about every other step. After a few weeks of vexation, the paper was removed, and a medium quality of unbleached muslin cloth was substituted, being laid on in the same way. This muslin was oiled twice with raw linseed oil. This was in December. The cloth lasted until late spring, but became very black and dirty toward the last. In the fall of 1891, another covering of the same muslin was laid, and this received three coats of raw oil. This lasted until the next summer.

This roof is now covered with glass.

L. H. BAILEY.

REPORTS

OF

DISTRICT AND LOCAL SOCIETIES

IN MICHIGAN

FOR 1893.

DISTRICT AND LOCAL SOCIETIES IN MICHIGAN

WEST MICHIGAN FRUITGROWERS' SOCIETY.

OFFICERS FOR 1892.

President, D. W. WILEY, Douglas; *first vice-president*, F. J. RUSSELL, Hart; *second vice-president*, GEORGE MCCLATCHIE, Ludington; *third vice-president*, AARON BOS, Forest Grove; *fourth vice-president*, W. H. PAYNE, South Haven; *fifth vice-president*, ALBERT JACKSON, Lowell; *secretary*, C. L. WHITNEY, Muskegon; *treasurer*, W. A. SMITH, Benton Harbor; *executive board*, J. R. HOUK, Ludington; JOSEPH LANNIN, South Haven; J. A. PEARCE, Grand Rapids; WALTER PHILLIPS, Grand Haven; ALEXANDER HAMILTON, Ganges.

ANNUAL MEETING, AT GRAND RAPIDS.

The opening session of the joint meeting of the Grand River Valley Horticultural society, the West Michigan Fruitgrowers' association, and manufacturers of fruit packages was held in the Farmers' club room in the county building.

J. A. PEARCE, president of the Grand River Valley society, delivered the address of welcome.

WALTER PHILLIPS, of Grand Haven, responded to the address of welcome. He urged that the study of pomology be continued with renewed energy. He paid a tribute to the work of CHARLES W. GARFIELD and thanked the society for the cordial welcome extended.

President JOS. LANNIN of the West Michigan Fruitgrowers' association then delivered his annual address in which he said that the fruitgrowers were the most disinterested men in the world as regards their business. In every other business, when men discover anything, they immediately obtain a patent for it, but the fruitgrowers give up all they discover to each other. If a man leaves his profession in any other walk of life, be he preacher, doctor or lawyer, he immediately learns all about the fruitgrowing business, if he goes into it, by asking the discoveries and experiences of those who have spent their lifetime in the business. He closed by inviting all to express views freely upon the fruit question.

Secretary C. L. WHITNEY of Muskegon then discussed the question of fruit packages. He said uniformity is the main object in view. He advo-

cated, as a remedy for the evil of unhandy packages, which are a bugbear in shipping fruit, that by a unanimity of action the fruitgrowers establish a certain size. All manufacturers would then manufacture that size, and those that would not do so would have to stop making other packages if all growers would agree to buy only a certain size. This would make shipping easier. He urged the necessity of having good roads. This is of the utmost importance to those who have to go a long distance with their produce, and is of equal importance to all farmers, whether fruitgrowers or not. "The society is out of debt," he said, "and our expenses were less than the year before, and this year they will be still less."

The following committees were announced by the president:

Resolutions—The Hon. F. J. RUSSELL of Hart, D. W. WILEY of Douglas, and CLARK SHEFFER of South Haven.

Fruit—A. HAMILTON, THOMAS WILDE, and A. BOS.

The question box was opened for the receipt of questions during a recess which was taken for that purpose. Then followed a general discussion. Mr. R. M. KELLOGG of Ionia was called upon to give his opinion on the benefit derived from mulching sandy land in the fall. He said there was no benefit in doing so, with sandy soil, but he had found it beneficial on heavier soil. For several years he had mulched everything. Mulching strawberries made a late crop, but it gave a better crop and was consequently profitable. Mulching with manure was a bad policy and spread weed seeds, but with a covering of chaffy straw the plants are protected and the leaves remain green during the winter. As soon as picking is over he mows his plants and then burns them over. He thought a great deal of that practice, as it helps to kill off the insects.

"Will cutting back new peach trees in September help to ripen the fruit?" was the next question. D. W. WILEY knew no good reason for cutting back the trees. ALEXANDER HAMILTON thought it would not tend to ripen the fruit, having the contrary effect instead. W. N. COOK knew of a case in which a growth of brush had been stimulated with detriment to the fruit. Mr. PEARCE knew of an instance in which the trees had been seriously injured by the practice, and did not favor it. Mr. ADAMS tried it on one tree, and the tree did not produce any fruit and was permanently injured.

Secretary WHITNEY related the history of the Michigan exhibit of fruit for the world's fair. The canned fruit exhibit, he said, had been neglected. Cans had been contracted for to hold seven and eleven pints; but when they were ordered the committee was told that the works had shut down, and no cans could be procured until Sept. 1.

J. J. WOODMAN of Paw Paw was called upon to open the discussion on the question, "What has been done, is being done, and should be done, to make the Michigan fruit exhibit at the Columbian Fair a success?" He said that he had not been connected with the pomological exhibit as was understood, but had taken a few steps in the matter and that he had appointed Judge J. G. RAMSDELL to take charge of the same. He was not here to instruct or advise, but merely on business connected with the World's Fair. "You have started," said he, "to make an exhibition at the World's Fair and you can do it well. I've been over the world a great deal and I have never seen a place that equaled Michigan. I have said it and say it again, Michigan is the garden of the world. I am here to hear what you have to say. I am not a fruitgrower, but am an ordinary farmer, and as such I'm connected with you in your interests,

although not a member of your society. It's Michigan that we're working for and we must put Michigan to the front at the World's Fair."

Mr. WILEY said he was formerly a member of the pomological committee of the World's Fair, but had resigned because of poor health and a lack of funds to work with. He said even now failure stared that committee in the face, as there seemed to be no funds.

The president here stated that he heard there was money, but wanted to know where it was. Mr. WOODMAN then stated that there were $4,000 appropriated for a pomological exhibit at the World's Fair, and that in order to get that money, itemized sworn statements of accounts must be sent in and would be paid.

The secretary was requested to state on what terms the committee was expected to work. He said that each member was supposed to give his services free, but a number of poor men could ill afford to give their services. He further stated that a large amount of canned fruit was ready for exhibition. Also a large amount of fresh fruit of 1892 had been put in cold storage for exhibition in 1893. Much could still be done and Michigan could make an excellent exhibit of strawberries. He thought the commission should purchase the fruit, certainly from those who could not afford to send it.

Other expressions of a similar character were heard from members and other interested persons, after which the meeting adjourned until morning.

MORNING SESSION.

President LANNIN called the morning session to order promptly at nine o'clock. Before proceeding to business he stated that any who were present might take part in the discussions but only members in good standing would be permitted to vote on questions which came to a vote.

The first question announced by the president for discussion was "Why did not apple trees bear as well this year as in former years?"

Mr. D. W. HINMAN of Ganges advanced the theory that the weather was so damp and wet that the pollen was washed off and destroyed.

Mr. KELLOGG of Ionia thought that excessive bearing had lowered the vitality to such an extent that it was impossible for the trees to bear other than blighted fruit.

Mr. THOMAS WILDE thought the excessively wet weather of last spring was the principal cause, but thought lack of fertilization had something to do with it.

The president called attention to the excessively cold and wet weather of last spring, and held to the theory that the pollen had been washed away and destroyed.

Messrs. HUTCHINS, WILEY and BILLINGS also took part in the discussion.

"Is cold storage practicable for individual fruit growers?" was the next question announced for discussion. The matter of placing an expert in charge of the pomological exhibit at Chicago, during the World's Fair, was called up by Mr. WOODMAN. Secretary C. L. WHITNEY of Muskegon moved that the committee having the matter in charge recommend to the World's Fair commissioners a suitable person for this position, who shall also collect and forward the exhibits to be made. On a suggestion he is to be entitled general manager. The resolution was carried.

Mr. W. K. MUNSON was asked to state his views regarding cold storage,

and responded by placing on exhibition some specimens of grapes so preserved.

Secretary WHITNEY gave his experience, and stated that in the matter of butter he had saved at leat $100 last season. He said he thought there was a money value in it, and that Judge RAMSDELL was intending to try it.

Mr. MUNSON said that cold storage, where ice was used was a failure; that was the experience of eastern buyers. He described a storage house he was using; said that it was as cool as a cellar six feet deep. The temperature in his storage house stood at 50° to 60° Fahrenheit. In his opinion cold storage was a failure.

Mr. J. L. HOPKINS of South Haven said he had seen, within a few weeks, a potato which had been kept in a hotel refrigerator for four years. He described the refrigerator, and said that it seemed to work perfectly.

A paper on "Good roads in marketing fruit," was read by Hon. S. S. BAILEY of East Paris. Every wagon load of sound fruit brought over good roads and marketed by the grower is a wagon load of health. Every bruise is an injury to the fruit and a loss to the grower. The loss sustained by reason of bruised fruit at first sight seems to fall upon the buyer. But this is not true. It is the grower who has to bear the loss by reason of lessened prices. Rough roads invariably bruise to a greater or less degree every load marketed. In order that all may get the benefit, we must have better roads; not merely better roads, but the best roads that ingenuity of man can devise. We want laws that will compel all who use highways to contribute to their support. Men are not angels, and we must take men as they are, and compel them to do that which they should do without any compulsion. Good roads not only contribute to the general welfare, but to the profit of all who have occasion to use them. The fruit-grower, more than any other, profits by good roads, and we should leave no work undone which will lead to the construction of smooth, hard highways.

D. W. WILEY agreed with the ideas advanced, and stated that the subject had lately been very broadly discussed and he thought much good would come of it. He instanced Black county, Ohio, where there was not a road but was macadamized; yet forty years ago the roads in that county were almost impassable. One of the benefits noted there was that farm lands had increased $25 per acre.

Mr. SESSIONS also spoke briefly and favorably of improved roads.

Mr. A. W. SLAYTON then read a petition addressed to the senate and house of representatives in congress assembled, which he stated was now being circulated extensively throughout the United States. The petition asks that there be established a road department in connection with the agricultural department, for the purpose of promoting knowledge in the art of road-building. It also asks that a permanent exhibit be established at the Columbian Exposition.

Secretary WHITNEY said that Mason and Muskegon counties had already moved in the matter and had a number of miles of graveled roads already constructed. He then moved that the matter of legislation be referred to the committee on resolutions; carried.

A recess of fifteen minutes then intervened. After the recess Judge RUSSELL was called to the chair while President LANNIN of South Haven read a paper on "The commercial pear orchard—what soil to choose, what varieties to plant, and how to cultivate." Mr. LANNIN stated that, owing to ill health, he had not prepared a paper but thought he knew enough of

the subject to state his views. As to what soil to choose, he said it was not advisable to plant a pear orchard on low grounds; high, rolling, and rich ground was the best. If it was underlaid with non-porous subsoil, no fruit trees should be planted with the expectation of raising fruit at a profit. Altitude and a warm, rich, friable soil are necessary. As to what variety to plant, he said great care should be exercised in the selection of trees. He thought pears more profitable than apples, one year with another. A tree of the Bartlett variety will bear one and one half bushels. Bartlett and Seckel were standard varieties, and no one could go far amiss who selected these varieties. True, there were many varieties, but he advised all to go slow on new varieties. "If I were planting an orchard of 1,500 trees I would plant 100 of the Sheldon variety, as they ripen early, and if well cared for are good bearers." Flemish Beauty is highly recommended by some, but unless the soil is highly adapted to pear-growing, he would not advise the planting of any of them.

Mr. LANNIN said he would set out 1,000 Bartletts in an orchard of 1,500 trees. The great fault noticed with the Sheldon is that they are "shy growers." The Anjou is a spreading, handsome tree. The fruit is late fall or early winter. They are hardy and prolific bearers, the fruit keeps well, but is not highly flavored. He would plant 200 trees. The Seckel is a nice, well-flavored, small pear, but he would plant a few. The Lawrence is almost as good as the Seckel, but is a slow grower; still, it bears well on arriving at "years of discretion."

After naming and giving the characteristics of a number of varieties of pear, he spoke of the Bosc as his favorite; said it was a finely flavored fruit, and showy. The tree presents a rather mean appearance and is rather tender than otherwise. He would by all means plant a few—perhaps thirty—trees. He believed in fertilizing; thinks horse manure the best, and never uses commercial fertilizers. There are about 1,200 varieties of pear, and out of this number there are only about a dozen varieties that can be profitably grown here. He had tried spraying with London purple for the codlin moth and curculio, and when he diluted one pound with 100 gallons of water he destroyed the leaves. Good results were obtained by diluting to the extent of 250 gallons of water to one pound of London purple.

A somewhat general and very interesting discussion followed, during which the fact developed that two-year-old trees taken from the nursery did best, and that seemed the best age for transplanting. The young trees should be trimmed to a stick and set shallow, twenty feet apart. The best time for trimming is early in July.

"What size and form of fruit package shall we use, and how can we secure uniformity?" The discussion was led by J. A. PEARCE, Grand Rapids, on the part of the fruitgrowers, and by ALFRED J. BROWN from the standpoint of the commission men.

A number of baskets were displayed. Mr. PEARCE first spoke of the evolution which had taken place in the packages used in marketing of fruit. He favored uniformity and thought some action looking to uniformity should be taken.

Mr. BROWN gave his experience with packages used in shipping peaches. The cover should be so constructed as to be quickly put on and easily taken off. He recommended a nine-pound grape basket in preference to any other size. He knows that some of the seven-pound packages were sold as nine-pound packages. He thinks that Michigan peaches should be

marketed in bushel baskets because they are best known in such a package.

The following resolution was offered by Mr. W. K. MUNSON:

Resolved, That a committee, composed of the basket manufacturers represented here, and two members from each fruit society, be elected to confer together and recommend a standard size and style of package for our use, and report at the afternoon session.

The resolution was adopted and J. A. PEARCE and W. K. MUNSON of the Grand River Valley society; D. W. WILEY and ALEXANDER HAMILTON of the West Michigan association; A. J. BROWN on the part of the commission men; E. A. STOWE on the part of the retail grocers, and H. O. BRAHMAN and L. C. WOODMAN on the part of the Grand Rapids fruitgrowers, were chosen such a committee.

AFTERNOON SESSION.

At the afternoon session, the subject for discussion was that of "Experience of the season with varieties under cultivation." In the absence of G. H. LAFLEUR of Millgrove, the discussion on his paper, "Can anything be done to induce our old apple trees to produce fruit enough for home use?" was general, and several members gave experience with apple orchards, showing that with proper care and cultivation the orchards could be made to bear good crops. It was the opinion of the members that the apple crop properly attended to was a very profitable crop.

J. G. RAMSDELL of Traverse City, who was on the program to read a paper on "Small fruits," was not present and the topic was given out for general discussion. THOMAS WILDE, the veteran fruitgrower of Ottawa county, gave his points on strawberry culture. He said the Warfield berry was altogether the best for market. He said the best fertilizer for berries on sandy soil is potash, although plenty of stable manure was excellent. He said the three best varieties for shipment were Warfield, Crawford and Long John, while Jessie, Bubeck, Crawford, Sharpless and Eureka were, in order named, the best for the home market. He had strawberries for sale from June 15 to July 15.

JAMES L. HOPKINS of South Haven, who is a successful grower of gooseberries, gave some points on the culture of this not very popular berry. He said the gooseberry was the most profitable of small fruits. A neighbor of his put out half an acre of gooseberries and netted from $100 to $200 per year from it. The same man had spent $90 for ninety bushels of seed wheat and had raised 400 bushels which he sold for $350. He put out 500 plants of the gooseberry and was sorry he had not mortgaged his farm and bought 5,000 plants, for the gooseberry proved to be the best crop on the farm.

EVENING SESSION.

In the beginning of the evening session the committee appointed to suggest a uniform shipping package for fruit, presented the following report:

Resolved, That we, the committee appointed by the meeting of the fruitgrowers and basket makers, recommend the adoption for the shipment of peaches and grapes, what is known as the regular one fifth Climax peach basket, that has been so largely used the past season; we also recommend the adoption of what is known as the standard five pound basket.

We further recommend that no fruitgrower adopt or encourage the manufacture of any smaller "climax" basket and urge no manufacturer to make smaller sizes than the above.

We also recommend continuing the use of the standard one half and bushel basket for shipment of peaches, and that we deprecate the cutting down of the present size.

An amendment was adopted to the effect that the package shall go with the fruit, and adopted the wine measure quart as the measure for small fruits. The report as amended was then unanimously adopted.

A paper on "Fine and superior fruit for market" was read by A. ADAMS of Shelby, and a general discussion of "Transportation and marketing of fruit" followed. "Peach culture" was the subject of an interesting paper read by C. M. SHEFFER of South Haven. He advocated the cultivation of the soil and the matter was made the subject of a long discussion, in which many of the members took part.

The committee on fruit reported the receipt from growers of eleven varieties of apple and two varieties of grape.

Judge RUSSELL, as chairman of the committee on resolutions read a petition asking congress to establish a road department in Washington where students could be trained in road-making in connection with the agricultural department. The committee was of the opinion that the petition did not embody the requirements of farmers in the matter of roads, and was also of the opinion that there was as much liklihood that congress would be struck by lightning as that it would grant such a request. The following resolutions were then submitted:

Resolved, That the urgent demands of fruitgrowers, as well as all other classes of producers, require a change in our state laws that shall provide us with adequate improvements in our system of public highways.

Resolved, That the West Michigan Fruitgrowers' association and the Grand River Valley Horticultural society, in joint meeting assembled, respectfully urge upon the members of our State legislature the importance of enacting such laws as shall be necessary to meet their generally admitted needs.

Resolved, That the secretary of this meeting be instructed to forward a copy of these resolutions to the secretaries of the State legislature when they assemble.

Resolutions of thanks to the Grand River society, the local press, and others for courtesies extended, were also submitted. All the resolutions were unanimously adopted.

A short recess was then taken and the West Michigan Fruitgrowers' society then proceeded to ballot for officers.

After some further discussion of fruit and methods of growing it, the meeting adjourned.

WASHTENAW COUNTY HORTICULTURAL SOCIETY.

OFFICERS FOR 1893.

President—W. F. BIRD.
Vice-Presidents—WM. MCCREARY, O. R. L. CROZIER.
Recording Secretary—JACOB GANZHORN.
Corresponding Secretary—A. A. CROZIER.
Treasurer—JOHN H. ALMAND.
Executive Committee—E. BAUR, H. C. MARKHAM, J. C. SCHENK.
Botanist—Prof. V. M. SPAULDING.
Entomologist—Prof. J. B. STEERE.
Hygienist—Dr. V. C. VAUGHAN.

At the January meeting, coming close after the holidays, there was such a small attendance that a formal meeting was not opened, but horticultural subjects were freely talked over in a social way between President J. AUSTIN SCOTT, ex-Gov. FELCH, and the recording secretary. The Governor, now a large peach-grower here at Ann Arbor, having been attracted to this meeting by the proposed subject of nut culture, but, owing to the small attendance, this was postponed to the next meeting.

At the February meeting President J. AUSTIN SCOTT presided.

The subject of nut culture, postponed from the last meeting, was taken up, and Secretary, J. GANZHORN, read the following paper:

That the cultivation of nuts in the United States should not have been attempted until the close of the nineteenth century may seem singular, though when we consider that the natural forests in which our country abounds have supplied us with this valuable product only for the gathering, the reason for delay may be explained. There is now considerable enthusiasm manifested throughout the United States in the cultivation of nuts, and especially in the south, and as the natural supply of the forests has given out, the interest in nut cultivation will be permanent. As tillers of the soil we can not look into this important matter any too soon.

We all like nuts, and have done so from our youth up. The gathering of nuts for the winter is one of the chiefest delights of boys. The nut is wholesome and very nutritious. It is essentially a winter fruit. Its oily substance produces heat, and I can speak from experience that when nuts are freely eaten in the winter season, less craving for meat is experienced. When the consumption of nuts will be fairly begun and their value become better known, there will be an increasing demand for them just as in the case of any other fruit.

About fifteen years ago I began to grow grapes here at Ann Arbor. The amount of my first crop was about one ton, and it was all I could sell in this market during the grape season. Now, when I am so fortunate as to get a good crop, I sell a ton every day in the same market, for weeks, and the supply has always given out too soon. But of course we can not expect that the increase in the demand for nuts will be as rapid as for the grape; but, neither can the nut be produced so quickly and rapidly. The nut does not come into bearing so soon, nor does it yield so largely a short time from planting; and although it is a product coming slowly into a profitable investment, it will be a safe and permanent one.

If varieties are selected adapted to our soil and climate, we have nothing to fear from cold winters, and, for some time to come, comparatively little from the depredations of insects.

Nut trees are valuable for their timber also, and this item alone, in the long run, will make a paying investment. The timber grown in orchard form will be more valuable than when grown singly, as is now largely the case. Trees growing together in a larger body, grow up straighter and therefore make more valuable timber. In the case of the hickory, the demand for its timber for handles of a great variety of tools, and for other uses, will be almost unlimited. The supply of this most valuable timber is already giving out, and wood of less strength has to be resorted to.

As a timber tree the black walnut has never been fully appreciated by Americans. Germany recognized its value long ago, and has made repeated attempts to grow it for its timber, but they have failed. The tree does not seem to thrive there.

But, going back to nuts, we find them on every fruit stand throughout the country, and the amount consumed in the aggregate must be enormous. That the nut has not found a place in the eleventh census, I think, has been an oversight. To know the amount at present produced, and how produced, by our natural forests as well as by cultivation, would have been valuable information just now, as a universal interest in the nut is awakening.

A large portion of the nuts used in our country are imported. Not that the foreign nut is better than our own, but other countries went into nut culture sooner than we. I have found no nut growing wild in Germany but the hazel nut. The leading highways in the southern part of Germany are lined with the English walnut. They make handsome shade trees, and the nuts are an important commercial article. I have a tree of this sort growing on my place, on trial, but it is not yet large enough to bear.

For richness in quality, I like our American black walnut better. I have had a black walnut in bearing on my place for some years, that I grew from the seed planted in the fall of 1875. I exhibited from this tree as much as a half bushel of nuts some three years ago, at our county fairs. So far there has not as yet been any premiums offered for

home grown or cultivated nuts at our fairs, but I believe that the time has come when this branch of husbandry should be recognized and encouraged by our fair associations.

It should ever be the aim of every country to produce everything it can for supply of its wants, and, so far as possible, so much as it needs. Home industries should not be neglected. The more we can export and the less we need to import the better will be our prosperity. Therefore, let us go hand in hand to improve and develop our own resources.

We have been much delighted with the American sweet chestnut, and it well deserves its extended pupularity, but it does not seem to thrive in our clay soil. I have found it to flourish on the sandy ridges below Cleveland, Ohio, and there are some very large trees growing wild on some sandy knolls at Monroe, in this State, but I have not noticed that where planted on our clay soils, the chestnut has done very well.

The black walnut flourishes best on rich bottom land, but does not grow well on wet land, and becomes scrubby on elevated knolls, or in poor soil. Yet, whenever the right conditions exist, it is one of the most valuable nut trees we can grow.

The hazel nut grows wild and abundantly here in our county, and bears quite regularly. Some monks in Bavaria have produced some new and improved varieties of the hazel nut which are much larger than our wild nuts. It may be well for us to experiment with these in a limited way and watch results. I have a large bush of the English filbert growing, but so far it has not fruited. The number of varieties of nut that promise to be successful are at present quite limited, yet there are enough of them to make a beginning.

The southern states are now looking to the pecan as a sort for a money enterprise. It is found to grow so far north as Missouri, but it is claimed that the best pecans grow in Mexico, and that the further north from there it grows, its shell becomes thicker. Comparing the pecan, however, to our black walnut I don't see that we are at any disadvantage in not being able to grow it here in the north.

I have a piece of land on my fruit farm which is not in good shape for cultivation, but as it is covered with nice hickory trees and a few butternuts, I will let it go into a nut grove. I am cutting out everything but the nut trees, and intend planting other sorts than are now growing wild there, to fill up the gaps. In the coming spring I intend to plant black walnut trees in the streets where I own land, as shade trees, instead of maples.

President SCOTT said that the cultivation of nuts might be made as profitable as any other branch of fruit culture. It had come to his notice that a gentleman had realized $18,000 from the timber of nut trees, on ten acres of land. His own experience in cultivating nut trees has been very favorable. He planted on his residence ground, here, at Ann Arbor, a number of walnut trees, which attained a height of twenty feet. The planting of nut trees he believed a good thing for fence posts, leaving or planting the trees where the fence is wanted, attaching the wire to the trees.

Prof. E. BAUR spoke of nut oil being used in Europe in the praparation of salads. It is largely used in Germany and other places for culinary purposes.

Mr. E. NORDMAN discussed the paper at length. As a pioneer farmer he found the nut trees largely cumbersome, but when the nut tree can be used for shading pastures, and along the highways, he believed them useful.

At the April meeting President J. AUSTIN SCOTT presided. The meeting was fairly well attended. The subject selected for discussion, "The Art of Grafting and Budding," brought in a number who had never attended before. President SCOTT gave his life-long experience in grafting and budding, and he was very often asked questions. He was eagerly listened to throughout the meeting. He favored seedling bodies for apple trees, top-grafting them after setting into the orchard; favors low-headed trees, and to keeping them well cultivated till coming into bearing. Mr. W. F. BIRD exhibited the Field knapsack sprayer, and a barrel pump for spraying trees, etc., made by the same company, at Lockport, N. Y. Mr.

LUTHER PALMER of Dexter said that he is contemplating the construction of a spraying pump, to be rigged on a wheelbarrow, for the use of small orchards and gardens. Some of the speakers favored the Bordeaux mixture in a weak form, and using it often. Secretary GANZHORN argued for the mixture of full strength, and use of it often, too, and that the sulphate of copper should be procured at wholesale prices by clubbing together.

President SCOTT presiding also at the March meeting. The topic for discussion was "the improvement of our roads." Although not a strictly horticultural subject, yet it is very important to the fruit-man, as fruit is easily bruised and injured by carrying over rough and bad roads, and therefore its market value lessened. The March meeting for 1890 was devoted to this matter, and a petition sent to the legislature praying for legislation that might provide better means to improve the leading highways. The same subject was resumed at the March meeting last year, making this the third succeeding March meeting devoted to the same topic. Each of these meetings were largely attended, and an animated discussion held, showing an unusual interest in this matter. The meetings were also largely attended by leading farmers. Mr. E. A. NORDMAN, as per invitation at the last meeting, prepared a paper on this topic which he read, and it was highly interesting. The paper was lengthy, and treated the subject of making roads and keeping them in repair, in all its details. He closed the matter by recommending the use of gravel as a cover. Mr. FRED C. BROWN had been invited to attend this meeting and speak on the subject. He kindly responded to the request and read a well-written paper on the topic, which was full of important and original matter. He compared the roads in their primitive state, forty years ago, to those of today, and showed the great progress made thus far. The log culverts of the old time have given place to such as are now made of stone, anchored at the top and otherwise highly artistically finished. He believed the present law on road-making good enough if properly carried out, but would recommend provision for a road commissioner to have charge of a whole township, so as to secure a uniform system in construction and repair.

HON. J. L. LOWDEN, who could not attend, sent a paper giving his views on this subject, and it was read by the corresponding secretary, Mr. BAUR. This paper was full of practical suggestions, and is well worthy of close perusal. He urged the idea of raising a private fund by enterprising citizens, with which to construct a road or a part of one, with stone, as an object lesson to others. President SCOTT, Vice President SCOTT, both secretaries, Messrs. W. F. BIRD and J. C. CONRAD spoke in favor of macadamized roads and spoke of those in use in Germany, Ohio, Michigan and Missouri, where they give the best of satisfaction, making travel on them a pleasure. The desirability was discussed of appointment of a committee to confer with the council of Ann Arbor, on the subject, and to recommending to them the purchase of a stone crusher. The motion that such a committee be appointed finally prevailed, and E. H. SCOTT, J. C. CONRAD and W. F. BIRD were appointed. On the question whether or not the roads should be worked on a cash system, or continue on the old way, the farmers stand divided, but all agree that the roads need improving. They favor gravel instead of crushed stone, on account of the supposed greater cost of the latter.

The summer meetings are not regularly kept up, and are not much

attended. The fruit business is a very active one, and the fruitman must make use of every moment in order to keep up with his work. During the ripening season, shipments are made daily, excepting on Saturday, and on this day, often, the home demand is generally supplied, and thus local orders are delivered. Our meetings are held on Saturdays; and, besides delivering fruits about the city, there is often important field work put off for this day, and thus the time for attending a horticultural meeting is frequently crowded out, though often with much regret.

The fall meetings were largely devoted to the perfecting of arrangements for the holding of the annual State meeting. Different committees were needed to perform this work; these to meet frequently and reported progress made, and a good deal of time was thus consumed.

General review of fruit crops.—The apple was a total failure. The trees had blossomed well but failed to bring forth the fruit. Severe night frosts were probably the cause. The leaves were badly damaged, also, so that most of the growing season was required to refoliate the trees. The peach crop was good on the whole, though the orchards on the banks of the Huron river had their fruit buds largely killed during the winter. Prices were good. From $2.00 to $3.00 per bushel was realized for first-class fruit. The crop was mostly shipped to Detroit, the bulk going as freight during the night. The loading was done during the day, and in good order, no hurry being necessary as when shipped by express and tossed pell-mell into the car. The pear yielded fairly well and a satisfactory price was obtained. The plum does not make much headway here with us. A good many trees have been planted, though the fruit is always scarce. Some scattering trees bear pretty well, though, as an orchard fruit, it has not been successful. The black knot is largely responsible for the failure. The plum and the peach do not seem to thrive well together. The conditions, right for one, seem uncongenial for the other. The grape crop in general was good, though black rot still cuts off a portion of the crop. It is a very serious disease to fight. For commercial purposes the grape is not planted very much, and the number of vineyards does not increase largely, but many vines are planted by farmers for home use. The Concord is still the chief variety grown. Woodruff Red is making considerable headway among the newer sorts. The Niagara is a popular white grape and is a fairly good keeper. For winter keeping, the Rogers hybrids, owing to their thick skins and richness in sugar, are good sorts. Quinces usually do well here, but are grown in limited quantities. Strawberries are not grown extensively any more. The crop this season was a limited one. The raspberry is grown very extensively with us, and is increasing very much about here. The Cuthbert leads all other sorts, the Gregg closely following. Currants and gooseberries do well but do not receive much attention as a market fruit. Our heavy clay soil, largely prevailing, is a hindrance to these small fruits.

Ever since the organization of this society, the fruit exhibits at our county fairs have been in charge by our members, and the displays have been much improved. The nomenclature of fruits is attaining a higher standard at these fairs, and artistic displays are growing features. Farming is giving way to fruitgrowing in the vicinity of Ann Arbor, the peach leading.

JACOB GANZHORN,
Sec'y.

SAUGATUCK AND GANGES POMOLOGICAL SOCIETY.

OFFICERS FOR 1893.

President—D. W. WILEY, Douglas.
Vice-Presidents—Rev. J. F. TAYLOR of Saugatuck, S. R. LEWIS of Ganges, BYRON MARKHAM of Laketown, and C. E. BASSETT of Manlius.
Secretary—C. E. BASSETT, Fennville.
Treasurer—C. B. WELCH, Douglas.

This society has held meetings the first Saturday in each month, with the exception of the months of June, July, August, and September, when the care of the fruit crop made a meeting impossible. The discussions and papers have been of a more or less local nature and a fairly good attendance has been secured.

The January meeting was held in Douglas. Among those present was AMORY BIGELOW of Chicago who was invited to read his article on the chemistry of plant foods and fertilizers. His article proved quite exhaustive, in the course of which he claimed that barn manure is not all that fruit trees require, but other commercial fertilizers are demanded. He claimed that $500,000,000 represents the annual loss from insect pests annually in the United States.

The article served to introduce an article, sold by Mr. BIGELOW, which is known as the "Oriental fertilizer and insect destroyer" and which he claimed took the place of all spraying solutions with even better results. He also "thought" that the use of this preparation would prevent the yellows.

President D. W. WILEY then read the following paper on

WHAT THE FRUITGROWERS NEED.

"The needs of the fruitgrower are so numerous and the subject covers so wide a field that to even refer to more than a few of them would require more thought and investigation than I can devote to the question in a short paper at this time. I will therefore confine what I have to say to one or two of the important needs of the grower here on the lake shore, as they appear to me from past experience.

In the first place I believe the man that intends to engage in fruit growing as a business needs to have a natural taste and love for it if he expects to be able to realize all the benefits to be derived for his calling. If he possesses this he has one of the essential qualifications that will do much in guiding him in all the future details of his work. In the second place, the man that contemplates engaging in peach growing needs to know on the start that to allow deseased trees or trees infected with yellows to remain in his orchard for any considerable length of time is poor management and an objectionable practice and even though he may be prompt in cutting them down it will be sure to result in the loss of his entire orchard sooner or later. He also needs to realize that by this practice he is imposing upon his neighbor's interests and the welfare of all that are engaged in peach culture in the vicinity of his orchard. In localities where the custom of cutting down deseased trees and leaving them in the orchard has prevailed, whole orchards have been lost and thousands of dollars worth of valuable property sacrificed.

To properly gather, assort and pack fruit and put it up in the proper condition for market needs care and careful management on the part of the grower, in order to be able to realize satisfactory results. The fruitgrower will find the task of securing adequate remuneration for the products of his orchard to be one that will need attention to the correction of conditions in marketing that will be sure to be against his interest.

While the majority of fruitgrowers take great interest in all the details in fruit culture and delight in being able to produce large crops, which is highly commendable,

many of them seem to loose sight of a very important part of the business and when it comes to marketing their fruit they fail to have any well defined or practicable plan and seem to be ready and anxious to turn it over to the first fellow that comes along with a well arranged story to tell of the wonderful advantages possessed by the house he may for the time being happen to represent.

The system, or rather the lack of any system, as practiced by the growers and shippers of western Allegan county in the marketing of their fruit has many defects and has taken from the growers thousands of dollars each year. By the present system a large per cent. of all our fruit is consigned to South Water street, Chicago and West Water street, Milwaukee, there to compete against itself in crowding prices down to the lowest possible point and in prolific seasons this results in little less than the giving away of a considerable portion of the crop.

It is said that "It is more blessed to give than to receive." If this rule in any way can be applied to the peach grower of western Allegan county, they would be a much blessed people.

It is thought by many of the growers and shippers that the commission merchant gets more than his share of the price paid by the consumer for their fruit. That this is true to a great extent there can be no reason for doubt, as the consumer invariably pays a good round price for all the fruit he gets, while at the same time growers may be receiving barely enough to defray the expense of gathering and packing, to say nothing of the cost of production. That there are dishonest men in the commission business no one doubts, but, from having dealt quite largely with that class of merchants, I am willing to believe that much the larger per cent. of them are endeavoring to transact a fair and honest business, under a very faulty and objectionable system. This, to a large extent, has been brought about by the close competition existing between themselves in obtaining and holding trade and by the unreasonable demands made upon them by the producers and shippers. The merchant knows perfectly well that, in order to be able to retain the average grower's trade, he must attend to the one essential thing (that of making prompt returns) and in order to comply with this demand account of sales must be made out and mailed to the consignor on the evening of the same day the fruit was received. It is generally understood that a very large per cent. of all fruit consigned to Chicago and Milwaukee commission merchants is sent or forwarded by them to points outside and beyond these cities for final sale. That the merchant expects to, and in most cases does, receive more for this fruit than could be obtained for it at his store or place of business is evident and this doubtless, to a great extent, is the main incentive to the persistent effort made by him and his agents in obtaining consignments. The main inducement and stock in trade with these men is that their house makes prompt returns and possesses unlimited facilities for sending fruit beyond their own market to be sold.

Growers as a general rule insist upon having prompt returns, and the merchant, in order to comply with this demand, returns the price prevailing on an already over-supplied market, while perhaps the fruit sent him by the grower is still in transit to a market, where it will sell for a good price.

Now what the fruitgrower needs and is entitled to is all that is paid by the consumer for his fruit, less the actual and necessary expense incurred in freight and commissions. But in order to be able to obtain this he needs to know that the house he consigns his fruit to is perfectly reliable and have an established reputation for honest dealing. He can arrange to have his fruit sold where it will bring the most money, so that should it be necessary for him to wait ten or even thirty days for returns he would feel safe in doing so. This would enable the merchant to return the amount the consumer pays for the fruit, less of course the expense incurred in forwarding it. This, too, would relieve the merchant from the necessity of advancing money to pay for the fruit before he receives it, as he is called upon to do under the present system.

It will need to be borne in mind that all expenses incurred by the commission merchant in soliciting and in the advance of money and even the paying of checks come out of the grower's pocket in the end.

It is quite generally conceded by growers that there is urgent need for a radical change in the manner of marketing our fruit here on the lake shore if we hope to obtain fair compensation for capital and labor invested. Competition in the leading fruit markets are fast reducing profits to the lowest possible mark, without a corresponding decrease in expenses.

Numerous schemes have, from time to time, been advanced by growers with a view of obtaining better conditions for marketing their fruit, but so far there has been no marked progress made, owing no doubt to a lack of united action on the part of the shippers. It is thought the plan of having agents in Chicago and Milwaukee during the shipping season, to look after the general interests of those employing them, might

prove beneficial in many ways, but coöperation of the growers will be necessary if any reformation is to be obtained."

CARELESSNESS WITH THE YELLOWS.

A general discussion of the paper followed in which it was stated that it was not a difficult matter to burn yellows trees green. Mr. WILLIAMS emphasized the fact that more care must be used to destroy all infected trees. It was stated that, by using proper care, new orchards are now being raised around South Haven, where the yellows was once so destructive. O. S. BUSH stated that he had no faith in Mr. BIGELOW'S article as a preventive of the yellows, but moved that a committee be appointed to test it. The motion was carried and the chair appointed O. S. BUSH, H. J. KINGSLEY and JAMES WILLIAMS. Mr. KITCHEN moved to collect the subscriptions that were signed in aid of enforcing the yellows law. Motion carried.

The question of methods of selling fruit was brought up and Mr. BIGELOW, who was at one time a commission man, said that if he was a fruit-grower he would not ship a single package to a commission house. By the present system it is customary for the houses to reship their consignments and make returns at a fair average price. He advocated the auction sale system which is so generally used with California fruit. He knew that buyers soon learn the mark of an honest shipper and always paid a good price for that fruit.

The march meeting was held in Fennville and a very large attendance was secured.

After a fine bass solo by Rev. PESCHMANN, J. H. CRANE read the following paper on

TRANSPORTATION.

We all understand the meaning of this word in a literal sense, but when the implied meaning is brought to practical application we see there is often a lack of system that greatly detracts from the comprehensive view imagined. Fruit transportation being the subject under consideration, I will endeavor to present some thoughts for our consideration:

First:—After the fruit is grown ready for harvesting, the question arises what shall be the mode of transporting from the orchard to the packing house. There are various methods employed. Some by locating the packing house in the center of the orchard, have the fruit carried in, thus preventing any damage in getting this far to market. Others convey fruit to the packing house by means of an orchard spring wagon, fruit in bushel baskets. This conveyance is perhaps the best. Others use a boat similar to a stone boat and this makes a very good rig for the fruit is moved with but little jar.

Having considered transportation from orchard to the packing house, we will dwell for a moment on transportation to place of shipment. In the pioneer period of fruit raising the means employed in hauling fruit were somewhat ruder, leaving a field open for much improvement in the way of perfecting more accommodating contrivances in the shape of wagon boxes or fruit racks with a diversity of springs under them, which by our past experience has shown us to be absolutely necessary for the moving of fruit, if we would overcome the great strain on the baskets and the bruising of the fruit by the jar of the wagon. These being very objectionable features when the old-fashioned wagon boxes without springs under them were in use. Thus we see the advancement made in perfecting the means of transportation to place of shipment.

Now we proceed to consider the two modes of transportation to the market of consumption. This beautiful fruit country possesses all of the natural advantages, for the surety of a crop almost equal to California, for quality of soil a richness that produces the most luscious fruit raised on the face of the earth, for season of ripening we have a climatic influence which enables us to grow any of the excellent varieties that are now propagated, all ripening with perfection. For nearness to market, our location is nearly

all we could desire. Chicago, that marvelous city of all ages, furnishes our principle market and makes a grand distributing point for the whole west and northwest and being only about a ten hours' run by boat or rail, we get our fruit in market with a ripeness that is hard to be found in many of the large markets of the world. Being located between two opposing lines of transportation we are in position to patronize the line that furnishes the best accommodations in consideration of rates charged. In looking over the years gone by, we review all the imperfections of both lines of transportation. The boats, owing to the condition of Saugatuck harbor, have been rather small and having quite a large traffic to accommodate, had to load the fruit in the hole around the boiler room and pile it up high on the deck, which prevented the necessary ventilation of the fruit.

They were subject to the elements and often storm or wind bound, causing the fruit to be placed on the market late. Boats visiting the piers are not to be relied upon, for it is only in fair weather that they will attempt to visit them and often when they are able to leave the harbor they cannot reach the pier. This leaves the fruit-shipper in a state of anxiety, for if the weather is pleasant when the fruit is delivered, there may a storm arise before leaving time at Saugatuck and the fruit at the piers will be left. Owing to a lack of appropriations by the government, during the last ten years, for the Saugatuck harbor, it is a deplorable fact that the mouth of the Kalamazoo river has gradually filled up with sand until there is hardly a channel passable for small boats, making the harbor practically no better than a common pier. So we see that boat transportation cannot be relied upon without aid from the government to improve the harbor. Had the harbor been kept in proper condition, the improvement now in boats used for this traffic would have furnished the shippers much better accommodations than in former years.

I look over rail transportation for twenty years back. We find in the first place the American express company handling the small amount of fruit going in those days, but their prices were exorbitant, being a shilling a basket for less than ten baskets and ten cents a basket where more were shipped. The prices were ruinous to the fruit industry and the boats were getting nearly all the trade. Then the railway company, after two or three years, concluded that a portion of this traffic was really theirs and conceived the idea that by taking the matter in their own hands, furnishing better accommodations and rates corresponding to the boat, they would receive their share of the patronage. So they concluded to load the fruit here and unload it in Chicago, charging the fruit-shippers five and one-half cents a basket. This was gratifying to the fruit-growers and they drew a large portion of their fruit to Fennville.

The business of the railroad grew to such proportions in four or five years it incurred the necessity of hiring so much extra help to load and unload the fruit which was not ordinarily a part of their business, and it caused so much more work for their depot agent that it made it difficult for them at all times to secure a proper man for this position when needed.

Viewing the circumstances, they concluded to turn this business over to the American express again, provided they would take it and make rates to the people that would not diminish or retard the trade that had yearly been growing upon them. So the proper arrangements were made and the American express had agreed to take the sole charge of this fruit traffic, delivering the fruit to the commission houses, charging the fruit-shippers six and one half cents for the whole service rendered. The change did not seem to discommode the fruit-shippers for three or four years during years of light crops, but in seasons when the yield was heavy there were many objections to their system of handling. In loading they used up a great deal of unnecessary time in requiring the fruit to all be tallied into the cars, and it was very important that this tally was always correct for that was their essential guide in unloading in Chicago. This was done on a very small platform which would not accommodate but one or two cars at a time and the exactness they required in delivering the fruit to the commission houses, not allowing any house to move their fruit until the cars were all unloaded and each lot had been properly checked, making a source of great loss to the fruit-shipper for it necessitated the late delivery of the fruit on South Water street, and with the train late, nearly the whole day's shipment would not be on the market for sale the day of arrival. Such an occurrence would damage the fruit-shipper for the immediate day and for a week after, as the market once demoralized by this tardy manner of handling the fruit, is hard to rally to its former prices.

With all these objections to the American express, there was still another of equal importance to the fruitgrower. There was the handling of the fruit in and out of the cars, the men that they employed, having no particular interest but to get the fruit in and out with as little inconvenience to themselves as possible, would handle it roughly; although with often repeated protestations the fruitgrower had no redress only in the

vent of his angry expostulations, for the employé cared only for the wages he earned and the American express had an eye for the lucrative emolument of this business rather than the satisfaction or accommodation of the fruit-shipper. All these grievances consummating in the season of 1888, when the crop was unusually large, created such dissatisfaction that the shippers began to look for a remedy. Our industry seemed to be threatened with ruin, but as has been said, "circumstances are the mother of invention," so we find it. A few of the growers having learned of the granger system of handling fruit resolved to organize what is now known as the Fennville Fruit Shippers Association, having for its first object the loading and unloading of their own fruit and the transportation of the same.

Now to enumerate some of the past accomplishments of this association. By diligent and untiring zeal they at last gained favor with the C. & W. M. railway company to allow us the privilege of a special train as they had the American express company on which to operate our system. The general freight agent and assistant general freight agent met with us several times to promote and advance this mutual interest which was growing between the fruitgrower and the railroad company and perfect this system which we were going to adopt. It was finally agreed that we would do away with the shelving and load cars to a minimum of 20,000 and they would make us a special rate of 26c per 100 pounds on full cars and 29½c on partial cars. By this arrangement the association would be able to handle the fruit for 3½c a basket instead of 6½ and the fruit would be under our care in loading and unloading. The railroad company agreed to furnish us with one hundred new cars thirty-eight feet long with a ventilated door; thus our fruit would have to be only five or six baskets deep to get in a carload and with the ventilation, afford excellent transportation for the same. They also agreed to bring up the matter of extension of platform with the Michigan Central railway, that we might have room to unload six or eight cars at a time. Before the fruit began to ripen in 1891 all these agreements were fulfilled. Thus began the operation of our granger system of transportation.

Now, to make this a success from the start we concluded it was expedient we should employ agents both here and in Chicago who had some experience in loading and unloading, and were also acquainted with our system of manifesting the fruit into the cars, and checking it out carefully to the commission men. So for our loader we employed Mr. AL WHITBECK, whose services for the American express company had given him an opportunity to gain the knowledge of properly conducting the manner of loading, and the propriety of giving the best service to the shippers He soon acquired the mode of manifesting the fruit and when an assistant was needed he could properly instruct. For our unloader, N. K. GOODRICH, of Chicago, was employed; his excellent service rendered us in organizing our association and his past experience in conducting the affairs of the southern Illinois associations which are operating this system of transportation, induced us to show our appreciation for his instructions, feeling that he would extend his best efforts to make this meet our approbation.

We went through the season of '91 with a marked degree of success and with the exception of holding the train a few times for some of our tardy shippers we made a very good record and did our part of the work better than the railroad company, for they were a number of times late when we were not instrumental in bringing it about. We also demonstrated that it was not necessary for our unloader to have a solicitor for Fennville and vicinity, for the people were much more inclined to patronize the railroad company when they felt there was no third party in this deal. As the season came to a close and we took a retrospective view of the operations of our acquirements, we concluded that this system of dealing with the transportation of our fruit had almost met our highest expectations.

The report showed we had handled 398 carloads; paid freight to the amount of $21,131.40; labor, $2,985; amount of balance to our credit, $289.82; amount paid for shortage and a few incidental expenses, $119.67; leaving in the treasurer's hands at the close of the first season's operations $170.15. This was highly gratifying to the fruit-shippers in general and filled the members with zeal for the work in prospect for 1892. The executive board for this season deemed it very essential, to facilitate the advantages of loading, that the C. & W. M. railroad should make a fill on the west side of the west side track, grading up the driveway there, to make it convenient for one team to pass another, giving a longer driveway and better accommodations for getting back into the streets of the village. By earnest endeavor they were able to get the officials of the railroad company on the grounds to view the actual conditions. Then our request was granted and before the season for shipment had arrived the work was finished up in a very satisfactory manner.

The directors next conceived the idea of road-building and thought by the aid of the good will of the shippers as a leverage, they could induce the railroad company to fur-

nish us 30 carloads of gravel to improve our town line road from the railroad two and a half miles west. By the coöperation of the village and the aid of the farmers in furnishing teams to haul the same from the depot, we expected to make a permanent improvement to this road. The committee, by studying the matter thoroughly, resolved that it was essential that the hills be lowered and something of a grade be established before we went forward with this work. Then they could see plainly that gravel was not the material to apply to sand and it was then decided to veneer as much of this sandy road with clay as we could get boom labor to coöperate with us, we to pay all the expenses of shoveling and grading. As the season was somewhat advanced before all plans were perfected and work on the farms crowding, it made it more difficult to rally a large force. One or two days we had out eighteen or twenty teams and for the time employed we made a grand showing and every farmer realized how much easier his team could transport the large loads of fruit from farm to railroad than in former years.

The gravel we had expected to use to give the finishing touch to this road had to be abandoned for this season. The village having their street thinly clayed and knowing in a wet time with heavy loads of fruit going over this thoroughfare it would soon cut up as to become almost impassable, they were determined therefore to complete their road while the gravel was on hand and could not be used by us and it being the railroad company's desire that the work of graveling be commenced at the railroad. We can all see with what perfection it finished the street.

Returning again to our system of transportation, will say the same loading and unloading agents were employed and we decided to retain a copy of our manifests for future reference which we did not do the first season. The work of the association in handling the fruit was performed with dispatch and we could not, as shippers, ask for a better system. The railroad company did not accomplish their part of the work so satisfactorily and our protestations were often and censorious, but the boats did such abominable work that we can feel almost highly favored that we had as good service as we did.

Our report shows we handled 239½ car loads; paid freight to the amount of $11,648.48; paid labor $1,736.25; paid shortages $155.25; balance on hand at close of season $553.52. In road building the whole amount of expense involved, including $107.25 worth of donated labor, was $517.09. This subject of better roads throughout the state should arrest the attention of all farmers. By a money tax we could soon put our main road in a condition that would acquire but a small expense to keep them in repair, and good roads add materially to rapid and easy transportation in marketing all of our produce as well as fruit.

Although the Fruit Shippers' association has accomplished some of the things desired from the outset, we still feel there is a broad field for action. We need prompter delivery of our fruit in Chicago, better rates than those now furnished, a system of distribution of our fruit by which markets may be maintained at good prices throughout the season, and last but not least, improvements of our roads as a matter of our nearest convenience.

REMARKS.

Inquiries were made of Mr CRANE concerning the rates to prevail this season, and he replied that he has been trying to get better rates than last year on cars not fully loaded.

MR. WILEY: We expect to have to draw our fruit largely to the railway, from the lake shore, for there is no appropriation for improvement of the harbor, which is thought to be in as bad condition as it was last spring. The work done upon it last season was of benefit that year only, and the matter of transportation has become a very serious question with us.

Mr. GOODRICH of Chicago, manager of the "granger" system on the Illinois Central railway, was present. He said he had been interested in this business twenty-five years, and had been managing it for ten years, and had latterly been studying how to facilitate the delivery of fruit from trains to the commission merchants, with the least expense and greatest dispatch. If fruit arrives by five o'clock a. m. he can get it on the market by the time the trade demands it, and the cent or half cent per crate

required for handling is nothing compared with the loss on fruit damaged by bad transportation. He referred to twenty-five cars of strawberries from Tennessee, that were so damaged as to be worthless by bad transportation. They arrived at a late hour and demoralized the market for several days. Fruit arriving late makes confusion and much trouble in many ways. He anticipated some improvements this season in handling the fruit at Chicago. He said there had been a marked improvement, the past two years, in the packing of Michigan fruit. Mr. GOODRICH commended Mr. CRANE'S paper, and said he had returned to the association $860, which had been expended in improvement of the road leading west from Fennville. What buyers in a Chicago market most desire is a good, average grade of fruit (peaches) not fancy grades, and would buy such fruit in 500 and 1,000 basket lots.

Mr. CRANE spoke of certain concessions the express company had received from the Michigan Central railway company, in the way of rates, the benefits of which had not been given to the growers, but which Mr. CRANE hopes to secure this season through the railway company.

Mr. E. HUTCHINS spoke of the desirability of getting special rates for fruit by express to points not receiving large quantities, thereby relieving the Chicago market to some extent. This matter had been up a year ago, but nothing was done about it. Mr. CRANE replied that Mr. ANGELL of the express company had been interviewed about the matter, but it was too late in the season.

President WILEY read the following paper on the cost of getting our fruit to the consumer.

COÖPERATION AMONG FRUITGROWERS.

In a previous article, read before this society, I made slight reference to the necessity of coöperation among fruitgrowers in marketing the products of their farms and orchards. The rapid progress made by our national government in the last few years in opening to settlement the vast area of cheap and fertile lands of the west, together with the extensive system of railroad building that has been going on, reaching out to every part of the country, has brought about great and important changes in the market value of most kinds of farm crops. By the aid of rapid transit and refrigerator cars the fruitgrower of California and other distant points is placed nearly on a level with his eastern competitor, so far as the markets are concerned. From the east the business has been moving westward until the people of the Pacific coast and Mississippi valley have become the great producers of the continent, of products that supply the world's markets.

The struggle for pre-eminence is daily becoming more fierce in every line of business and, as a result, fruitgrowers of Michigan have been brought to face a condition in the leading markets of our country that twenty-five years ago would have been thought impossible to occur.

The teaching of our leading fruitgrowers and writers upon the subject of fruit culture and markets has been all along that, as the country developed and population increased, prices for fruit would be maintained if not advanced. Now just how far and to what extent these predictions are being fulfilled I will leave for growers that have had experience in the last few years to answer.

Many theories have been advanced as to the cause that has brought about this great and unlooked for change in our markets; but the results have been such as to call the attention of fruitgrowers to the importance and necessity of renewing their efforts to obtain a better and less expensive system of marketing their fruit.

Now I believe it can't be said, with due regard to facts, but what the fruitgrowers of western Allegan county are as a rule enterprising and progressive and fully alive to their interests in everything that goes to improve their business or their general condition as citizens.

But notwithstanding this spirit of improvement that is to be seen on all sides in the surrounding country and in this village, for some reason, not easy to understand, a mat-

ter of vital importance to all interested in the success of fruit culture and one that has much to do with the welfare of our people has met with general neglect. As a result there has been no perceptible advance or improvement made in the system of marketing the products of our farms and orchards in the last twenty years.

The middleman still continues to stand between the producer and consumer, demanding and obtaining one tenth of the entire crop for a remarkable small part of the work. Now I believe it is generally conceded by our most eminent and able financiers that no business can afford to have ten per cent. taken from it and expect to remain in a prosperous condition for any great length of time.

According to reliable estimates in seasons of fair crops of fruit, there is shipped from Douglas, Saugatuck, Fennville and the pier something over 3,000,000 baskets of peaches, to say nothing of the large amount of other fruits that find an outlet at these points, such as apples, pears, plums and small fruits.

After this fruit is laid down on the docks in Chicago and Milwaukee free, I believe it will not be deemed an over-estimate to put the cost of selling it under the ten per cent. system at $100,000, and for cartage no less than $40,000 must be paid, making a total of $140,000 for cartage and commission for selling the fruit, produced in a single neighborhood.

Now I don't believe there is a person present here today who has had experience and has given this subject any thought but what will say this work should and can be done for not to exceed one half of this amount. While the future is full of encouragement and promise for the intelligent fruitgrower of Michigan, and perhaps it is safe to assume that no branch of agriculture has been more remunerative for the capital and labor invested, notwithstanding this the necessity and importance of using every legitimate means of reducing the cost of production and marketing is becoming more and more apparent each year and there is no reason to believe the near future will bring any change in this respect.

The tendency in every line of industry is to produce at the least possible cost, and the business that fails to employ this means of increasing profits is pretty sure to fall behind in the great and rapidly increasing commercial race being run in this country. Competition in all lines of trade has become an important factor and, in order to successfuliy meet these conditions, organization has become the order of the day, to the extent that there is hardly a business of any importance but what has its organization for the advancement of its interests.

These conditions call for a united effort among producers and for the adoption of improved methods of reaching the consumer. I am of the opinion that profits to be derived from fruit culture must in the future depend upon the extent to which growers coöperate in reducing expenses. "In union there is strength." This principle is well understood by all, yet how difficult to put in practice, especially among farmers and fruitgrowers.

Coöperative effort for the purpose of mutual advancement and protection is commendable only when justly and wisely used and not carried to the extent that "Might makes right," as has too often been done. The system of coöperation found but little favor in the United States until within the last twenty years. Prior to this time competition, as it exists today, was unknown. Then profits were so generally satisfactory that each interest seemed to have been content to paddle its own canoe.

During the last decade, associated effort in most all lines of business has been quietly and steadily making great advances in all parts of the country, both north and south. Coöperation among fruitgrowers has been in successful operation in California, Delaware and other fruit producing sections for a number of years and according to reports has been of great benefit in obtaining lower rates for freight and a better system of marketing. As an illustration of some of the benefits to be derived by coöperation, your attention is called to the results obtained from the united effort of a few members of the Saugatuck and Ganges Pomological Society and the Fruitgrowers' Association of Fennville, in 1891. As a result of the action, taken that season, a net saving to growers and shippers of from thirty to forty thousand dollars was made on the one item of freight. Not only was this amount saved to the shippers of this vicinity, but it fully demonstrated the fact that fruit can be carried by transportation companies with profit at a much less rate than had formerly been charged for this work.

Conditions are such that farmers and fruitgrowers must resort to united efforts in obtaining fair rates for freight and in reducing cost of marketing, if they hope to successfully solve the problem of how to receive a fair share of what is paid by the consumer for their products.

I am led to believe from past experience that coöperation properly managed and not abused, can be made to accomplish grand results for all classes, but will doubtless be of greater benefit to farmers and fruitgrowers than other lines of business, on account of

their circumstances. Living isolated, as their business makes it incumbent upon them to do, has made them the best of prey for all kinds of sharpers, under the present system of distribution.

Fruitgrowers of California have an organization known as the California Fruit Union, that is reported as having accomplished a great deal of valuable work in the interest of its members. One of the most important results of this organization and one of importance to fruitgrowers of Michigan and the east has been the placing of California fruit in all the principal markets of the country—a result that was thought impossible twenty years ago and perhaps never could have been accomplished, except through and by the aid and coöperation among growers and shippers.

Another important accomplishment of this union has been the introduction and establishment of the auction system of selling their fruit in all the principal markets throughout the country. I am informed that this plan of selling has proved so satisfactory that all California fruit is now sold in this way.

If the auction system of selling fruit possesses the merits claimed for it by those who have had experience, fruitgrowers of Michigan should lose no time in arranging for selling their fruit in this way. I am fully confident however, that nothing can be accomplished in this direction, no matter how desirable, except by the coöperation of a large per cent. of all the growers and shippers.

In conclusion I will say that while I have no special plan to advocate or recommend, I believe fruitgrowers ought to be able to agree upon some plan that would give promise of better results at a less expense than the system now in use for selling their fruit.

MR. HINMAN wished to see more encouragement to buyers to come here and buy our fruit at our orchards. He had sold his fruit at Weed's dock for $1.25 per bushel, not including the baskets.

Mr. WILEY spoke of the decline in the value of our fruit, of over one half in ten years, and said that the charge of one cent per basket, for cartage, was in his opinion not much better than robbery, yet he would not ask any man or company to do business at a loss. Dockage was at one time two cents per basket, but had been brought down to one cent.

Mr. HUTCHINS thought Mr. HINMAN had hit it right when he said our fruit did not compare well with the California fruit, on the market, and advised adoption of the California plan of coöperation and the putting up of fruit in better condition or a better quality of fruit.

Mr. WADSWORTH spoke in favor of shipping fruit by rail altogether, as there is so much trouble in use of the bad harbor.

Mr. WILEY replied that competition between the railway and the boats was what had brought rates down where they are, and is the only thing that will keep them there; at least, it is the only thing we can depend upon.

APRIL MEETING.

The April meeting was held at Douglas and several members reported that they noticed in trimming their peach orchards, much dead wood had accumulated, probably caused from the unfavorable season last year, curl leaf, etc.

The president said there were two subjects of considerable importance, that should come before the meeting—One being the yellows; the other, "What shall we do to make a creditable showing at the Columbian Exhibition?" Mr. A. HAMILTON has been appointed a member of the State World's Fair commission for Michigan, in place of Hon. D. W. WILEY, who had been for some time in ill health.

Mr. HAMILTON said there was no feasible plan as yet adopted, as there was no fund to work with, and what was done would probably be in the way of both in work and specimens for exhibition.

The question of yellows was laid on the table until the next regular meeting of the society.

Under resolutions the following were adopted:

Resolved, That the township boards in Ganges, Saugatuck, Manlius, Laketown and Clyde be requested to use all diligent care in the selection of yellows commissioners. That efficient men be appointed, and when appointed, that they do their full duty in destroying all diseased trees. The secretary be requested to furnish a copy of this resolution to each township board.

After some informal talk as to what subject to take up at the next meeting, Mr. J. F. TAYLOR was asked to read a paper upon "Can the yellows be stopped where it is on this lake shore?"

Mr. TAYLOR: We all want to look which way the wind blows. In California and the south there appears a disease of the peach called "Root Knot." Considerable attention is being called to it, particularly among the scientific investigators. "Root Aphis" is another of the new pests and is becoming somewhat troublesome in our own locality. I would like to call the attention of all who have sickly looking trees to investigate, and perhaps try some of the new mixtures for spraying.

MAY MEETING.

The May meeting of the society was called to order by President WILEY at the Mack's Landing school house, Saturday afternoon, May 6. About 25 gentlemen were present. The subject for discussion was the yellows law.

Pres. WILEY: What we lack is public sentiment, not law. If the people are educated up to the point of demanding a thorough cleaning out of infected trees the work will be done. Commissioners have a hard row to hoe, as they get small pay and have the opposition of many who ought to assist them. Let the people assist the commissioner and better work will be done.

H. H. GOODRICH: It is almost impossible for commissioners to do good work unless the growers coöperate with them.

P. PURDY: The town line is the boundary of the trouble. In Manlius the growers ship their yellows fruit and the commissioners do nothing.

D. C. PUTNAM: I understand some growers east of here intend to get all they can out of their yellows peaches this year. If the Saugatuck and Ganges people had not tended to their trees in the past, the yellows would have swept in from that direction.

M. E. WILLIAMS moved that the secretary be instructed to write to all legislators interested, to use their utmost diligence in the passage of a new yellows law. Carried.

H. H. GOODRICH moved that the chair appoint a committee to wait upon the Manlius township board and urge them to look after the yellows law. Carried. The chair appointed P. PURDY, D. C. PUTNAM, and M. E. WILLIAMS as such a committee.

Rev. J. F. TAYLOR then read a paper on peach yellows, in which he showed that the growers, who allow the disease to spread in their orchards, will soon be out of the business, while those who tend closely to their duty, will be left to enjoy the profits of their labor, with a better market.

The use of lime as a preventive of yellows was discussed, but not much credit was given to it. The prompt removal of diseased trees is the greatest preventive.

Capt. BRITTAIN was reported by the president as saying that the steamers McVea and Saugatuck would be unable to get into Saugatuck harbor this season to take care of the fruit on account of the depth of water drawn. Mr. PURDY thought it is too early in the season to be able to tell just what can be done with the harbor.

NOVEMBER MEETING.

After a rest of several months, during the busy season, the regular monthly meeting of the society was held at Douglas, Saturday afternoon, Nov. 4, and was called to order by President WILEY. Only eight persons were present and the time was taken up in a discussion of the harbor question.

President WILEY stated that, as a result of the trip made to Grand Rapids to see Col. LUDLOW, it was learned that the harbor is not in so bad a shape as has been represented. It would be necessary to plant a row of trees along the sand banks to act as a windbrake and prevent the sand from drifting into the river. The rotten piling could be cut off beneath the water and recapped by a process now in use, at a comparatively slight expense. Senator STOCKBRIDGE and Representative THOMAS are ready to do all they can and it is thought that by sending a committee to Chicago and Milwaukee among the commission men their influence could be secured in securing the coöperation of their congressional representatives. It would be necessary to go to work this fall and raise as much money as possible to pay these necessary expenses in securing aid and to employ Hon. W. P. SUTTON or some other experienced man at Washington, to labor in the interest of an appropriation. The boat owners stand ready to give as much as the fruitgrowers, and with the aid of the business men a sufficient sum could be raised.

H. H. GOODRICH stated that all Ganges is interested in the harbor for, without a harbor, all their fruit must be drawn to Fennville. [Just what objection there is to drawing it there, he did not state.]

THOS. GRAY thought that a ship load of manure could be brought over from Chicago and spread on the sand and then a wide belt of willows or cottonwood trees planted as a protection. He thought the trees would grow, as Baldhead is covered with all kinds of trees that act as a protection to it. Sand fences might be necessary until the trees were large enough. Unless something is done to secure an appropriation soon, Saugatuck will go on the list of abandoned harbors.

H. H. GOODRICH stated that South Haven used sand fences with good results and now has a good harbor, though not having as much water as at Saugatuck.

Mr. WELCH was in favor of trying to secure an appropriation, but didn't think it advisable to do any work on the harbor themselves, as it is "too big a job."

D. C. PUTNAM said that united effort was what is needed to get the appropriation. Statistics must be shown and considerable "log-rolling" would be necessary, and that is why it was thought best to have a man in Washington to look after the case.

The discussion ended by leaving the matter in the old committee's hands and the meeting adjourned to meet at the masonic hall in Douglas, the first Saturday in December at two o'clock p. m. The meeting will then

listen to reports from the different townships on the question, "What progress has been made in carrying out the provisions of the yellows law; what per cent. of increase or decrease has there been the past season and what is the outlook?" At the same meeting the annual election of officers will take place.

C. E. BASSETT, *Secretary.*

LENAWEE COUNTY HORTICULTURAL SOCIETY

OFFICERS FOR 1893.

President—D. G. EDMISTON
Vice-President—H. C. BRADISH.
Secretary—E. W. ALLIS.
Treasurer—B. I. LAING.
Librarian—Mrs. GEO. KNIGHT.
Executive Committee—H. C. BRADISH, J. W. HELME, C. F. GUSTIN, Mrs. GEO. KNIGHT, Mrs. M. S. TRINE, D. G. EDMISTON, E. W. ALLIS.

All the above are of Adrian, except Mr. LAING, who is of Holloway.

The year 1892, for our society, has been a prosperous one; the meetings were well attended. They are usually held at the hall in the court-house, but are occasionally held at the house of some member, by invitation.

We have had during the year several original papers, viz.: "The proper time and manner for preparing wood for fuel and timber," by B. I. LAING; an original poem by F. R. STEBBINS; "Will it pay to plant wind-breaks in this vicinity?" by Mr. STEERE; "The secret of successful horticultural planting," by C. F. GUSTIN; "The art of budding," by D. G. EDMISTON; "Cherries and their preparation for the table," by Mrs. E. P. ALLIS; "Receipts collected from members," by Mrs. STRONG.

Besides these were the discussions upon many topics, as the potato scab, fruit topics, and garden and household hints by the ladies. Each month we have had an interesting programme bearing upon some branches of horticulture.

As for many years past, our society looked after some features of the horticultural exhibit at the annual fair, held here in view of the elevation of the character of horticulture in this locality.

We have lost by death four of our members: Mrs. S. R. ROGERS, Mrs. NORMAN GEDDES, Mr. J. A. HOWELL, and Mr. F. R. STEBBINS. All had been active members and were prominent citizens in this locality. Mr. STEBBINS, who was in active membership at the time of his death, was also the first secretary of this society, which was organized March 15, 1851, and he held the position two years.

E. W. ALLIS, *Secretary.*

EATON COUNTY HORTICULTURAL SOCIETY.

OFFICERS FOR 1893.

President—H. D. GRIFFITH, Otter Creek.
Vice-President—Mrs. F. S. LEIGHTON, Eaton Rapids.
Secretary and Treasurer—S. R. FULLER, Eaton Rapids.

There were but fourteen memberships paid during the year 1892. The society met ten times during the year. Each meeting was enlivened by subjects of interest for the day, and by essays, but I have none of the latter in my possession.

S. R. FULLER, *Secretary*.

OCEANA COUNTY HORTICULTURAL SOCIETY.

OFFICERS FOR 1893.

President—A. ADAMS, Shelby.
Vice-President—WM. D. MARKHAM, Hart.
Secretary—BENTON GEBHART, Hart.
Treasurer—WM. H. BARRY, Shelby.
Directors—JAMES HAIGHT, Shelby; C. A. SESSIONS, Mears; I. H. FORD, Hart.

SANILAC COUNTY HORTICULTURAL SOCIETY.

OFFICERS OF 1893.

President—HENRY OLDFIELD, Port Sanilac.
Vice-Presidents—H. S. HAYWARD, Lexington; WM. CUMMINGS, Applegate; NELSON GEOFFROY, Carsonville.
Secretary—THOS. OLDFIELD, Port Sanilac.
Treasurer—DAVID QUAIL, Croswell.

GRATIOT COUNTY HORTICULTURAL SOCIETY.

OFFICERS FOR 1893.

President—GEO. P. STONE, Ithaca.
Vice-President—I. N. COWDRY, Ithaca.
Secretary—L. J. MARVIN, Ithaca.
Treasurer—H. OSCAR KELLY, St. Louis.

GRAND RIVER VALLEY HORTICULTURAL SOCIETY.

OFFICERS FOR 1893.

President—JAMES A. PEARCE.
Vice-President—W. N. COOK.
Secretary—THOMAS L. BROWN.
Treasurer—E. C. PHILLIPS.
Trustees—ASA W. SLAYTON, SLUMAN S. BAILEY, THOMAS WILDE, EDMUND MANLEY.

BERRIEN COUNTY HORTICULTURAL SOCIETY.

OFFICERS FOR 1893.

President—R. MORRILL, Benton Harbor.
Vice-Presidents—R. C. THAYER, W. A. SMITH, DAVID JUDSON, S. G. ANTISDALE, M. L. MCCLAVE.
Secretary and Treasurer—A. J. KNISELY, Benton Harbor.

IONIA DISTRICT HORTICULTURAL SOCIETY.

This society was organized in December, 1892, with the following membership and officers: R. M. KELLOGG, president; W. N. LORD, vice-president; W. L. WINCHELL, secretary; JACOB KING, treasurer; GEO. DOOLITTLE, GEO. HOSFORD, W. B. HILL, J. V. MICKLE, M. B. WINCHELL, E. C. FROST.

There have been held three meetings during the year. The discussions were of a general nature, pertaining to fruit cultivation. The loss of the minutes of the meetings makes it difficult to report particulars. The annual meeting has been called for Dec. 9, when it is hoped the membership may be enlarged.

W. L. WINCHELL, *Secretary*.

MUSKEGON HORTICULTURAL SOCIETY.

OFFICERS FOR 1893.

President—C. L. WHITNEY, Muskegon.
Vice-President—ORMAN BAXTER, Muskegon.
Secretary—CELIA BAXTER, Muskegon.
Treasurer—RILEY CLEMONS, North Muskegon.
Executive Committee—The four above named, and CHARLES F. WHITNEY, Black Lake, and F. F. BOWLES, Muskegon.

During 1892 the papers and discussions have been very good and taken a wide range of topics. The society, during the winter months, has met in a hall in the city of Muskegon, but during warm weather held large, well-attended meetings at the homes of the members upon their farms. In the large new court house, just completed in the county, a room has been assigned this society, and is being finished and furnished in a suitable manner, in which to hold meetings and keep records, library, exhibits, etc.

C. L. WHITNEY, *President.*

SOUTH HAVEN AND CASCO POMOLOGICAL SOCIETY.

OFFICERS FOR THE YEAR 1892.

President—JOSEPH LANNIN, South Haven.
Vice-President—O. BEEBE, South Haven.
Secretary—W. H. PAYNE, South Haven.
Treasurer—J. J. ATHERLY, South Haven.
Executive Board—J. G. RAMSDELL, JOHN MACKEY, D. E. HISTED.

This society has held weekly meetings during the winter months, and up to the busy fruit season in the spring, when they were discontinued until the busy season was over. During these meetings various subjects were introduced, by the committee appointed for that purpose, and exhaustively discussed. These were: "What fertilizers have been most successful in growing the different kinds of fruit;" discussion of the published report of J. H. HALE'S successful peach-growing; "How high shall peach trees be headed?" "Trimming and pruning;" "How shall we grade our peaches to ensure the best results in packing?" "Fertilizing: how, when, and with what material?" "Pruning of all kinds, including vines:" "Arbor day and how it will and has improved and beautified the township;" "Transportation and packages." This discussion was so vital and interesting that committees were appointed to wait upon the manufacturers and transportation companies and try to make better terms with them, with the result that transportation was lessened twenty per cent., or from five cents per basket, for transportation by boat to Chicago, to four cents per basket; and the baskets were reduced in price from four cents to three and one half cents, and the next year to three cents.

Then the exhibit of Michigan fruit at the World's Fair was taken up and discussed for several sessions, and many of the fruitgrowers offered both plants and trees to be taken up and replanted in boxes for use at the Fair, as an object lesson, showing the fruit growing on the trees. Several committees were appointed to secure the specimens offered, and others, each committee having but one kind of fruit to handle. Ten specimens of each kind were to be obtained and cared for and forwarded to Chicago at the proper time.

The curl-leaf came in for discussion at one meeting, and it seemed the prevailing opinion that great harm had already come of it on the peach.

and especially the apple trees which looked as though a fire had run through the branches. It was thought to be caused by the cool, wet weather, with occasional hot sunshine. The last session of the year was devoted to a discussion of the lessons of the year.

The out-door meetings during the harvest season were well attended, and were valuable as object lessons.

Perhaps the most notable event of the year to the society was the celebration of the twenty-first birthday of the society, by a banquet or anniversary dinner, held on the 29th day of January. The society had reached its age of manhood, twenty-one years, and about eighty of the fruitgrowers celebrated the event fittingly. NORMAN PHILLIPS, the first president of the society, was present and gave some interesting reminiscences of the early times in fruit culture, and said, in looking over the list of thirteen charter members, "I find but eight are left; five have passed over, but I see their places are filled by many times their number of intelligent fruitgrowers, whom I hope and believe have profited largely by the example and precepts of this early band, and the many lessons of experience brought before this society in the past twenty-one years." Prof. TAFT of Michigan Agricultural College, who was present, congratulated the society on its successful and practical existence, saying, "Even before I came to the state of Michigan I had heard of this society, its name and fame reaching me through its published reports." He spoke of the efforts now being made by the national government to assist in this work, the appropriation of money for experimenting in all lines of agriculture and horticulture; in chemical tests; the cause, cure and prevention of insect pests and fungi. The venerable president of the State Horticultural Society was present and made an interesting address, as did many prominent citizens and visitors from abroad.

On the whole, the season of 1892 was not satisfactory to the fruitgrowers, as the crop of fruit fell far below what was reasonably expected in the spring, although the prices were fair to good. Still, the society, profiting by failure and success, by experiment and experience, is doing great good to all and especially to the new workers in the "vineyard," as a report of all their proceedings is condensed and published in at least five different newspapers. In the multitude of counselors there is strength.

W. H. PAYNE, *Secretary*.

LIFE MEMBERS OF THE STATE HORTICULTURAL SOCIETY.*

Name.	P. O. Address.	County.
Adams, H. Dale	Galesburg	Kalamazoo.
Adams, Mrs. H. Dale	Galesburg	Kalamazoo.
Allis, E. W.	Adrian	Lenawee.
Allis, Miss Mary C.	Adrian	Lenawee.
Archer, Thomas	St. Joseph	Berrien.
Armitage, James	Monroe	Monroe.
Arnold, W. D.	Ionia	Ionia.
Avery, C. P.	Old Mission	Grand Traverse.
Bagley, John J. (deceased)	Detroit	Wayne.
Bailey, L. H.	South Haven	Van Buren.
Bailey, L. H., jr.	Ithaca	*New York.*
Baldwin, H. P.	Detroit	Wayne.
Baldwin, J. D.	Ann Arbor	Washtenaw.
Ball, John (deceased)	Grand Rapids	Kent.
Barnett, G. W., 159 South Water street	Chicago	*Illinois.*
Bates, T. T.	Traverse City	Grand Traverse.
Baxter, W. J. (deceased)	Jonesville	Hillsdale.
Beal, W. J.	Agricultural College	Ingham.
Becker, Albert J.	Saginaw	Saginaw.
Bidwell, H. E.	Plymouth	Wayne.
Blodgett, D. A.	Grand Rapids	Kent.
Brackett, G. B.	Denmark	*Iowa.*
Bradfield, Edward (deceased)	Ada	Kent.
Bragg, L. G.	Kalamazoo	Kalamazoo.
Bruchner, George W.	Monroe	Monroe.
Bryant, C. T.	South Haven	Van Buren.
Bullock, R. D. (deceased)	Jackson	Jackson.
Burham, W. P.	Ionia	Ionia.
Burrows, George L.	Saginaw City	Saginaw.
Caie, Robert	Yarmouth	*Nova Scotia.*
Castello, George	Saginaw City	Saginaw.
Chandler, Z. (deceased)	Detroit	Wayne.
Chapman, H. B. (deceased)	Reading	Hillsdale.
Chapman, Alvin	Bangor	Van Buren.
Chapman, Austin B.	Rockford	Monroe.
Chilson, Nathaniel	Tower City	*Dakota.*
Chilson, Miss Ida	Tower City	*Dakota.*
Clark, M. W.	Jackson	Jackson.
Cook, A. J.	Agricultural College	Ingham.
Cook, W. N.	Grand Rapids	Kent.
Cooley, Elisha (deceased)	Jackson	Jackson.
Cooper, George S.	Ionia	Ionia.
Crosby, M. S.	Grand Rapids	Kent.
Crozier, A. A.	Washington	*D. C.*
Curtis, H. W.	Old Mission	Grand Traverse.
Cushman, E. H.	Euclid	*Ohio.*

*NOTE.—A Life Membership is $10. The fund thus gathered is invested in good securities and only the interest employed for general purposes.

Name.	P. O. Address.	County.
Davis, P. C.	Kalamazoo	Kalamazoo.
Day, Benjamin	Ann Arbor	Washtenaw.
Dean, A. J.	Adrian	Lenawee.
DeLisle, Wm. H.	Bay City	Bay.
Dickinson, G W. (deceased)	Grand Rapids	Kent.
Dieckman, Mrs. Josephine M.	East Saginaw	Saginaw.
Deitrich, C. J.	Chicago	*Illinois.*
Dixon, A. S.	East Saginaw	Saginaw.
Dorr, S. W.	Manchester	Washtenaw.
Doyle, Thomas	Monroe	Monroe.
Dyckman, A. S.	South Haven	Van Buren.
Dykman, J.	East Saginaw	Saginaw.
Edmiston, D. G.	Adrian	Lenawee.
Ferry, D. M.	Detroit	Wayne.
Ferry, T. W.	Grand Haven	Ottawa.
Fields, Miss Jennie E.	East Saginaw	Saginaw.
Flowerday, Robert	Detroit	Wayne.
Foster, W. D. (deceased)	Grand Rapids	Kent.
Foster, Mrs. Mary E.	Ann Arbor	Washtenaw.
Fowler, S. W.	Manistee	Manistee.
Fuller, S. L.	Grand Rapids	Kent.
Fuller, S. R.	Eaton Rapids	Eaton.
Garfield, Chas. W.	Grand Rapids	Kent.
Geddes, David	Saginaw	Saginaw.
Gibson, Mrs. W. K.	Jackson	Jackson.
Gilbert, John (deceased)	Ovid	Clinton.
Graham, Elwood	Grand Rapids	Kent.
Greening, J. C.	Monroe	Monroe.
Griggs, George W. (deceased)	Grand Rapids	Kent.
Guild, E. F.	East Saginaw	Saginaw.
Hall, Frederick (deceased)	Ionia	Ionia.
Hanford, H. P. (deceased)	Bristol	*Indiana.*
Hannah, Perry	Traverse City	Grand Traverse.
Hathaway, B.	Little Prairie Ronde	Cass.
Haviland, J. B. (deceased)	Traverse City	Grand Traverse.
Hayden, Mrs. H. A.	Jackson	Jackson.
Humphrey, J. W.	South Haven	Van Buren.
Husted, James D.	Vineyard	*Georgia.*
Husted, Noah P.	Lowell	Kent.
Ilgenfritz, I. E.	Monroe	Monroe.
Ilgenfritz, C. A.	Monroe	Monroe.
Ives, Caleb	Monroe	Monroe.
Jerome, Mrs. David H.	Saginaw City	Saginaw.
Johnson, William	Vassar	Tuscola.
Kedzie, R. C.	Lansing	Ingham.
Kelsey, E. P.	Ionia	Ionia.
Kidd, J. H.	Ionia	Ionia.
Klein, F. J., 156 St. Aubin ave.	Detroit	Wayne.
Knapp, S. O. (deceased)	Jackson	Jackson.
Knapp, E. U.	Grand Rapids	Kent.
Kniseley, A. J.	Benton Harbor	Berrien.
Lawton, George W. (deceased)	Lawton	Van Buren.
Lincoln, L. C.	Greenville	Montcalm.
Lincoln, Mrs. L. C	Greenville	Montcalm.
Linderman, Harvey J. (deceased)	South Haven	Van Buren.
Linderman, A. T.	Whitehall	Muskegon.
Littlejohn, F. J. (deceased)	Allegan	Allegan.
Loomis, P. B.	Jackson	Jackson.
Lyon, T. T.	South Haven	Van Buren.
Mann, S. B.	Glenwood	*Florida.*
Marshall, Wm A.	Old Mission	Grand Traverse.

Name.	P. O. Address.	County.
Mason, L. M.	East Saginaw	Saginaw.
Mason, Mrs. Sarah A.	East Saginaw	Saginaw.
McCallam, E. H.	Lansing	Ingham.
McClatchie, G. C.	Ludington	Mason.
McDiarmid, James D.	Bear Lake	Manistee.
McNaughton, Robert T.	Jackson	Jackson.
Mitchell, W. H. C.	Traverse City	Grand Traverse.
Moores, J. H.	Lansing	Ingham.
Monroe, C. J.	South Haven	Van Buren.
Monroe, Judge (deceased)	Lawrence	Van Buren.
Montague, A. K.	Traverse City	Grand Traverse.
Nabors, Nellie S.	Flint	Genesee.
Nichols, W. W.	Ann Arbor	Washtenaw.
Noble, W. A.	Monroe	Monroe.
Odell, Samuel W.	Muskegon	Muskegon.
Palmer, Thomas W.	Detroit	Wayne.
Parmelee, George (deceased)	Old Mission	Grand Traverse.
Parmelee, Mrs. George (deceased)	Old Mission	Grand Traverse.
Parke, Mrs. Amos S.	East Saginaw	Saginaw.
Parsons, Philo	Detroit	Wayne.
Partridge, B. F.	Bay City	Bay.
Pearsall, S. M.	Grand Rapids	Kent.
Perry, George L.	Lansing	Ingham.
Petty, Thomas	Spring Lake	Ottawa.
Pierce, N. B.	Ludington	Mason.
Potter, E. M.	Manderson	*Nebraska.*
Ramsdell, J. G.	Traverse City	Grand Traverse.
Ramsdell, Mrs. J. G.	Traverse City	Grand Traverse.
Ransom, W. D.	St. Joseph	Berrien.
Renwick, T. R.	Grand Rapids	Kent.
Reynolds, E. H.	Monroe	Monroe.
Reynolds, H. G.	Agricultural College	Ingham.
Rich, Hampton	Ionia	Ionia.
Root, Amos	Jackson	Jackson.
Rose, D. Forsyth	East Saginaw	Saginaw.
Rose, Mrs. Sophie E.	East Saginaw	Saginaw.
Rowe, William	Grand Rapids	Kent.
Rowe, William N.	Grand Rapids	Kent.
Russell, Dr. Geo. B.	Detroit	Wayne.
Rust, C. E.	Ionia	Ionia.
Satterlee, James	Albany	*New York.*
Savidge, Hunter (deceased)	Spring Lake	Ottawa.
Scott, J. Austin (deceased)	Ann Arbor	Washtenaw.
Scott, Dr. Austin	Newark	*New Jersey.*
Scott, E. H.	Ann Arbor	Washtenaw.
Sessions, Charles A.	Mears	Oceana.
Sessions, Alonzo (deceased)	Ionia	Ionia.
Sessions, William	Ionia	Ionia.
Shirts, E. J.	Shelby	Oceana.
Shoop, Rev. D. R.	Hastings	Barry
Sinclair, W. G.	Grand Rapids	Kent.
Sigler, Artimus	Adrian	Lenawee.
Slayton, Asa W.	Grand Rapids	Kent.
Sleeper, F. S. (deceased)	Galesburg	Kalamazoo.
Smith, E. T.	Ionia	Ionia.
Smith, N. E.	Ionia	Ionia.
Smith, H. H.	Jackson	Jackson.
Soule, J. B.	Fruitport	Muskegon.
Staunton, G. W.	Grand Rapids	Kent
Stearns, J. N.	Kalamazoo	Kalamazoo.
Stearns, Ida L.	Kalamazoo	Kalamazoo.

Name.	P. O. Address.	County.
Steere, B. W.	Carthage	*Indiana.*
Sterling, F. S.	Monroe	Monroe.
Sterling, J. M.	Monroe	Monroe.
Sterling, J. C. (deceased)	Monroe	Monroe.
Sterling, W. C.	Monroe	Monroe.
Sterling, W. P.	Monroe	Monroe.
Sterling, Mrs. Emma M.	Monroe	Monroe.
Stockbridge, F. B.	Kalamazoo	Kalamazoo.
Suttle, John (deceased)	Grand Rapids	Kent.
Taylor, George	Kalamazoo	Kalamazoo.
Taylor George C.	Kalamazoo	Kalamazoo.
Thomas, H. F.	Jackson	Jackson.
Thompson, W. D.	Jackson	Jackson.
Thompson, J. P. (deceased)	Detroit	Wayne.
Towles, George W. (deceased)	Benton Harbor	Berrien.
Tracy, Will W.	Detroit	Wayne.
Vick, James (deceased)	Rochester	*New York.*
Vick, James, jr.	Rochester	*New York.*
Vick, Frank H.	Rochester	*New York.*
Vick, Charles H.	Rochester	*New York.*
Vick, E. Colston	Rochester	*New York.*
Wadsworth, W. R.	Lapeer	Lapeer.
Waite, Gilbert M.	Paw Paw	Van Buren.
Walker, S. S.	St. Johns	Clinton.
Watkins, L. D.	Manchester	Washtenaw.
Webber, William L.	East Saginaw	Saginaw.
Webber, George W.	Ionia	Ionia.
Webber, Miss Frances E.	East Saginaw	Saginaw.
Wells, H. G. (deceased)	Kalamazoo	Kalamazoo.
Whittlesey, John	St. Joseph	Berrien.
Wier, Antoine	Monroe	Monroe.
Wilde, Thomas	Herrington	Ottawa.
Williams, S. P.	Monroe	Monroe.
Winchester, A. O.	St. Joseph	Berrien.
Wooding, Charles F.	Lowell	Kent.
Woodward, David	Clinton	Lenawee.
Wurtz, Elias H.	East Saginaw	Saginaw.
Zeigler, J. C.	Saginaw City	Saginaw.

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