THIRTY-SEVENTH ANNUAL REPORT

OF THE

Nebraska State Horticultural Society

1908 L. M. RUSSELL


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Thirty-Seventh Annual Report

OF THE

NEBRASKA STATE

Horticultural Society

Containing all the Proceedings of the Summer Meeting Held at York, July 19 and 20, 1905, and the Annual Meeting Held at Lincoln, January 16, 17 and 18, 1906.

By L. M. RUSSELL, Secretary
Lincoln, Nebraska

LINCOLN, NEB.
PUBLISHED BY THE STATE
1906

LETTER OF TRANSMITTAL.

To His Excellency, John H. Mickey, Governor of Nebraska:

SIR: In compliance with legal requisition, the annual report of the Nebraska State Horticultural Society for the year 1906 is respectfully submitted.

L. M. RUSSELL,
Secretary Nebraska State Horticultural Society.

Lincoln, August 1, 1906.

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OFFICERS.

President.....J. H. Hadkinson, Omaha
First Vice-President.....H. S. Harrison, York
Second Vice-President.....C. H. Green, Fremont
Secretary.....L. M. Russell, Lincoln
Treasurer.....Peter Youngers, Geneva

DIRECTORS.

For one year.....J. A. Yager, Fremont
For two years.....A. J. Brown, Geneva
For three years.....W. G. Swan, Tecumseh

STANDING COMMITTEES OF THE SOCIETY.

SYNONYMS.

E. M. Pollard, Nehawka.
A. J. Brown, Geneva,
C. H. Barnard, Table Rock.

METEOROLOGY.

Prof. G. D. Sweezy, Lincoln.

ENTOMOLOGY AND ORNITHOLOGY.

Prof L. Bruner, Lincoln.

VISITING COMMITTEE TO THE UNIVERSITY OF NEBRASKA EXPERIMENT STATION.

E. F. Stephens, Crete.

GEOLOGY.

Prof. E. H. Barbour, Lincoln.

FORESTRY.

Prof. E. T. Hartley, Lincoln.

VEGETABLE CULTURE.

Prof. R. A. Emerson, Lincoln.

ORNAMENTAL GARDENING.

J. H. Hadkinson, Omaha.

LEGISLATION.

Peter Youngers, Geneva,
L. C. Chapin, Lincoln.
C. H. Barnard, Table Rock.

MEMBERSHIP LIST.

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Bruner, L. ..... Lincoln
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Crounse, Lorenzo ..... Fort Calhoun
Earle, P. ..... Ocean Springs, Mississippi
Garfield, C. W. ..... Grand Rapids, Michigan
Green, Wesley ..... Des Moines, Iowa
Hansen, Prof. N. E. ..... Brookings, South Dakota
Van Deman, H. E. ..... Parksley, Virginia
Van Houten, George ..... Lenox, Iowa

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Adams, W. R. ..... Omaha
Albert, U. G. ..... Normal
Aldrich, Benton ..... Johnson
Aldrich, Karl ..... Johnson
Alexander, G. W. ..... Julian
Allen, Geo. L. ..... Spicer, Oregon
Atkinson, J. E. ..... Pawnee City
Barnard, C. H. ..... Table Rock
Beltzer, L. A. ..... Osceola
Bessey, Charles E. ..... Lincoln
Blystone, W. J. ..... Lincoln
Bowers, W. B. ..... Post Office Unknown
Brown, A. J. ..... Geneva
Brown, Frank P. ..... Florence
Brown, J. L. ..... Kearney
Bruning, W. H. ..... Cedar Bluffs
Camp, Charles B. ..... Cheney
Card, F. W. ..... Kingston, R. I
Carpenter, G. J. ..... Grand Junction, Colo
Chapin, H. A. ..... Lincoln
Chapin, L. C. ..... Lincoln
Chowins, Chas. E. ..... Lincoln

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Colvin, W. E. ..... Post Office Unknown
Coppoc, J. L. ..... Chambers
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Crist, J. W. ..... Box 761, Lincoln
Cross, T. B. ..... Lincoln
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Davies, Wm. ..... Brownville
Davis, W. H. ..... Fullerton
De France, C. Q. ..... Lincoln
Deweber, H. N. ..... Pawnee City
Dillon, J. W. ..... Greeley, Colo
Dole, E. W. ..... Beatrice
Dunkin, J. M. ..... Ravenna
Dugan, John ..... Papillion
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Dunlap, J. P. ..... Dwight
Emerson, R. A. ..... Lincoln
Erfling, E. C. ..... 1150 Sherman Ave., Omaha
Ernst, Wm. ..... Graf
Field, B. E. ..... Fremont
Field, R. B. ..... Fremont
Floth, Paul ..... Omaha
Fox, B. C. ..... Lincoln
Fredenburg, B. ..... Johnson
Frey, C. H. ..... Lincoln
Frey, H. H. ..... Lincoln
*Furnas, R. W. ..... Brownville
Gage, J. A. ..... Beatrice
Gaiser, A. ..... Friend
Galbraith, G. B. ..... Fairbury
*Godfrey, A. S. ..... Lincoln
Green, Charles H. ..... Fremont
Grennell, E. N. ..... Fort Calhoun
Gurney, C. W. ..... Yankton, S. D
Hadkinson, J. H. ..... Omaha
*Hale, C. A. ..... University Place
Harris, W. R. ..... Forest Grove, Oregon
Harris, W. T. ..... Blackfoot, Idaho

*Deceased

Harrison, C. S. ..... York
Harrison, H. S. ..... York
Harrison, W. A. ..... York
Hartley, E. T. ..... Lincoln
Heath, H. E. ..... Omaha
Helin, J. F. ..... 1612 Farnam St., Omaha
Henderson, Lewis ..... Omaha
Hess, Jacob ..... Omaha
Hesser, W. J. ..... Pasadena, California
Hogg, J. H. ..... Luce
Hornung, Ernest ..... Raymond
Howe, H. R. ..... Auburn
Hurlburt, C. M. ..... Fairbury
Jackson, T. C. ..... Purdum
Jenkins, W. F. ..... Arcadia
*Kent, H. J. ..... Box 961, Lincoln
Keyser, Val ..... Lincoln
Langdan, J. N. ..... Seward
Leonard, I. N. ..... Post Office Unknown
Link, Harvey ..... Millard
Loughry, James ..... Geneva
Lundeen, N. P. ..... York
Marshall, A. C. ..... Weeping Water
Marshall, G. A. ..... Arlington
Marshall, C. C. ..... Arlington
Marshall, H. W. ..... Arlington
Marshall, C. G. ..... Arlington
Martin, Arnold ..... DuBois
Masters, J. H. ..... Syracuse
Masters, J. W. ..... Lincoln
Martin, F. R. ..... 4622 Boulevard Ave., Omaha
McComb, H. A. ..... Lincoln
McIntosh, H. F. ..... Alda
Meek, John ..... Unadilla
Meek, James ..... Unadilla
Mergen, Phillip ..... Omaha
Morsch, C. H. ..... Greeley Center
Mosher, D. C. ..... Colorado City, Colo
Mosher, P. C. ..... Kearney
Murphey, P. A. ..... Exeter
Neff, J. G. ..... Davey
Nemechek, Paul ..... Humboldt

*Deceased

Nownes, Charles.....Papillion
Parker, C. B.....Brock
Paulson, Paul.....Omaha
Pearson, James.....Germantown
Perin, L. W.....Lincoln
Perry, T. H.....Elk Creek
Peterson, Frank.....Post Office Unknown
Peterson, John.....Omaha
Pollard, E. M.....Nehawka
Pollard, Isaac.....Nehawka
Randell, J. C.....Hamburg, Ia
Reed, M. H.....Blue Springs
Reed, Mrs. J. H.....Blue Springs
Riley, Alfred.....Greeley, Colo
Roberts, B. A.....Albion
Russell, J. M.....Lincoln
Russell, L. M.....Lincoln
Russell, Don L.....Lincoln
Russell, Dale.....Lincoln
Sandoz, Jules A.....Sandoz via Peters
Saunders, Chas. L.....211 So. 18th St., Omaha
Schamp, L. D.....Lincoln
Schumacher, A.....York
Slayton, Geo. A.....192 Hillsdale St., Hillsdale, Mich
Smith, H. C.....Falls City
Smith, H. L.....Geneva
Smith, O. F.....Blackfoot, Idaho
Smith, E. E.....Lincoln
Stephens, E. F.....Crete
Stephens, Frank G.....Crete
Stevenson, J. W.....North Bend
Stilson, L. D.....York
Stouffer, B. R.....Bellevue
Strand, G. A.....Minden
Swan, W. G.....Tecumseh
Swezey, G. D.....Lincoln
Tanahill, Wm.....Post Office Unknown
Taylor, Frederick W.....3940 West Bell Place, St. Louis, Mo
Tiffany, M. D.....Lincoln
Titus, G. N.....Nemaha City
Tracy, Chas. A.....1523 Douglas St., Omaha
Van Metre, C. M.....Valentine

Walker, J. W.....Crete
Warren, G. F.....Harvard
Watt, James.....Lincoln
Welch, G. L.....Fremont
Wheeler, D. H.....Omaha
Whitford, C. A.....Arlington
Williams, John.....Tecumseh
Williams, L. O.....University Place
Williams, Theodore.....Benson
Wilson, W. H.....Post Office Unknown
Woods, A. F.....Washington, D. C
Yager, J. A.....Fremont
Youngers, Peter.....Geneva

HONORARY ANNUAL MEMBERS.

Patten, C. G.....Charles City, Iowa
Welch, E. S.....Shenandoah, Iowa

ANNUAL MEMBERS.

Anderson, A. N.....Shickley
Denny, F. E.....Lincoln
Howard, T. M.....Scotts Bluff
Jury, E. G.....Tecumseh
Mohler, Wm.....Falls City
Williams, John.....Tecumseh

CONSTITUTION.

ARTICLE I. **Name.** This association shall be known as the Nebraska State Horticultural Society.

ARTICLE II. **Object.** This society shall have for its object the promotion of pomology, arboriculture, floriculture, and gardening.

ARTICLE III. **Membership.** The membership of this society shall consist of four classes, viz., active, associate, annual honorary, and life honorary. The active membership shall consist of persons practically engaged in fruit culture, forestry, floriculture, or gardening, who shall be admitted to life membership on the payment of a fee of $5 at one time; to associate membership, by the payment of a fee of $1 annually. The honorary members shall consist of such persons as may be elected at any meeting of the Society by a two-thirds vote of the members present, and shall have all the privileges and benefits of the Society, except those of voting and holding office, which privileges shall belong exclusively to active members.

ARTICLE IV. **Officers.** The officers of this society shall be a president, first and second vice-presidents, secretary, treasurer, and board of directors of eight members, said board consisting of the officers enumerated in this article and three additional members. The officers, with the exception of secretary, shall be elected by ballot at the annual meeting of the society in January. The secretary shall be elected by the executive board. The term of office of these officers, with the exception of directors, shall be for a period of one year, commencing on the first day of June following. One director shall be elected for one year, one for two years, and one for three years, and afterward every year one director to serve for three years.

ARTICLE V. **Duties of President.** It shall be the duty of the president to preside at all meetings of the society, appoint all committees not otherwise provided for, countersign all orders drawn on the treasurer by the secretary; in conjunction with the secretary he shall arrange all programs for the meetings of the society, and perform such other duties as the society or board of directors may require.

ARTICLE VI. **Duties of Vice-Presidents.** The vice-presidents shall superintend all exhibits of the society, and in case of vacancy in the office of president at any meeting of the society or board of directors, shall perform all the functions of that office in the order of their rank.

ARTICLE VII. **Duties of Secretary.** The secretary shall keep an accurate record of the proceedings of all meetings of the society and board of directors, draw all warrants on the treasurer, and keep an accurate record of same as countersigned by the president, prepare for publication and edit all reports of the society requiring publication by the statutes of the state; in conjunction with the president prepare all programs and make all other necessary arrangements for all meetings of the society.

ARTICLE VIII. **Duties of Treasurer.** The treasurer shall be the custodian of all moneys belonging to the society, and shall pay from such funds all warrants drawn on him by the secretary and countersigned by the president.

ARTICLE IX. **Duties of the Board of Directors.** The board of directors shall have general management of all the affairs of the society, for which no specific directors are otherwise provided in the constitution and by-laws.

ARTICLE X. **Bonds of Officers.** The president and secretary shall each give a bond in the sum of $5,000, and the treasurer in the sum of $12,000 for the proper performance of his duties, which bond must be approved by the board of directors.

ARTICLE XI. **Salaries of Officers.** The president, vice-president, treasurer, and members of the board of directors shall receive such per diem per day for their services in attendance upon the meetings of the society as the society or board of directors may from time to time determine. The board of directors shall pay the secretary an annual salary of $1,000, if they deem best, in consideration of his keeping an open office and giving his whole time to the work, spending at least eight hours a day in his office. It shall be his duty to put out each year a creditable annual report, issue monthly bulletins to each member, prepare articles at least once a month for the leading papers, doing also his utmost to secure new members. This to be done with the advice and direction of the executive board.

ARTICLE XII. **Reports of Officers.** The president, secretary and treasurer shall each present an annual report in writing at the January meeting of all the business matters pertaining to their respective offices during the annual term expiring at that time.

ARTICLE XIII. **Meetings.** The society shall hold two or more meetings each year. The annual meeting shall be held in Lincoln on the third Tuesday in January, as provided by statute, and the other meetings shall be held at the same time and place as the annual exhibition of the Nebraska State Board of Agriculture.

ARTICLE XIV. **By-Laws.** By-laws not in conflict with the provisions of this constitution may be enacted by the society at any regular meeting.

ARTICLE XV. **Amendments.** The constitution may be amended at January meetings of the society by a two-thirds vote of the members present, such amendments having been presented in writing and read before the society at a session preceding the one in which the vote is taken.

BY-LAWS.

1. All the officers of this society shall be elected at the January meeting.

2. All officers of this society shall assume the duties of their respective offices on the first day of June following their election, and continue in office for the period of one year, or until their successors are elected and qualified.

3. The officers elected at the January meeting, 1895, shall hold their respective offices until the first day of June, 1896.

4. The amount allowed the secretary for express, postage and stationery shall not exceed $150 per annum, and it shall be the duty of the board of directors to employ a competent stenographer to report the proceedings of the meetings of the society, whose fee shall be paid by the society.

5. The first business of the society shall be on each morning the reading of the minutes of the previous day's proceedings, and submitting the same to the approval of the meeting.

6. There shall be elected at each winter meeting nine district directors, one from each horticultural district in the state.

Also a standing committee of three on synonyms.

Also a standing committee of one on each of the following: Meteorology in its relation to Horticulture, Entomology, Ornithology, Geology, Forestry, Vegetable Culture, and Ornamental Gardening.

7. These by-laws may be amended at any general meeting of the society by a majority of the members present.

PROCEEDINGS.

Proceedings of the Summer meeting of the Nebraska State Horticultural Society, held at York, July 19 and 20, 1905.

SUMMER MEETING.

PROCEEDINGS.

The Summer meeting of the Nebraska State Horticultural Society convened at the Court House, York, on Wednesday, July 19, 1905, at 9:30 a m., with President Christy in the chair. Following is a copy of the program carried out:

PROGRAM.

WEDNESDAY, JULY 19, 1905, 9:00 A. M.

Invocation.
Address of Welcome.....Mayor M. Sovereign
Response.....President Christy
Greeting.....Geo. F. Corcoran, President York Commercial Club
Work of the United States Forest Service in Nebraska.....
.....Chas. A. Scott, Halsey
The Need of a Fruit Judging Course at the State Farm.....
.....Val. Keyser, Lincoln

2:00 P. M.

The Flower Garden.....C. H. Green, Fremont
Present Outlook for Horticulture.....C. S. Harrison, York
Small Fruits.....G. S. Christy, Johnson

8:00 P. M.

Duet—"My Heart Greets the Morn."....
Horticultural Education.....Hon. E. Von Forell, Aurora
"Legends".....Cecilian Ladies' Quartette
Ornamental Decoration of Home Grounds.....J. H. Hadkinson, Omaha

THURSDAY, JULY 20, 9:30 A. M.

Apples.....G. A. Marshall, Arlington
Ornamental Planting of School Grounds..Prof. P A. Emerson, Lincoln
Hardy Fruits for South-Central Nebraska.....A. J. Brown, Geneva

1:30 P. M.

Drive about the City of York.

Music at this meeting in charge of Prof. J. A. Parks, York.

THE PRESIDENT: The Summer meeting of the Nebraska State Horticultural Society will now come to order. I want to announce that

we have a very fine gavel, presented to the society by the secretary, with which to keep order. The invocation will be given by Reverend Ballard.

INVOCATION.

Almighty God, we are grateful to Thee that we are permitted to gather here in health and strength. We are grateful to Thee for every blessing which has crowned our lives. We ask Thy blessing upon this body of men. Bless the work and cause which this society represents. May wisdom attend the sessions of this meeting. May we remember that Thou art the giver of every good and perfect gift. Oh God, bless our country. May we be kept from entanglements with other nations. May we be patriotic citizens. Help us to faithfully do our work here, and receive us at last, we ask in the name of Jesus Christ, our Lord, Amen.

ADDRESS OF WELCOME.

By Mayor M. Sovereign.

Mr. President, Members of the Society, Ladies and Gentlemen: It affords me much pleasure indeed to extend, on behalf of the City of York, a hearty welcome to you.

The cause that you gentlemen represent is one of the most interesting vocations that man has ever engaged in. It is also one of the oldest. This subject of landscape gardening was practiced by Nebuchadnezzar three thousand years ago. And I don't suppose we have anything at the present time that will compare with what he did then in order to please his wife.

We people of York are rather proud of what we have done along the line of landscape gardening. We have beautiful shade trees, large, well kept lawns, etc. We have a public park that contains over seventy different varieties and kinds of trees.

We are glad to welcome you among us. We think that your meeting here will be a benefit not only to you yourselves, but also to the people of York, and we therefore welcome you most heartily. Your work has a tendency to elevate the human race, and anything that tends to elevate humanity is good. Men engaged in your vocation are not bad men, you know. They are men to be praised. Again I extend to you a hearty welcome, and I hope your stay in our city may be profitable. Thank you. (Applause.)

RESPONSE.

By President Christy.

Hon. Mayor and Citizens of York: In behalf of the members of

the State Horticultural Society, I wish to assure you we appreciate the welcome extended to our members. And I can guarantee that no act of any of our members will ever cause the people of York to regret our gathering here. The great majority of our horticulturists are engaged in the work for the added pleasures it brings to the home of Nebraska, and men engaged in a work of sacrifice for the love of the wife and children at home were never known to paint a city "red." The ruler of old made a magnificent garden by proxy and the money to carry on the work filched from his subjects.

Our horticulturists put their intellect, their own bone and sinew, and their own money into the gardens and orchards to please their lady love, with a love purer and truer than that of any ancient noble, ruler or potentate, and—we thank the Lord—for more appreciative wives.

We have admired and been interested in the amount of work done by the citizens of York to beautify the homes, and this work speaks volumes for the intelligence and morals of your people. While it is a great pleasure to the older people of York to view the beauties of the Park, I believe you will receive even greater benefits from an educational feature for your children. To be able to call all the trees, vines, and shrubs by name is the ambition of every child that loves nature.

To know and to admire the stately elm in all his natural glory is of far more value to the youthful mind than to learn the cold fact from books that the elm is a deciduous tree or that it is oxogenous.

We admire the work you have begun and wish to encourage you to still greater efforts to beautify your city. Time, money, and labor will be required before you reach your ideal; donate liberally the last two necessities and you will surely be given the first in abundance.

Again thanking you for your cordial welcome, we will pass on to the next part of our program.

GREETING.

By Geo. F. Corcoran, President York Commercial Club.

Mr. President, Ladies and Gentlemen: I think about the best thing I could do would be to say amen to what our mayor has said. I just want to say, that while we are busy, we are glad to have you here. You are welcome among us. I hope this will be a pleasant meeting for you.

On behalf of the Commercial Club, I want to welcome you to our city. We have some comfortable rooms just across the street, and you are welcome there at any time. The people of York are glad to have you here. As our mayor has said, we have done some horticultural work here in York, and this is really not a very bad place. All the work

of horticulture done in Nebraska in the last quarter of a century has certainly done great good in developing the country.

Now I don't want to spoil what the mayor has said, so I will stop. Again I say, we are all glad to have you here. Everything we have is open to you. Come and come again. Thank you. (Applause).

H. S. HARRISON: I move that the chairman send a telegram of congratulation to Mr. Pollard.

Motion carried unanimously.

THE PRESIDENT: Mr. Scott was to have given a paper this morning, but he is not here yet, and we will take up the next subject on our program, by Mr. Keyser.

THE NEED OF A FRUIT JUDGING COURSE IN OUR AGRICULTURAL SCHOOLS.

By Val Keyser, Lincoln.

In the department of animal husbandry, the professors will tell you that the stock judging course is the most attractive work they give. The grain judging courses are equally interesting, especially the judging of corn, which has given rise to the numerous lectures on seed corn selection and created a demand for the seed corn special train.

Now because these departments are giving such work and are making a success of it is no reason why a fruit judging course should be introduced, nor would we expect to attach the importance to this work that is claimed for the judging of stock or corn. In fact, the lines of work are not entirely comparable. However, the idea of having the student handle the finished product, and the laboratory methods, are essentially the same. It is by studying the finished product that we learn to observe its points of excellence, that we become able to appreciate its good points and criticise the bad ones.

The judging of stock and corn enables the student to pick out the best, and stimulates a desire to reproduce the best. There is a standard of excellence among fruits as well as in corn, and by learning to score fruit, by comparing the superior with the inferior, the same desire to reproduce the best is bound to come.

If you want a boy to become interested in fruit, you must put the fruit before him. It takes an expert word painter to make a boy's mouth water by merely telling him about apples or peaches, but it does not take long to appreciate his interest in the subject if you place before him a basket of big, red apples or a plate of juicy peaches.

Now then, it happens to be the case that the majority of students in our agricultural schools know very little about fruit. It is true that

some come from sections of the state where the amount of fruit which can be grown is very limited, but I dare say that there is not a farm in Nebraska, which if properly cared for, would not support a fair crop of strawberries, grapes, and currants. Men who are interested in fruit are widening the fruit belt year by year, and good fruit is being produced in sections of the state where we formerly supposed it impossible to grow such crops. Who is responsible for this advance? Is it the man who has never had a desire to grow good fruit, who knows nothing about the possibilities he can expect? By no manner of means. It is the man who is thoroughly acquainted with fruit, the man who is a competent judge, who knows good fruit and has a desire to produce the best.

It has occurred to the writer that the average teacher of horticulture attaches altogether too little importance to familiarizing the student with the best varieties of fruits.

As was said before, the idea did not originate with the writer. It was suggested by some of the older members of the society and at our last meeting the president made a few fitting remarks on the subject. During the course of his remarks he pointed out the value he had received from such training. He said that for years he was an exhibitor at the fairs and failed to take any premiums because he did not know what good fruit was, because he did not understand the judging. Now since he has become familiar with fruit, better acquainted with varieties and with methods of exhibiting, we all know he carries off his share of the prizes.

In considering a question like this, it is a good plan to put ourselves in the position of the student for a while and see if we can trace out where our interest was first awakened in growing fruit.

There is no question but that the work could be made the most attractive course in the whole agriculture curriculum. It has been the experience of the writer in giving what might be called an introduction to such work, our exercise on scoring fruits, that the boys are generally on hand. If the horticultural work should begin to drag, announce that the next exercise will be on the scoring and describing of apples, and then count the absent marks in your class roll. We need not argue the question whether or not the students want such work. There are, however, difficulties in introducing such a course. The course would have to be given in the winter and this would greatly lessen the number of fruits which would be available, though it would be possible to get apples, pears, plums, grapes, and the citrous fruits; also nearly all the nuts are obtainable at that time of year.

With proper conveniences it is possible to grow strawberries so as to have them ready for use while the school is in session. Preserved

specimens and wax models can be used to some extent to show methods of identifying the softer fruits. Since the principles for describing and scoring are essentially the same for all the fruits, it would be best to have the class spend most of their time with apples.

The Score-Card.

(Taken from Waugh's Systematic Pomology.)

The score-card, for example, will consist essentially of the following points:

Apples.

Form	15
Size	10
Color	15
Uniformity	20
Quality	20
Freedom from imperfections	20
	100

Grapes.

Flavor	15
Form of bunch	20
Size of bunch	15
Size of berry	10
Color	10
Firmness	5
Bloom	5
Freedom from blemishes	20
	100

The preparation for the course would not be so difficult when only one got at it. A good assortment of varieties of apples should be collected and properly stored; summer varieties would require cold storage. The average student ought to be able to identify fifty or sixty varieties in the time allotted to this work during the judging week He also ought to carry away a good general notion of how other fruits are described and scored, and the work would be very valuable to him in the choice of varieties for his home orchard.

It seems to the writer that the boys of Nebraska deserve an opportunity of this kind.

The argument that we cannot grow fruit in Nebraska can no longer be used, at least it would not appeal to those who have visited Mr. Pollard's apple orchard at Nehawaka, Mr. Russell's peach orchard at Lin-

coln, Mr. Christy's strawberry patch at Johnson in picking season, or have talked with Theodore Williams of Benson and found how to grow plums.

A course of this kind means better instruction in pomology. It means, if it is introduced, that where now two or three students are allowed to take the work in the University courses, from 150 to 200 boys may have the benefit of such instruction in our agricultural school. A course of this kind would not only help the boys but it would also give the department a better standing.

Since the expense for materials would be considerable, and since the want of competent assistants, the matter of storage and lack of laboratory facilities are questions with a great many of our schools, the time may not be ripe to introduce the course. The matter of expense would of course be greatly reduced by the co-operation of the fruit men in the state, as is the case in the stock judging and corn judging courses.

In conclusion it may be well to mention that we have three very good texts on pomology, Goff's Lessons in Fruit Growing, American Manual of Horticulture by Budd and Hansen, Part 2, and Systematic Pomology by Waugh. The things we need are, better laboratory facilities, better laboratory methods. The question is worth our careful consideration and no doubt our fruit growers who are making a specialty of fruits can lend helpful suggestions in planning such a course.

DISCUSSION

MR. MARSHALL: I cannot help but commend that paper. I think that is a very essential thing, as any one will agree if he has seen some of the fruit placed on exhibition at the state fair. We do not realize how little we know about apples, for instance, until we get a perfect specimen. If we had such a course as Mr. Keyser suggests, it would surely do a great deal of good. I think that the Horticultural Society and individual members should support such a plan and encourage it all we can. I did not know what a good specimen of fruit was until I was beaten two or three times at the state fair. So I say the need of a fruit judging course is quite evident.

H. S. HARRISON: We had the moral to that at the state fair last fall. Marshall and Yager came down there and took nearly all of the prizes. A few men from the western part of the state had fine, clean fruit, but they could not understand why Marshall and Yager took all the premiums. I hope that their failure last year will do them as much good as Marshall got from his experience.

MR. YAGER: I think all we need to do is to make the demand

on the fruit growers of the state; encourage them to push this thing The hog men and cattle men, etc., have judging courses, and I don't think the horticulturists ought to take a back seat for any one.

MR. HADKINSON: I say amen to all this.

THE PRESIDENT: I would like to add a word. Last year at St. Louis, Nebraska exhibitors took more premiums, according to the number of exhibitors, than any other state. This fact was due, not only to the perfection of the fruit sent there, but also to the placing of it on the tables. This work was done by Mrs. Hadkinson. It usually takes two or three years of experience before one knows perfect fruit. This fruit judging course would certainly be a good thing.

The Secretary will now read a paper from Mr. Stephens, on The Plum Curculio.

THE CURCULIO.

By E. F. Stephens, Crete.

Our attention has recently been called to the work of the plum curculio in the apple orchards. While the writer has been familiar with the work of the plum curculio in the plum orchards and the occasional harm which they did the cherries and peaches, we have not until this season noticed any harm from this particular insect in the apple orchards. My attention has also this day been called to the work of the apple curculio in the apple orchards. Doubtless we have all of us suffered more or less from the work of this insect for many years, but the insects were not in sufficient numbers to make their presence noticeable.

Apparently the greater amount of harm done this season in the apple orchards is from the plum curculio. In the neighborhoods under discussion, there was a failure of the plum crop in 1904 and again in 1905, This compelled the plum curculio to seek food in the apple orchards. Since the beetle of the plum curculio commences to deposit eggs in the apple while it is yet less than half an inch in diameter and the puncture is slight and might not be noticed, the dropping of a good many apples at this time might easily be attributed to other causes and not charged to the work of this particular insect. To lose 10 per cent of a full crop involves so slight a loss that it would not be noticed. To lose the same number of bushels out of a very light crop might mean the loss of one-third or even one-half of all the fruit in the orchard. In many orchards in Nebraska the latter condition confronts us today, and should be promptly met with such instant and persistant work as shall control the ravages of this insect and guard against or lessen future loss.

In the effort to ascertain what our scientific friends have had to say upon this subject, we notice bulletin No. 98, University of Illinois Agricultural Experiment Station, "The Curculio and the Apple," by Prof. Charles S. Crandell. Perhaps a few paragraphs from this work may be of general interest and may encourage the planter to at once start his disc in motion and during the next thirty days as far as possible destroy the larvae before they emerge as mature beetles

"The life cycle of the plum curculio is as follows: At about the time in early spring when vegetation resumes activity and buds begin to push, curculios which have hibernated under rubbish on the ground, under the rough bark of trees and in other secure hiding places, emerge from concealment and seek the fruit plants upon which they feed and breed. About the time the trees bloom, mating begins, and as soon as the young fruit enlarges the deposition of eggs begins. Apples no larger than small peas often bear from one to three of the characteristic crescent marks made by this curculio. The deposition of eggs goes on most rapidly during the month of June, but continues through July and August, gradually growing less and less as the beetles die. The majority of the beetles of this generation do not live beyond the month of July, but a few may survive until September, or in rare instances until late fall. During the season both males and females feed upon the same fruits in which eggs are deposited, making small, usually cylindrical punctures. The eggs hatch in from four to six days and the young larvae start tortuous burrows through the fruit. The larvae when fully developed average .32 inch in length and .078 inch in thickness. Development of the larvae causes the fruit to fall wtihin a few days. In about twenty days the larvae mature, cease feeding, bore out of the fruit, and at once enter the ground where they complete their transformation and in about twenty-eight days emerge as perfect beetles. The newly emerged beetles usually remain quiet for a day or two, allowing the body wall, beak and jaws to harden; then they fly into the trees and begin feeding upon the fruit. Beetles of this new generation do not (except possibly in rare cases) pair, and no eggs are laid during this first season. The fruit is freely punctured for feeding purposes and the amount of this work increases as the season advances. It is this feeding of the new generation that causes the greatest injury to the fruit crop. Feeding continues as long as fruit remains on the trees. Late in the fall the beetles leave the trees and hide away in secure places for the long winter period of hibernation."

"No case has been found of the full development of a plum curculio larvae in fruit remaining upon the trees. It seems to be necessary to larvae development that the fruit fall. Sometimes the larvae complete development before the decay of the fruit begins; more fre-

quently development of larvae and decay go on together. Badly decayed apples have in most cases furnished the largest and most vigorous larvae, and we have come to regard the rotten pulp as the food most acceptable to the larvae of the plum curculio."

"There is considerable mortality among larvae while within the fruit. Extended observations through two seasons point to two possible causes:

First—Crushing by growth of fruit. The writer holds the opinion that some larvae die from this cause, and this opinion is based upon miscroscopical examination of larvae found dead in the burrows, and examination of the fruit tissue surrounding these larvae. Many larvae thus found have a flattened, crushed appearance. This, taken in connection with the fact that newly formed cells closely encompased the larvae and completely closed the burrows behind them, is looked upon as fairly good evidence that death resulted from pressure from growing fruit cells. The eggs of the plum curculio are deposited in apples on the trees. If the apples fall at the time the eggs hatch, or soon after, growth of the fruit is arrested, and development of the larvae may proceed; but if the fruit fails to fall, growth of tissue continues and the formation of new cells may be so rapid and strong that the weak, newly hatched larvae cannot overcome it and hence are crushed.

Second—The action of direct sunlight upon fruit. Considerable evidence has been gathered tending to show that sunlight on fallen apples is destructive to the contained larvae. No living larvae were found in fallen apples that had been exposed to the sun for a few hours, while apples taken from under the shade of trees gave a fair proportion of living larvae.

DEPTHS TO WHICH LARVAE GO FOR PUPATION.

The larvae, having remained in the apple an average of twenty days, enter the ground to a depth of from one-fourth inch to three and one-half inches, depending on the character of the soil and other conditions. Most of them enter the soil to a depth of from 1½ to 2½ inches. This point is of value in determining the depth to which the disc must be run to disturb the larvae during pupation. The average length of time for pupation has been found to be 28 days. There is, therefore, 28 days' time during which they may be disturbed by the disc or other methods of cultivation.

The most pupae are in the earth from the middle of June until perhaps the middle of August, although some may remain as late as November. The average number of eggs deposited by each female beetle is 231. "Newly emerged beetles usually remain quiet for a time,

apparently to allow complete hardening of the body wall and appendages. Then they seek the food plants, and, so far as the evidence at hand indicates, spend the rest of the season in eating and sleeping."

Upon the emergence of the fully matured beetles they fed freely upon the apple, the plum, and some other fruits and it is during this period of their growth that the greatest harm to the apple is done. As the fall temperature lowers, the beetles become less and less active, finally all leave the trees and seek places of hibernation. The place most commonly chosen for hibernation is in or near the ground, under grass or such other rubbish as may be present. It also seems probable that many of the beetles hibernate in the woods, as orchards in close proximity to wood lands suffer most in the rows nearest the woods. When orchards are kept free from weeds and grass, good shelter for hibernating insects is not afforded. They are naturally driven to seek shelter elsewhere and woods afford ample opportunity to secure shelter.

APPLE CURCULIO.

The apple curculio has been known as injurious for a much shorter period than has the plum curculio, and it has never been so serious a menace to the fruit crops, never has developed the interest or received the attention that has been accorded to the plum curculio.

"The main facts in the life history of the apple curculio are well established, and were first clearly set forth by Riley in his Third Missouri Report in 1871. Oviposition begins in the spring, while the fruits are quite small. The larvae feed on the pulp, pupate in the cavity excavated, and emerge from the fruit as perfect beetles. This new generation of beetles, for the most part, hides away in secure places until late fall, then hibernates until time for ovipositing in the spring.

The oviposition of eggs occurs from the early days of May until about the middle of July, the average number of eggs for each female, is 65,

"Comparing the damage done by the two curculios under consideration it is quite plain that for northern and central Illinois, at least, much the greater injury is done by the plum curculio. This is due to numerical superiority, to longer period of work, and to the more destructive character of the puncture made. The greatest damage done to apples by the plum curculio is done after all injurious work by the apple curculio has ceased."

CULTIVATION AS A MEANS OF REPRESSION.

"Superficial tillage of the surface soil can be recommended as an effective method of attacking curculio. This tillage should be carried on continuously or at frequent intervals for a period of from thirty to

forty days, during which the great bulk of the new crop of plum curculios is in the ground. The object of this tillage is to turn the pupae out, kill some in the process, and expose the rest to the elements and to birds and insects that prey upon them. Pupae of the plum curculio are extremely delicate, and they are incapable of moving about. In digging for pupae it was observed that admission of air to the burrow invariably caused immediate distress; the pupae would squirm and wriggle as if in pain. Actual trial proved that sunlight was quickly fatal and that exposure on the surface in the shade, on a warm day, would kill in a few hours. It was also demonstrated that birds, ants, and other insects devour exposed pupae greedily. In view of the results obtained in this work with pupae, the definite statement is warranted that cultivation with disc or harrow will, in great measure, prevent the maturation of these insects and at less cost than by any other means.

"Those who put in practice the suggested means of holding the curculio in check need apprehend no serious trouble from these insects in ordinary years unless injury results through invasion from neighboring orchards that are neglected and that serve as harbors and breeding places.

"Years of excessive abundance of curculios will doubtless recur, but orchards that are pruned, cultivated, and sprayed are not likely to suffer serious injury. It is the neglected orchards, those affording ideal conditions for insect development, that will suffer most in these years of abundant insects.

"Curculios, like many other insects, appear to run in cycles. Years of great abundance are, through natural causes, followed by years of comparative scarcity.

"Persistent application of artificial means of repression will reduce injury to its lowest point in years of scarcity, make the recurrence of maximum injury less frequent, and greatly mitigate the injury in years when insects are most aboundant.

"It should be remembered that curculios are not the only orchard pests, and that means of repression directed against these insects are equally effective in controlling other insects which are more or less injurious every year.

"Spraying is an essential practice for the control of apple scab and other fungus diseases. Arsenical poisons applied with the Bordeaux mixture add little to the expense and are even more effective in checking the ravages of Codlin moth, canker worm and other leaf-eating insects than they are in destroying curculios. The practice of destroying fallen fruit commended as a means of attacking curculio, is equally effective

against Codling moth and at the same time aids in preventing the spread of some destructive fungi.

"Cultivation is an effective means for destroying plum curculio pupae and for promoting conditions generally unfavorable to insects, but the benefits of cultivation do not end here. The physical condition of the soil is improved and plant food renedered available. Growth of both trees and fruit is stimulated and the increased vigor insures greater resistance to the ravages of insects and diseases. In view of the wide reaching effects of the means commended for the detsruction of curculio, the cost attending their application is not chargeable to curculio alone. To fight curculio is virtually to attack all orchard pests and to make right any conditions not favorable to the growth and productiveness of orchard trees.

CONCLUSIONS.

It seems possible to attack the curculio in three different ways:

First—By spraying with arsenical poisons. This method aims at the destruction of the adult or beetle stage of the insect only.

Second—By destruction of fallen fruit. This method of attack aims at the egg and larvae stages of the insect. All fallen fruit must be taken into account, not only the larger fruits that fall in late summer, but more particularly the small apples that fall in June and early July. The early fallen fruit is usually ignored, but is really more important from the standpoint of attack on curculio than the late fallen fruit, because oviposition and larval development is at its height early in the season.

Third—Cultivation. This method of attack is directed against the insect in the ground and may affect the three stages, larvae, pupa, and beetle, but is more particularly intended to destroy pupa.

The experiments given have demonstrated:

First—That both larvae and pupae are very delicate and extremely sensitive to exposure to light and air.

Second—That short exposure to direct sunlight is fatal to both larvae and pupae.

Third—That ants and other predaceous insects, as well as birds, prey upon both larvae and pupae.

In the light of these facts superficial tillage for a period of thirty or more days from July 10th is commended as an effective means of attacking plum curculios.

To advocate measures against curculios is, in effect, to urge the

maintainence of better orchard conditions. The state of orchard culture most favorable to the production of profitable crops is correspondingly unfavorable to the development of insects and the spread of fungus diseases.

Best results can only be obtained through intensive culture and to aim at these best results is simply to apply to the management of orchards that same business sense that brings success in other commercial veentures."

We are frequently asked why the cherry orchards in eastern Nebraska are less fruitful this year than last. A partial answer to this query may be found in the following suggestions:

Many orchards were weakened by overproduction last season. The trees have not yet fully recovered. I doubt if any orchardist would ever think of reducing the crop the trees must attempt to mature. While the development of the flesh of the cherry is not a very serious strain on the tree, to perfect the pit in so many thousands of cherries on a single tree is a serious tax on its vitality. The average orchardist does not realize how seriously his trees have suffered in this effort. Perhaps the ground has been tramped by the pickers. Perhaps the season of cherry ripening has also been followed by some days or weeks of dry weather. Under such conditions the best of cultivation should be given. Many years ago the writer saw young orchards in western Iowa which had fruited abundantly. Many of the trees were sadly weakened and some died the following spring. They had not retained sufficient vitality to to enable them to put on new growth and store the necessary vigor to pass through the succeeding winter.

Last winter the temperature ranged very low, and this further taxed the vitality of the trees already seriously depleted by the over abundant crop in 1904.

SHOT HOLE FUNGUS.

The cherry orchards of eastern Nebraska have seriously suffered during these recent wet seasons from the ravages of the shot hole fungus. This is peculiarly trying to what have been called the red juice cherries, such as English Morello and Wragg. Early Richmond and Large Montmorency have not entirely escaped. In many orchards the trees have been seriously weakened. The presence of this fungus is indicatd by leaves changing color and by premature dropping. Cherry trees which lose their foliage in July and August do not store up a sufficient amount of starch for themeslves and do not perfect leaf and fruit buds to such an extent as to enable the tree to start off with

vigor the following spring. Should this disease attack the orchard two or three years in succession the trees are so weakened that they bear very little fruit and many of them die.

REMEDIES.

On a recent trip through the middle states the writer noticed that cherry orchards which had been persistently sprayed with Bordeaux mixture were in the most vigorous possible condition, thrifty vigorous growth, healthy foliage, and an aundant crop of fruit. This indicates that it is entirely practicable by judicious spraying to keep this fungus disease in check and to keep our orchards in fruitful condition. At Vincennes, Indiana, H. M. Simpson & Sons are very extensively engaged in commercial orcharding. They make large use of Bordeaux mixture in spraying their orchards for the control of all fungus diseases attacking either cherry or apple trees.

THEIR METHOD.

Before the buds open in the spring they spray with sulphate of copper. Before the trees bloom they spray with Bordeaux mixture. When the cherries are about the size of small peas they again spray with Bordeaux. Between this time and the picking of the crop they do not spray for fear some of the poison might remain attached to the fruit. After the crop has been marketed they again spray with Bordeaux mixture.

The writer would like to suggest from his own experience in this work, that should the summer be wet or showery, it is wise to spray again three weeks later. In the growing of cherry trees in nursery row it has been found very advantageous to spray the trees two or three times a month to keep down shot hole fungus, to keep the foliage in perfect health, and to secure the most vigorous possible growth. Should cherry trees in nursery row shed their leaves in July or August they may not winter well and would be found to be weak the following spring. Frequent surface culture helps to secure such vigorous growth as will materially assist in the production of healthy foliage. Heavy application of fertilizers supply plant food in such abundance as to be of marked assistance in the growth of healthy foliage.

HUMIDITY.

Twenty years ago when the writer attended horticultural meetings

in states east of us and noted the troubles with which they contended, the feeling was natural that in our dry, breezy climate such trials as blight and fungus diseases were not likely to come to us. At that time they were unknown in eastern Nebraska.

Twenty-five or thirty years ago a heavy rainfall in June was quite likely to send the Blue river up over our lower pasture lands. The rolling prairies were covered largely with buffalo grass. A considerable portion of a heavy rainfall quickly found its way into the streams and ran away to the seas. While statistics show that for a long period of time Nebraska has had as much rainfall as we have now, yet the humidity created by that rainfall was much less than now. The Blue river has not been up over our pasture for very many years. Cultivated fields, ranker, stronger growing grasses catch the rainfall and retard its flow to the draws and ravines. A larger percentage of the annual rainfall now soaks into the soil. It is stored in the subsoil, is ultimately given back to the atmosphere. We now have a much more humid climate than twenty to thirty years ago. This humidity favors the dissemination of spores of blight and fungus diseases. We must adapt our methods to these changed conditions.

In passing to western central and western Nebraska we find that they have a drier summer climate than eastern Nebraska, more days of sunlight and much more rapid evaporation. Such weather is not conducive to the spread of fungus diseases, hence we find that in Lincoln county and on to the west line of the state even the red juice cherries may be grown with perfect safety. Cherry and plum orchards find most favorable conditions beyond a line 300 miles from the Missouri river. Cherry and plum trees commence bearing the next season after planting and when planted four or five years are yielding all the fruit they can carry. With the advent of large areas brought under irrigation there will be a marked increase in humidity of the atmosphere, and diseases from which they are now exempt will ultimately reach them. For this reason our far western planters should be warned in time and should be as careful as their eastern neighbors in keeping fungus diseases in check.

DISCUSSION.

A MEMBER: I consider the plum curculio one of the worst pests we have. Last year it commenced by destroying portions of the branches of cherry and apple trees. This season it has destroyed the entire crop with me, and all of my peaches. I presume it is worse with me because my orchard is bordering on the timber where there are lots

of wild plums. I think the plum curculio has been more destructive than we have any idea of.

MR. DAVIDSON: Why would not geese in an orchard be a good remedy?

MR. YAGER: We have a farmer in our community who is veery much interested in plum culture. He is not a scientific man, however, but he has discovered a way of getting rid of the plum curculio. It is by keeping a small flock of guineas. He says it is surprising how many curculio one guinea will eat in a season. He has fine plums to show for it, too. The guinea proposition on a small scale is all right. I think that spraying is ineffective; it does not seem to do the business.

PROF. EMERSON: Spraying alone is not enough, but spraying two or three times, and then giving the orchard good cultivation and a thorough cleaning in the fall is good. There should be no decaying fruit or dead matter of any kind left in the orchard as a breeding place for diseases.

MR. SWAN: Down in our country I have not seen a curculio this summer. They probably got disgusted with us down there. This guinea idea might be all right, but we cannot raise guineas in Johnson county. They don't have sense enough to live down there.

MR. HENDERSON: I was talking with a friend of mine last night, and he said one of his neighbors had a good deal of trouble with rats. He got some guineas, and they scared the rats away. Maybe it was the same way with these bugs,—that they were scared away by the guineas. Cherry trees have never been affected by worms or bugs, but this year little worms about a quarter of an inch long have eaten nearly fifty percent of the leaves.

THE PRESIDENT: If that worm is a leaf eater, you can get rid of it by spraying. That is the trouble with this curculio, it don't eat the leaves. It eats at the fruit first, and for that reason it is pretty hard to spray for the curculio.

MR. YAGER: One word about this guinea idea. Swan now is making light of this, but it is really a good thing. The trouble with you is you want to tame your guineas. You should let them run, for they are naturally wild. Just get them and let them go it alone.

MR. SWAN: You can get all the guineas you want in Nemaha county for $3 a dozen. An old hen had all kinds of guineas, but only raised one.

MR. BROWN: I am a stranger here, but I would like to say a few words on this subject. I am originally a New Yorker, and with us there in New York State, you could raise apples just as well as shade

trees, and we never had any trouble, either. All kinds of fruit grew well. I went back there about twenty years ago, and found that no fruit could be grown except apples. Plums, peaches and everything else was gone. Some insect had done the business. We asked ourselves what was the cause of this. It seems to me that this is the same here, —there is a cause at the bottom of all this, and we must get down to that underlying cause before we can hope to accomplish anything. We want to get down to the bottom of this scientifically, and find out just how these things come to be.

MR. DAVIDSON: Just one word. It occurs to me that this trouble is more noticeable and prevalent on account of the destruction of our forests and the scarcity of bird life. If we had fifty times the number of birds that we now have, there would be a great scarcity of insects at the present time. It seems to me that birds would do more toward keeping insects down than all the guineas we could raise.

MR. KEYSER: I would like to make a few remarks on this bird question. I have listened to the talk of entomologists, etc., for several years about the protection of birds. It seems to me to be time spent uselessly. I believe birds are a good thing, however, but when you come to fighting insects, you can wait for the birds to do it. I think we should pay more attention to scientific investigation and more thorough experiments in spraying. It may be that I don't appreciate the full value of the bird side of this question, but I think we can accomplish more in some other way—in a way that is much more practical.

MR. MARSHALL: I don't think that which Mr. Keyser suggests is the whole solution of this question, but it is surely part of it. I think he is drawing the bird question a little too strong. I believe the birds do more good than we really think for. I believe the birds are increasing steadily. I did not use to think much of birds, but now I am a friend of almost any bird.

MR. BROWN: While it is true that we are nearly always fighting insects of some kind, yet we surely get rid of a large amount of them during the summer by the bird method. I believe that if the birds were encouraged more, and protected, that they would do a great deal toward solving this insect question.

MR. YAGER: I used to get the old shotgun out and go after the birds at cherry picking time, but this year I did not do it. I really think the birds ought to be encouraged and protected.

MR. SWAN: A couple of years ago we had a field of about half

an acre of cucumbers. One day I noticed some bugs on the cucumber vines. I had four hens with about thirty chickens apiece, and when these chickens were turned loose among those vines, they cleaned every bug off the whole patch.

Meeting adjourned until 2:00 p. m.

SECOND SESSION.—2:00 P. M.

THE PRESIDENT: The first subject on our program for this afternoon is the Flower Garden, by Mr. Green.

THE FLOWER GARDEN.

By C. H. Green, Fremont.

In presenting to the members and friends assembled here a plea for the flower garden I feel that it would be unneccesary for me to go into details regarding varieties, methods of propogating and caring for the different blooming and decorative plants adapted to the flower gardens of Nebraska.

Neither will I take into consideration anything in the line of hardy ornamentals. Our worthy secretary first asked me to give you something on the line of ornamental shrubs. I told him that in my opinion there was just one man in the state who knew all about them and the first letter of his name was C. S. Harrison, York, Nebraska.

My line is growing tender plants under glass both for cut flowers and for planting in the flower garden, such as geraniums, verbenias, cannas, coleus, heliotrope, pansies, ageratium, dahlias, and many others of this class of which we produced and distributed during the present season many thousands of plants.

Now perhaps some of you will be disappointed because I do not tell you to plant something different from what you have been used to, something new, something strange and odd, but twenty years experience in this line of work has taught me that there are a great many beautiful sorts of plants recommended in catalogues, for planting in your yard, that will only bring disappointment to you. How much better to have something that will thrive under all circumstances even though we saw it in our grandmother's garden, than to have something with a long, unpronounceable name, praised to the skies by the introducee, that will possibly produce flowers resembling those shown in the glorious lithograph only, about one-tenth the size you expected, and that will burn and curl up on the first day that the sun shines genially, that will look like a young man with his first cigar if we should have a cool wet spell, that will whip to rags the first time we

have a nice comfortable breeze as we sometimes do here in God's country.

Not that I am opposed to the introduction of new varities or the improvement of old ones. Far from it. There is room for great improvement along all lines and new and better sorts are coming out the old and inferior sorts being dropped continually.

Every season we try a number of new sorts of different plants, each claimed to be the very finest that ever happened and sure to revolutionize things. Once in a while we get something that is good but most of them soon drop from sight and are never heard of again.

Now let us suppose that spring is coming, that we begin to long for the green growing things and for the smell of the fresh turned soil. Say we have just an ordinary home and an ordinary knowledge of how to raise flowers. We had a couple of flower beds last summer but the pesky things did not amount to much. This season we are going to start early and we are going to have the nicest yard in this neighborhood or we will know the reason why.

The first thing to be considered is annuals. These may be procured as small plants from most any florist or can be grown at home.

Everything considered, it is perhaps better to get the started plants, as they will be better and stronger than you can produce and the expense will be slight and you will be amply repaid in the satisfaction you get from them.

I will mention a few of the best annuals which you can raise from seed by sowing in shallow boxes, transplanting into other boxes when large enough to handle, and finally planting into your flower beds when danger of frost is past. Asters in their various types and colors, than which there is nothing finer for cutting for a bouquet for the table.

Marguerite carnations, that will bloom until everything else is killed down by frost in the fall. Centurea Gymnocarpa or Dusty Miller, whose silvery, feathery foliage makes a beautiful border.

Nasturtiums, which you all know. In Nasturtiums, always get the tall, growing sort, even though you don't want them to climb. For this reason: The dwarf sorts form a compact little bush which twists and winds with every breeze that blows and often breaks off after it is too late to replace it, while the tall growing sorts spread over the ground enough that they are not injured in this manner.

Pansies, one of the most interesting classes of flowers grown. Always something new in color and markings every time you visit them. If you will sow these where you want them, in the fall, and

protect them with leaves or other light litter, they will make good, strong bloomers early in the spring.

Phlox Drummondii will give you a blaze of color all summer, as will Portulaca. Ricinus or castor beans, planted in a group, give an elegant tropical effect.

Plant a few Sweet Peas if you have nothing else. Their beautiful colorings and delightful odor you will never tire of. Plant only what you can keep picked at least every other day, else they will stop blooming. An ounce of seed making a row perhaps fifteen feet long will give you an abundance of bloom.

Verbenas you can grow from seed, but small plants from the florists will give you a better range of color.

For an easy started, rapid growing vine, try the Cobea. The Hyacinth bean and Cypress vine are also very satisfactory.

After we have settled the question of what we will have in the line of annuals comes the question of bulbs. Under this head comes also the tubers and corms, but for convenience we call them all bulbs.

As these will be procured from the florist either in a dormant state or already started in pots, I will only mention them in a general way in connection with other plants procured from the same source and in the combinations in which they are generally used for best effect upon the lawn or in the border.

Suppose we have a good sized bed in the front yard that we want to look particularly nice. Everybody that goes by sees that bed and we will just show them a flowerbed as is a flowerbed. We will plant Cannas in the center, tall growing ones in the middle and shorter ones next to them, then a row of Caladiums, then a row of brilliant red Coleus and a row of Golden Bedder Coleus on the edge. Talk about grandeur, why, we will have everybody hanging over the fence.

Or a bed of deep red Geraniums, bordered with the Dusty Miller already mentioned, will be a constant delight. A bed of Salvia Splendens, bordered with a mottled Coleus is another rich combination. A bed of purple Heliotrope, bordered with dwarf Alyssum, is very dainty.

A bed of double Petunias, in assorted colors, bordered with Pansy, is rich; in fact, there are innumerable combinations that suggest themselves to the flower lover with taste in color and arrangement.

For a border along a drive or walk, a row of Dahlias, of Gladioluses, assorted Cannas, of giant summer blooming Hyacinths or

Hyacinthus Candicans, will be found very satisfactory. In fact, there are so many, many of these easily procured, easily cared for things, that it would simply be out of the question for me to even name them here.

Now, I want to say to the men who have listened so patiently to me this afternoon, and also to those who read this effort in the printed report of the society:

Don't think it is beneath you to get out and dig up the flower beds for your good wife, or to help her to care for them during the summer.

If you are not fond of the beautiful in nature, if you do not take a pride in making your home surroundings as bright and pleasant as your circumstances will permit, there is something wrong in your makeup.

If you have a flower garden this summer, have a nicer one next summer. Entirely aside from the satisfaction you will get out of it, it is a good investment.

DISCUSSION.

MR. KEYSER: Do you recommend the greenhouse plants, like pansies, etc., for fixing up the average country home, or would you plant the hardy stuff entirely?

MR. GREEN: Greenhouse stock cannot be obtained for the aver age country home. It does give quicker and better results, though. It is good to have both the greenhouse and hardy plants. Most of the plants grown by the florists for bedding purposes will grow until they freeze up in the fall. The hardy, outdoor stock is of course all right, but the greenhouse plants will thrive longer in the season.

ISAAC POLLARD: Have you a perpetual blooming rose that is good for average planting?

MR. GREEN: Among the hardy perpetuals you will get a good crop of flowers early in the spring, and then later on they don't make the flowers. They are classes as perpetual blooming roses, but they don't give a steady crop of flowers in the fall.

MR. HARRISON: If you have plenty of moisture for them, they will give the bloom.

MR. GREEN: Yes, that would be all right. All conditions must be most favorable, though.

THE PRESIDENT: Mr. Work, of the Fruit Grower Company, is with us, and we would be pleased to hear a few words from him.

MR. WORK: **Mr. President, Members of the Society, Ladies and Gentlemen:** When the chairman came to me a few minutes ago and asked me if I would say a few words this afternoon, I was immediately seized with stage fright. You all probably know Mr. Irvine, the President of our company and editor of the paper. One of the things which I envy him is ease and ability to get up and say things.

As representatives of the Fruit Grower, you will undoubtedly understand that it is our mission to assist the nurserymen and horticulturists. In the early days, news was carried overland by the usual slow methods, and things were not known very generally. As the newspapers came more in evidence, the news became more general. Consequently, as this development progressed, there came to be newspapers devoted to certain lines of business. The Fruit Grower is of course for the advancement and education of the people along the lines of horticulture. We feel that we are doing some good in that way.

I want to say that I am very glad to have the opportunity of being present at this meeting and hearing these good papers. I have received some good ideas, and expect to hear more. I want to say also, that at any time any of you are in St. Joseph, our latch string hangs outside for you all. We will be glad to show you around, and to help you in any way we can.

I want to sincerely thank you again for this opportunity of being here and saying these few words. (Applause).

THE PRESIDENT: The next subject on our program this afternoon is "Small Fruits," by G. S. Christy, Johnson.

SMALL FRUITS.

By G. S. Christy, Johnson.

Of all the fruit for home use, nothing makes a surer crop and can be grown in a wider range of soil and climate than the berries.

Fruit should form a part of the daily ration of every well regulated family, as the vegetable acid is beneficial to the system. The only way to get the best fruit is to grow it, you are then able to pick it fresh and ripe every day, with no taint of refrigerator cars or musty boxes, and no stale berries.

So much has been written for our reports on the cultivation of small fruit that I believe it best in this paper to enter more into a discussion of varieties, beginning with the strawberry.

With nearly 1,000 varieties to choose from and the most of them doing well in some favored locality, catalogues describing each in its

most favored seasons, forgetting to tell of its defects; it is no surprise that the novice so often makes a failure and soon gives up the attempt to grow berries, even for home use. The most important part of berry growing is to make a proper selection of varieities.

Nebraska growers can not depend on men in Texas, Michigan or New York to make those selections for them.

From Nevada, Mo., south, every commercial grower will advise growing the Aroma. I have had the Aroma in Nebraska five years and have had as many failures.

Rough Rider comes to me from Michigan as the berry to grow if you would wear diamonds. My profits on it in six years would neither buy turquoise nor tortoise ornaments.

New York, bought at a long price, has been a failure. The amount of printers' ink it required to tell of this wonderful berry made the high price of plants necessary. The crop of 1905 is the only one that has paid rent, and then many other varieties more than doubled their yield, but Dunlap and Gandies were the only berries that produced nicer boxes of berries.

Of the varieites that succeed well all over the state, Warfield is the earliest and one of the best; berry dark red to the core, and excellent quality. It is a free runner and if left alone will set plants too thick and the berries will be small.

Bederwood is a light red berry with good foliage and a berry of fine quality. Among the 100 varieties that I have tested, Dunlaps have no equal. A large dark red berry of splendid quality. A prolific plant maker, good foliage, and a strong fruit stem that holds its berries well up from the ground, and excellent polenizer, mid-season, but ripens its entire crop and continues in bearing as late as some of the late varieites. Warfield, Dunlaps and Gandies were our money makers this year, but as the Gandy is a shy bearer, some places I could not recommend it for the entire state, but it is worthy of a trial, as I believe it is one of our best late varieties. First berries June 5. Bisels produced more berries this year than the Gandy, but owing to their season, the Gandies sold for the most money.

Splendid, our "old reliable," failed this year for the first time in nine years. Their foliage was poor, the berries ripened soft and the calyx dead. I believe the trouble was caused by the late freeze and continued dry weather. Of the very early berries, August Luther and Excelsior have both done well. Uncle Jim is of exceptionally fine quality and quite prolific, but the fresh picked berries have a dead appearance that spoils the looks of the box and will be aaginst them as a

commercial berry, but they are fine for home use, where quality is one of the first considerations. Parsons Beauty, Parker Earl, Crescent, Loyd, and Yant all did well. Ridgeway, Sample and Brandywine of the late varieties did well, but were not up to the standard of the Gandy. Oom Paul, Lucas, Challenge and Rough Rider scarcely paid rent. Jessie, McKinley, Clyde, and Johnsons Early did better, but were not up to the standard we are striving for.

Several new varieties are being pushed to the front at present. One of these, the Commonwealth, is superior to any of the late varieties in use, according to the introducer. I like its appearance very well, but have not yet fruited it. Some southern growers are planting the Klondike almost exclusively, and it gives promise of doing well here.

One of the latest to be offered to the public is the Cardinal Strawberry. More money has been spent to advertise it than any other new variety ever introduced, and the public pays the expense at the rate of $3.00 per dozen for plants. If it will take the place of our late varieties as well as Dunlaps supplants the mid-season varieties, we will not begrudge the price. I would advise new beginners in the berry business to buy only well established varieties. Nine out of ten of the highest priced plants in all catalogues are of no value.

RASPBERRIES.

No fruit retains its natural flavor after canning better than the raspberry. Several years' experience with Kansas, Gregg, Nemaha. Parmer, etc., has given us a few very fine crops and several poor ones. It was really a question with me whether raspberries could be grown at $2.00@2.50 per case or not.

I have been testing new varieties and had by success in a small way gained confidence enough in Cumberlands and Cardinals to plant quite liberally of them in 1904. I planted four rows of Cumberland fifty rods long, five rows of Cardinals, and on recommendation of my friend, McGeehon, added three rows of Haymaker. The rows of raspberries were eight feet apart, and not expecting much of a crop the first year, I planted strawberries between the rows. The raspberries were tended almost entirely with a two-horse cultivator, as we only hoed them twice.

Last winter the thermometer registered 34 degrees below zero and we became anxious as to the fate of our raspberries. Last spring one-half of the strawberries were removed from the field and from the

balance we picked 200 cases, doing some damage to our raspberries. On June 19 we sold our first Cumberland berries (black caps) and the four rows yielded twenty-three cases. June 26 Cardinal red raspberries were on the market and from the five rows we picked sixty-four cases. July 1 Haymaker red raspberries began paying rent; the three rows have given us forty-two cases and are not all picked at this date (July 19). A total of 200 cases of strawberries and 129 cases of raspberries from two acres and poor land at that.

Two rows of Kansas raspberries 2 years old, of the same length were so seriously injured by the winter that they only yielded one case of berries to the row.

Cumberlands were killed back some, Haymakers were damaged, but not a single cane of the Cardinal was injured.

BLACKBERRIES.

Snyder still remains the standard in hardiness and yield of berries. Lawtons, Wilson, Jr., and several other varieties produce a much nicer berry, but do not give regular crops. We are testing Mersereau, Eldorado, Blowers and others in hopes of getting the desired berry.

The Lucretia Dewberry has this year excelled all the blackberries in point of quality and quantity. Our finest berries were trellised about eighteen inches high. This gave a chance to cultivate them and they were easily picked. Our first ripe dewberries were picked June 23, and they are still furnishing some berries. They have yielded six boxes to the rod, or about eighty cases per acre. I have known the dewberry several years, but never saw a better crop of them than this year. I could not recommend them for commercial purposes, but a few are fine for home use. But of all the berries we have ever grown, the Logan berry attracts the most attention. We planted a few last year and were pleased to find they had passed through the winter without injury. They are trailers like the dewberry and were also put on wires. The first berries ripened June 17 and they are still blooming and ripening berries. They are of the size of the dewberry and the color of the finest red raspberry.

The most of the blackberries are green when they are red, but the Logan blackberry is red when it is ripe. The flavor is excellent and the berries will command a high price.

In California the Logans are almost everbearing and only ripen a few berries at a time, making the picking expensive. As they are forced to lie dormant here for a season they give promise of ripening their fruit in a shorter season. Encouraged by our success, I ordered

another lot of plants from California last spring and now have enough fine plants growing to make a thorough test of their merits. We have also planted a few Burbank's Phenomenal raspberry, the growth of it is about the same as the Logan berry, but they are much more prolific in California, $1,400 worth of berries per acre being the claims of its promoters. I cannot recommend either of these for commercial planting, but the lover of fancy fruit should try a few of them even though it costs 25 cents per quart to grow them, as they cost us this year.

DISCUSSION.

MR. HARRISON: Have you experimented with the dewberry yet?

MR. CHRISTY: Yes, some.

MR. HARRISON: Do you have the Palmer raspberry?

MR. CHRISTY: Yes, I have it, but it is a very small berry.

MR. BELTZER: Is it larger than the Kansas?

MR. CHRISTY: No.

MR. BELTZER: I have the Cumberland, and like it all right.

MR. BROWN: Have you the Logan berry?

MR. CHRISTY: Yes, I have brought a few with me, but I don't think they are holding up very well.

MR. DAVIDSON: I have had the Logan berry for three years, and I think it has come to be a little disppointment.

MR. CHRISTY: It may do fairly well in the eastern part of the state, but not in the western. The berry for the western part of Nebraska is the dewberry. This Logan berry is rather a shy bearer. It does not bear heavy enough to make any money out of it.

MR. BELTZER: Did you ever make any money out of any kind of dewberry in this state? I don't think it amounts to anything at all.

MR. CHRISTY: Yes, I did this year.

C. S. HARRISON: The dewberry is decidedly a good thing for the western part of the state. It bears pretty regularly. The people want something out there, and the dewberry is all right for them.

MR. DAVIDSON: I would like to ask Mr. Christy what he got for dewberries.

MR. CHRISTY: My dewberries sold for $2.50 per case, and blackberries for $1.75.

QUESTION: Is the dewberry more palatable than the blackberry?

MR. CHRISTY: That depends entirely on the palate; it is merely a matter of taste. I would just about as soon eat gooseberries.

MR. YAGER: Is not the Cumberland about the best black raspberry that you have?

MR. CHRISTY: I believe the Palmer is a little sweeter. The Cumberland is a good deal better for size, and it has done well with us.

MR. YAGER: They are good up in the northern part of the state.

MR. KEYSER: In picking berries do you pick them pretty green?

MR. CHRISTY: That depends on how far they are to go. We make a difference when they are to go long distances.

MR. BELTZER: I have a question I would like to ask. I would like to know whether it is a fact that the Burbank plum is absolutely worthy of being planted over the state generally.

A. J. BROWN: We raise the trees all right. But if I were planting Burbank plums down at Geneva, I would plant something else.

MR. DUNLAP: I think the Persimmon is a good fruit for Nebraska, and I think Nebraska horticulturists are neglecting it.

MR. BELTZER: I was talking about the Burbank plum. I want to know something about it.

MR. DAVIDSON: My Burbanks last year were about the best plums that I ever had.

H. S. HARRISON: I am satisfied that the Burbank plum is as hardy as any peach in Nebraska. A good many of our peach trees have died, but we have an orchard of Burbank plums planted the same time as our peach trees, and the plum trees are in fine shape. We have discussed this Burbank question quite frequently, and I have always advocated the Burbank for this country and west of here.

A. J. BROWN: I think perhaps if you observe the Burbank almost anywhere in the western part of the state, you will find that they are doing much better than farther east. I would not plant them in our part of the country, because they drop the foliage.

MR. DAVIDSON: I would like to know where we can buy persimmon trees. I believe they are worthy of a trial here.

THE PRESIDENT: When you get persimmons started, they sprout worse than blackberries, and you cannot get rid of them. I like the fruit all right, but I don't want any of the trees on my place.

MR. VON FORELL: Will the persimmon grow all right?

MR. DUNLAP: I have grown them in Butler county for twenty years. The tree is a good grower and hardy, and makes good fruit. I consider it worthy of planting in this country.

MR. VON FORELL: How do you start them first?

MR. DUNLAP: Start them from the seed.

MR. SWAN: I move that we adjourn till 8 o'clock.

Motion carried.

EVENING SESSION.

JULY 19TH, 8:00 P. M.

Some very enjoyable music was furnished at this session by the Celician Ladies Quartette, assisted by Professor J. A. Parks.

MR. BELTZER: I rise to a question of privilege, Mr. Chairman. I feel that I have done the dewberry an injustice. But since I have seen and eaten them this evening, I do believe now that they will do well.

MR. HARRISON: I want to say that Mr. Beltzer is easy if you go at him along the right line. Just feed him.

THE PRESIDENT: We will now hear from Mr. von Forell, on Horticultural Eduction.

HORTICULTURAL EDUCATION.

By E. von Forell, Aurora.

There is a principle in Pedagogy which declares that Teaching, both in matter and method, must be adapted to the capability of the taught.

If this principle is true, then have we indeed gone far out of our way to find the nearest way home. We do not mean to say that in matter and method we have been altogether wrong, nor that we intend to continue stubbornly, in the wrong methods of the past, but that we do not show the willingness, that the occasion requires, to make haste in this matter of correcting our mistakes.

That the study of Horticulture should be taken up in every school

of the state, is a matter that should not, and does not require argument.

Of the hundreds of men whose opinion I have secured upon this matter, not one has denied its right in the Public School curriculum. All these, however, have given their assent on the ground that it is a good, economic proposition for all to be informed on the subject. There is another side, however, more important than the first, and that is that it enables the teacher to follow natural lines along which the pupils' desires may be the more readily stimulated.

If the human soul were a machine that could be wound up like a watch, then it would be unnecessary to excite the desires. Then, too, it would be unnecessary to follow any given line for the sake of greater efficiency, for the abstract and concrete would then appeal alike to the pupil and no stimulous could change the desires. Then would the cramming process be the proper process, and the "Machine School," with its "Intellectual Hopper" grind out its uniform, and unchangeable grist, be the School and only School that need apply. Happily, however, man is not a machine. He is not an automaton. He has varying desires. His tendencies may take different directions as the years pass by, therefore, the above maxim, Teaching, both in matter and method, must be adapted to the capability of the taught.

No one will say that the capabilities of the pupil of seven are equal to that of the pupil of fourteen. If there is a difference in power, there must of necessity be some difference in the matter presented.

If the student of fourteen wishes to find the unknown quantity, would it not be reasonably supposed that mathematics and philosophy would necessarily appeal to him as the proper topic to take up for special study?

If the student of seven wishes to know why God paints the flowers and gives them such various colors, why the vines do not bear acorns and the trees pumpkins, should they not be permitted to follow the trend of their inherent desires and find somewhere an answer to their earnest inquiry? Is there any law in Pedagogy that would deny or forbid an answer to honest inquiry at seven and grant it at fourteen?

No educator will deny but that knowledge can be taught only by occasioning or stimulating the appropriate activities of the pupil's mind.

What then are the appropriate activities of the child mind? Are they to be found in the domain of abstractions, or natural objects? Philosophy or the plant? The tree, the flower, the horse, the toad, the ant, the toad stool, the peony, or a proposition in geometry?

It must always be remembered that Mind acquires knowledge by exerted inner energy. It can not be filled like you fill an evelator by dumping in load after load. The teacher can, however, excite the desires and give direction to the mind thus stimulated.

It is true that there need not be long intervals between the lower and the higher activities, between observation and reason. In truth, the different faculties of the mind seem to be present in the young child, some less active than others, as though awaiting their time for the grooming which each is to receive in its time.

As observation precedes reason, so it becomes necessary to give attention to this faculty first. But what is it that now readily appeals to the child? The mind being self acute is seeking objects of interest, which interest we will find centered in the use and action of things first of all. After this they seek other fields, in which substance, place, form and color come in regular order, and receive each, due consideration.

Having thus taken a hasty glance at the natural order in which the child receives most readily its instruction we will try next to show why the subject of Horticulture should be taught early in the common schools of our country.

1. It appeals to the child. Observe small children five years of age, or even younger, as I have been permitted to do, and thought it may be a surprise to most of us, they show a skill in their ability to learn the names of plants and flowers, that is remarkable, and is only equaled by the interest they take in the subject.

2. It opens the door to a laboratory into which they may enter. that is so complete that no university with its most munificent legislative appropriation can hope to purchase a better. A laboratory where they experiemnt is a divine revelation to the learner,—where the interest is secured at the start, and held to the end,—where our eyes are taught to see and our ears to hear the beautiful visions and sweet haromines in this great universe of ours. Can there be a nobler purpose in education than this?

3. It is the practice school in ethics.

When the student leaves the common schools and enters college, he has for the first time, as a rule, an opportunity to study Moral Ethics. A text is placed in his hand and he is soon to have an intellectual grasp of man's duty to man. But what of the heart's grasp of man's duty to man? Can that be taught by abstruse and learned lectures in the class room? It might as well be said that the stature of a boy should increase by telling him to grow, as to say that he will get a clear grasp of the ethical problem without the proper heart food whereby his ser-

sibilities may be nourished and quickened. Cowper has truly said, "I would not enroll upon my list of friends, though graced with polished manners and fine senses, yet lacking sensibility, the man who needlessly sets foot upon a worm." The finer sensibilities are not grown by commands and learned lectures, they are developed by the nourishment they receive. I am a strong believer in the potent influence of environment. The large red corpuscles that give life and vigor to the body are but the transporters of health and energy gathered from the atmosphere in which we move. We can not expect to develop strong and rugged manhood in a malarious atmosphere, neither can the moral fiber be improved, by the deleterious environment of the back alley or the modern livery barn. Look at the condition we find in the country home of today. The woeful ignorance of the simplest form of animal or plant life. We have been so busy teaching our children the supreme importance of learning to read in a dead language the remarkable fables of Caesar's Gaelic wars, that it has been thought a serious loss of time to consider the "lilies of the valley."

The following question was asked in a teacher's examination, and a farmer's daughter was taking the test. What is an insect? She could not tell. Another question was; Name four domestic animals fered much as to the importance, but nearly all agreed that the cat must most useful to man. The six teachers answering these questions dif· be one of the four indispensible to the farmer's need, while the goat and dog were freely mentioned. Not one word was said, however, about the Belgian hare. Another question: Name four beef breeds of cattle. The Durock and Percheron here had their admirers. We do not give these facts in jest, it is too serious a matter. To think that we can live forever in surroundings in which we take no interest, though God has nothing more beatuiful in store for us than the things we teach our children to ignore as we have done in the past.

4. It cultivates the esthetic— who can study the life history of a plant or a flower for a single day, and not his finer feelings coming to the surface. If we live in the atmosphere of plants and shrubs, our spiritual condition will be measured by the emotions that our environment stirs within us.

We could say much more that should be said along this line, but ve forbear, lest our contention be granted with the inevitable "that's all right, but—it won't stick to the ribs. We therefore turn to the practical side of this qeustion and give the true American reason.

5. It pays. This is axiomatic, and needs no proof. No one will take the statistics of the fruit grown in new sections where special at-

tention must be given to new conditions as they exist but will see that it pays to know. Who in this world has done more for humanity during this present generation than has Luther Burbank in his endless discoveries in fruit propogation, cross fertilization, and hybridization? But the good he has done consists not of what he has produced, but in the interest he has stimulated. The good of horticultural education will not be seen in the things we know, but in the inspirations we receive.

I will not speak of the money value of horticultural pursuits, for that is so well understood that it would be folly to take the time of this meeting. I would rather speak of the richness this subject, well studied, will bring to the human soul. In preparing a course of study for the schools, it should be our desire to so fit it to the inherent nature of the child, that when the course is completed, the scholar will be rich not only in the things he knows, but also in the things he feels.

Whatever success has attended educational efforts in the past has been due to the direct or indirct study of human nature. We are waking to the fact that the child is to be guided along natural lines, and not to be thrust into the dark closet of senseless abstractions.

An unhappy child learns with difficulty. Cramming with indigestible mental food causes mental dyspepsia, pessimism and despair. When this condition is reached, what do we do? Give it a tonic, an appetizer and then cram some more. What should we do? Give the child a rest, a change of scenery. We must change our methods of dealing with our children or, completing the course we have so unwisely begun, we will soon reap the awful harvest of melancholia, and suicide. This is not a prophesy of what may be, but what IS already, as has been seen but a short time ago in your fair city when a young life, crushed by the eternal grind of an inspirationless curriculum, was made unable to bear the disappointment she was forced to face, and she sought relief in death. York is not the only city that has had this sad experience, for many have, during the past year, like this one, sought the end of all earthly trials beyond the silent river. This is not the fault of the teacher, no, no. It is the fault of the system. "Shall we then continue in this sin?"

In the past quarter of a century we have made considerable advancement in method, some in matter, but little in the order in which we present the subjects. We, a long time ago, built agricultural colleges wher the youth of the land was expectd to receive instruction in all that was required to make the farmer and horticulturist, but where were the sons and daughters of our fertile prairies who were

to be thus molded. They were not in evidence. Why? They knew not the advantages of this kind of an education. No one seemed exceedingly anxious to awaken an interest in the young mind. We said by our actions that there was nothing in it, and the young men and women of the land believed us. But to attempt to teach agriculture and horticulture in college and neglect it in the common schools, is like neglecting to impart lessons of truth and honesty until the student enters college wher he may enter a class in Moral Ethics. In the first he is slow to enter and in the second he is slow to practice.

Wherein then, have we erred as to the order? In that we have practically neglected to give instruction along natural lines. The little child has been, too early, placed in the field of abstractions and kept there. When later the longing for natural objects have been satisfied, by no longer desiring them, we place in his hand a text on how plants grow, and then try to revive a desire, long dead; killed by the system, for plant life. Then, too, we wonder, why the boy, to manhood grown, is not moved by the sweet song of the bird, tramples under foot the beautiful flowers without a thought, and surreptuously kills the innocent quaily whose crop is at that very time filled with a thousand destructive insects. The answer is, we have been following an order that places the horse behind the cart. Let us begin now to change the order.

The child by nature is a naturalist. He desires to know more about plants and animals. He also wishes the approval of his seniors. If those to whom he looks for guidance, ignore his questions, he will soon feel that the matter in which he is interested is of little importance, and he soon changes the trend of his interest.

Here is the danger point. Once destroy these wholesome and innate desires, and seldom can he be brought back to those simple tastes that once challenged his youthful attention.

The sweet lullaby of nature will never again sing to rest the perverted tastes of bookcrammed humanity. Let us be serious in viewing this matter as the occasion demands. (Applause).

FOURTH SESSION.

WEDNESDAY, JULY 20TH, 9:30 A. M.

THE PRESIDENT: We will now have Mr. Scott's paper, on The Work of the United States Forest Service in Nebraska, which was to have been given yesterday.

WORK OF THE FOREST SERVICE IN NEBRASKA.

By Chas. A. Scott.

The work of the Federal Forest Service in Nebraska in previous years has been thoroughly discussed in former meetings of this Society and I will confine my remarks today entirely to the work of the past two years. As my work has been almost wholly in connection with the Federal reserves within the state I will first speak of what has been done there. These reserves as most of you know are situated in the sand hill region of the state, and they are practically treeless. Our purpose is to plant the area within their bounds, approximately 225,000 acres, to trees that will in time supply the local demand for timber. Up to the present time we have planted about one million trees on one thousand acres of land.

On beginning this work many new problems confronted us. It was the first such undertaking the government had attempted. The question of what species to try arose, this was discussed and threshed over by men of authority on trees, and the list simmered down to two trees that were likely to succeed, the Jack Pine (Pinus divaracata) and the Western Yellow Pine (Pinus ponderosa). Up to the present time both are proving to be valuable. In addition to these two we are giving the Red Fir (Pseudotsuga taxifolia) a good trial and it is promising well. We are now almost convinced that the Red Pine (Pinus resinosa) will do well in the sand hills, and it will be given a trial as soon as seed can be secured.

Another question that arose was, how can we get satisfactory stock for planting? The advisability of using wild seedlings in preference to nursery grown stock was thoroughly discussed. It was decided that nursery grown stock would undoubtedly be more successful, but the species wanted were not on the market in such quantities as we

would require, and we would have to grow our own stock. It would require three years time to prepare nurseries and grow seedlings. The Forestry officials and the public were anxious to see a beginning made, so we resorted to extreme measures. We shipped in wild seedlings from the forests of the Black Hills of South Dakota and the sand barrens of Minnesota. The result was, we profited by success and failure. The results have been freely given to the public at all times, and I am glad today to tell you more about the results of our work.

In the beginning let me say that we cannot contribute any of our failures to weather conditions, for the summers of 1903, 1904 and 1905 have been very favorable. The winter of 1903-1904 was very dry and probably injured us some but not severely.

One of the first things that we learned was that we could not ship in Western Yellow Pine seedlings from the forest and grow them successfully. The reason is obvious to those who are acquainted with the habit of growth and nature of the tree. It is impossible to dig the murdering their roots, and the roots are the vital parts of a pine tree.

Another thing that we learned by experience in the spring of 1903 was that we could successfully grow Jack pine seedlings from the sandy barrens of Minnesota. Of the 70,000 trees of this species planted that season between 30 and 40 per cent grew. That is not a large percentage but it was enough to encourage us. We saw where we could improve the methods of handling the trees and we determined to double the per cent of living trees in another year. In our next attempt with the same kind of stock we succeeded in getting 67½ per cent to grow. We made no changes in our methods of planting, but we sent two men to the woods to see that the trees were dug from the ground, not pulled, and to see that the men digging the trees carried pails partly filled with water and that the roots were put into into the buckets as soon as the trees were dug, instead of being carried around under the arm until a good big bunch had been secured. Our men also saw that they were properly packed. The moral of this is protect the roots of a pine tree if you expect it to live after transplanting.

The success of the Jack Pine as a tree for the sand hills has not stopped with our own planting. We recommend it for general planting throughout the sand hill region of this state and to my knowledge over 60,000 Jack Pines were shipped into this state last spring by one dealer. A number of these came to Thedford. Two weeks ago I wrote to each of the men who bought trees and asked for the results of their planting. A summary of the replies gives the following

results: The average of all the reports received show that 76 per cent of the trees are growing. The best report gives 97 per cent of the trees growing, the poorest 35 per cent. The writer of this report states that the trees were planted on low ground near the river and that the trees drowned out. The trees were planted under various conditions according to the tastes of the planter. The greater number were planted in the grass sod, the ground not being prepared in any way, and the remainder were planted in plowed ground. Seventy-five per cent of those planted in the sod are growing, and 71 per cent of those planted in the plowed ground are living. The soil around Thedford is as light and sandy as can be found anywhere in the sand hill region. As a result of success of this year's planting there is a lot of enthusiastic tree planters around Thedford and the indications are a large number of trees will be planted in that vicinity next season.

Pine trees do not make rapid growth the first and second year after they are set out in the hills, but after that their growth is quite surprising. On an area of five square rods that was staked off for a sample plot, planted to Jack Pine in 1903, there are thirty-four trees the average height of which is eleven inches, the average height growth of these trees for this year is 6.56 inches or 59½ per cent of their entire height. This is but the beginning of their growth and it will not surprise me if they average one foot in height growth in another year.

Our experience with nursery grown Western Yellow Pine up to the present time has been very encouraging, but we are not yet recommending it for general planting because of the indifferent success so many have met with in transplanting it. Last year we planted about 350,000 one year old trees of this species in furrows in the hills. Between 80 and 90 per cent lived through the planting and we were much elated over our work. The seedlings used in this planting were not over four inches in height, in the fall when the grass dried up and the sand began to fill up the furrows a great many of the little trees were buried, and those surviving are not making the growth they should, but it is very probable that they will make a good growth next year.

This year we planted 275,000 Western Yellow Pine trees, part were planted in furrows and part in the grass sod without preparing the ground in any way. At the present time 85 per cent of those planted in the furrows and 89 per cent of those planted in the sod are growing. Some of the stock of this year's planting is two years old, but it is growing exceptionally well and if future planting does as well

we will no doubt recommend it for general planting, as it is a tree of more economic value than the Jack Pine. This two year old stock that is doing so well with us is planted in furrows, but the one year old stock is more successful in the sod.

Planting trees in the hills is a simple operation. We organize our force in squads of threes, one man carries the trees in a bucket and the other two do the planting with spades. When planting in furrows, the furrows are plowed six feet apart and the trees are set six feet apart in the bottom of the furrow. When planting in the sod a line of stakes is set for the leader to follow and each successive squad follows to the flank of the preceding squad.

Planting in this manner costs from $1.75 to $3.00 per thousand trees, depending upon the character of the ground to be planted, the rougher and more uneven the ground the more it will cost to plant it.

We find that the direction of the slope of the ground is a tremendous factor in the success of planting, 10 to 15 per cent more trees live on a north slope than on a south slope, and an east slope is preferable to a west slope. To sum up the results of our experience in tree planting we have reached the following conclusions:

1. For general planting throughout the sand hills of this state we recommend the Jack Pine. Two year old stock should be used, six to eight inches in height, wild seedlings grow very successfully and are much cheaper than nursery stock.

2. The best results are obtained from planting on northern exposures, followed by the northeast, east, and southeast exposures. South and west exposures give the poorest results. Side hills are more preferable for planting than depressions or pockets, or the crests of hills.

3. On ground where the sand is light and loose the trees should be planted in the grass sod with the least possible disturbance of the soil. In the valleys or on nearly level ground where the soil is firm and the grass sod thick and heavy single furrows should be plowed six feet apart and the trees planted in the bottom of the furrow.

4. Pine trees should be planted early in May in damp or foggy weather if possible. Never attempt to plant pine trees in dry, windy weather.

5. Every precaution must be taken to prevent undue exposure of the roots to the sun and wind.

In connection with tree planting, growing the seedlings has required much of our time and attention. Time will not permit me to go into details in discussing this work. Suffice it to say that we now

have two and one-half acres of seed beds under slatted roof, which gives us a capacity of from three to four millions of seedlings. The slatted roof over the beds gives us part shade, which is necessary the first year. The Western Yellow Pine and the Red Fir are easily raised from seed, they are strong, thrifty seedlings and require very little attention. The Jack Pine is a very tender little seedling and if one-half of the plants that start out survive the first year they are extremely fortunate. The first and great calamity to befall them is an attack of "damping off." The best remedy that I have found to prevent serious loss from this source is a good dressing of gravel over the surface of the seed beds. Sow the seed on the surface of the bed and then with a shovel scatter a thin layer of gravel over the seed, it should never be over one-half inch in depth. The gravel permits the surface of the beds to drain quickly, prevents the soil from spattering up over the plants in times of rain, thus leaving the stems clean at all times and in the very best possible condition. In some experimental beds in which we sowed the same amount of seed on the same area of ground the difference in number of plants produced at the close of the season was more than 5 to 1 in favor of the gravel cover. We are using gravel to some extent of our Jack Pine seed beds this season with the same result that the experiments gave last year. If the gravel could be easily gotten we would use it on all our beds. We sprayed our seedlings and seed beds with Bordeaux mixture this year to test its virtue as a fungicide to prevent damping off, but we find it a very inefficient preventive in such a rainy season as we have had. The seedlings under the gravel cover without any spray have withstood the attack far better than those in the ordinary beds under a liberal application of the spray.

The seedlings grow in the seed beds through two seasons without transplanting. They are then a fine size, about six inches in height, for planting in the hills. The entire cost of growing the seedlings to this age is less than $1.00 per thousand.

Another fungus which we have not yet definitely determined by name, has attacked our seedlings in the beginning of their second season's growth. It appears as a blight the tips of the leaves and works downward until it finally destroys the terminal bud or perhaps an inch or two of the stem. Spraying with Bordeaux mixture appears to hold it in check and we anticipate no serious trouble from this source in the future.

In addition to growing trees for planting on the reserves within this state, we have in the past season shipped 90,000 to the Black Hills and Pike's Peak Forest Reserves for planting up denuded areas. It is

quite probable that the Dismal River Nursery will ultimately become a nursery for some of the other reserves.

At this point, let me correct an erroneous idea that through a mis-statement seems to have gained wide credence. We do not grow trees for public distribution, nor do we sell them. We grow them solely for planting on the Government reserves. The Forest Service, however, does offer assistance to private individuals and concerns, and it is our ambition to give every applicant the best service we can, entirely or nearly free of cost. The assistance that the Forest Service offers is entirely of a technical nature, it is not our purpose to spend time or money doing for the individual what he is capable of doing for himself. If a farmer or ranchman within this state, or any other state for that matter, contemplates setting out a plantation and applies to the Forest Service for assistance, his application is placed on file and as soon as we are satisfied that he really means business, an agent is sent to make an examination of the proposed site. If deemed advisable a planting plan is made for the specific tract. Thirty such plans have been made for farmers and ranchmen of this state. A planting plan consists of a scheme for planting the tract under consideration, recommends the planting of such species of trees as we believe are best adapted and most suitable to fulfill the purpose of the plantation. It also includes information as to where the nursery stock may be secured, how to handle and plant the trees, and how to cultivate and care for them after they are planted.

To lumbermen and owners of timbered tracts the Forest Service offers similar assistance. Upon application working plans are prepared. A working plan takes up in detail the most advisable methods of handling a timbered tract so that it will yield the largest possible net returns and at the same time leave the ground in the highest productive condition. The science of Forestry has two definite objects in view, and these objects are prominently emphasized in every working plan. The first is economy in harvesting the present crop of timber, and the second is the protection of the future crop. The Forester always has the future in mind. Economical utilization and perpetuation of the forests, expresses in one sentence the purpose of the profession. All applications for assistance of any nature or for bulletins published by the Forest Service and distributed free of cost, should be addressed to " 'THE FORESTER,' U. S. Forest Service, Washington, D. C."

Before we can give advice or instruction for planting trees or handling tracts of timber land we must be thoroughly acquainted with the country and the conditions under which the work is to be done. To secure this necessary knowledge for our work in Nebraska a party of

Forest students were sent out by the Bureau of Forestry last summer under the leadership of Professor Frank G. Miller of the State University to make a Forest Survey of the planted timber in the eastern part of the state. Their work extended west to the 99th Meridian, a north and south line passing through Kearney. The results of their work brought out many interesting points which are summed up by Professor Miller as follows:

1. The entire State of Neoraska has 286,000 acres of planted timber, according to the figures returned by the assessors for 1903 and 1904, 248,000 of which are in the territory east of the 99th Meridian. This is slightly more than 1 per cent of the total area of the state.

2. The planted area east of the 99th Meridian as a whole is decreasing, owing to the fact that many of the old plantations are being cleared off and very little planting is being done to replace them. There has been a notable decline in forest planting since 1894. Nurserymen generally agree, however, that there is a revival of interest in tree planting at the present time.

3. The most promising trees for economic planting in the region covered are:

For fuel: Cottonwood and Willow. On good bottom soils Cottonwood will produce three cords per acre annually for the first twenty-five or thirty years. Willow does not yield so heavily, perhaps, but its fuel value is somewhat nigher.

For posts: Catalpa, Osage Orange, Honey Locust, and Green Ash, also European Larch and Red Cedar. Catalpa should be given first place wherever it will grow, and I believe it will succeed on the right kind of soil through the territory covered. The western part may be a little dry and the northern a trifle cold. There is a successful plantation at Yankton, S. D., however. The Robinson plantation at Pawnee City, thirteen acres of the best portion is worth nearly $15.00 per acre annually, and it is but 14 years old. This is on new land; eight acres, 15 years old, on old land, is not so good. Mr. John Heins at Ulyssus, Neb., is selling $207.00 worth of posts per acre from his 19-year-old plantation. Another Catalpa plantation in Nemaha County, 25 years old, has paid even better than the Robinson plantation. All three of these groves are on upland.

Osage Orange will yield excellent returns on good soil.

Honey Locust and Green Ash are not so profitable, but both are excellent trees for the high, dry uplands of the western and southwestern counties.

European Larch has not been given a thorough trial in Nebraska, but judging from its success in Minnesota, the Dakotas, and Illinois, I believe it to be a most promising tree for eastern Nebraska.

Red Cedar is, of course, an excellent post tree, but it grows too slow to command much attention from the average planter.

There are many other trees that are valuable for posts, Cottonwood and Willow are being used quite extensively, and if methods are developed for treating them that the farmer can use, both will likely be grown extensively for posts, since they grow so raipdly.

Black Walnut is too valuable a timber to be used for posts, although we have some plantations that would pay well were the timber cut and used in this way.

For timber: Cottonwood and Black Walnut.

One point that has been made prominent by this investigation is the value of wind breaks for the protection of field crops. We have many examples furnished by reliable and prominent men to show that wind breaks on the south and west sides of a field will increase the crop production.

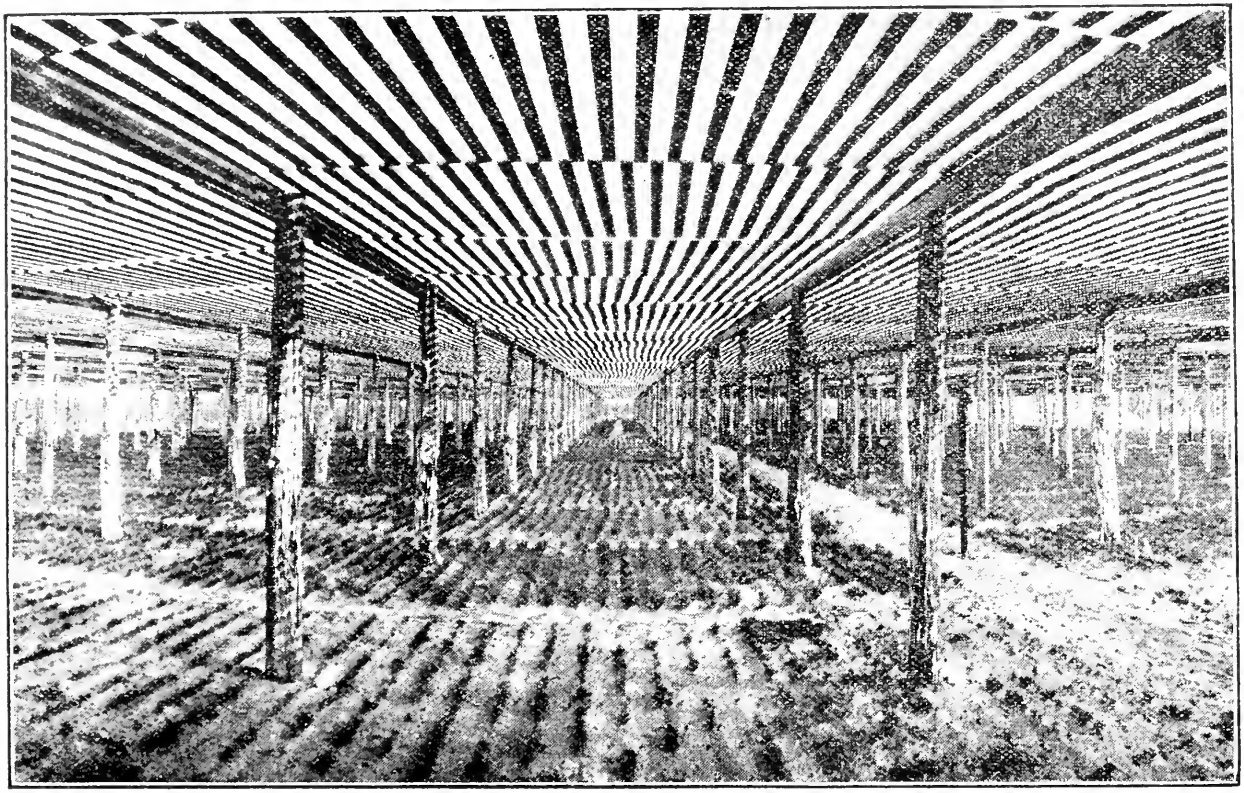
The following is the relative percentages of species planted in eastern Nebraska:

Species.	Per Cent.
Cottonwood	48.40
Green Ash	10.15
Boxelder	8.61
Silver Maple	4.98
Black Walnut	1.25
Catalpa	1.11
Honey Locust	0.15
White Willow	0.15
Black Locust	0.08
White Elm	0.04
Mixed Groves	24.98

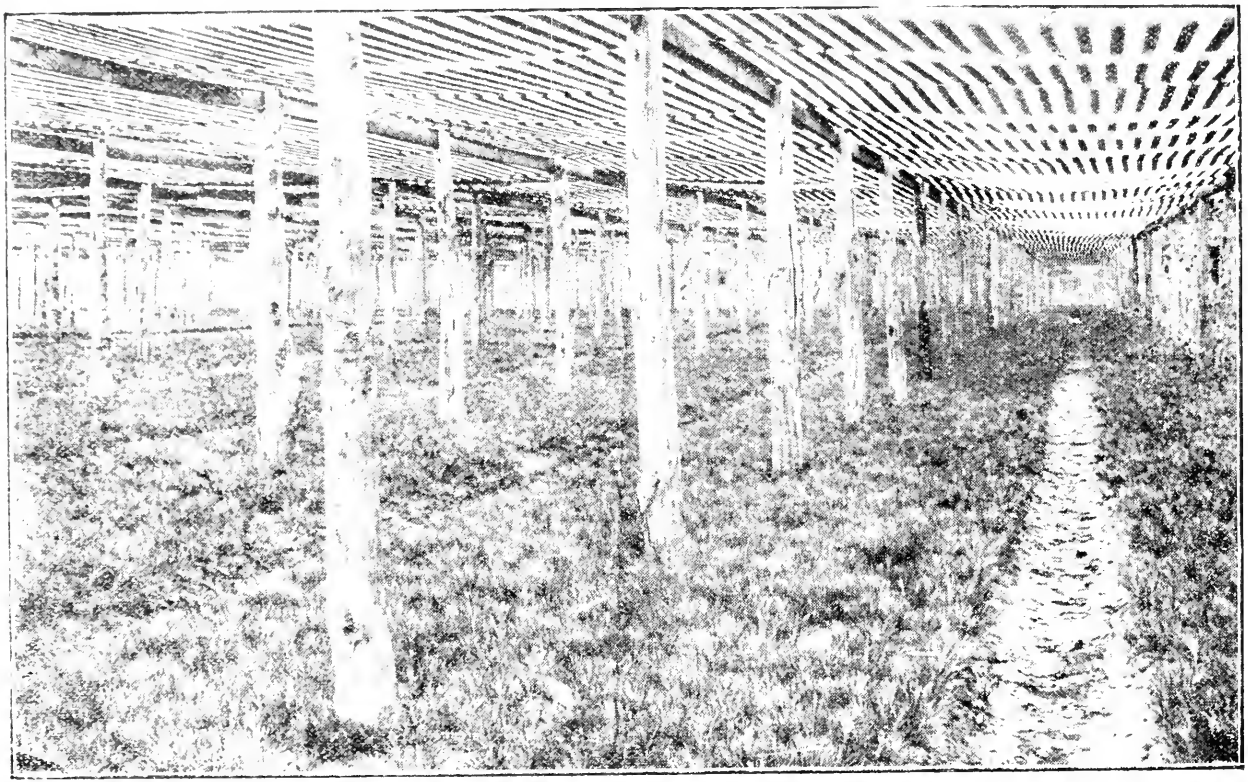
The above notes are made up from the notes on planted timber through the territory covered. While riding along the road, the parties would make record of all groves passed, noting the species and estimating the area. Several hundred groves were recorded in this way. While it is not claimed that the figures as given are accurate, yet it is believed that they represent fairly well the relative percentage of the species planted. The areas, it is true, were only estimated, but it is very probable that any one man would be consistent in estimating, hence would

either estimate too low or too high quite constantly, and therefore the percentages would not be affected by error in estimates. It is assumed that on the whole the planted area on the roads traveled would be representative of the whole region."

The investigations carried out by Professor Miller's party last summer were thorough and complete for the territory covered. The results of the work enables us to give to the people of this state information of the very highest value regarding the species to plant, the probable cost of planting, and the possible returns from such planting. The purpose of this investigation tour was to get as many facts as possible bearing upon the relative values of the species that have been planted in years past. In eastern Nebraska tree planting has passed the experimental stage, and we must now improve our plantations by the very same methods as we improve our orchards or berry patches, by planting the species that will yield the best returns.



One Year Old Western Yellow Pine Seedlings in Dismal River Forest Reserve Nursery.—Chas. A. Scott.



One Year Old Western Yellow Pine Seedlings in Dismal River Forest Reserve Nursery.—Chas. A. Scott.

SCHOOL GROUNDS AND SCHOOL GARDENS.

By Professor R. A. Emerson.

More Room for School Grounds.

Country school grounds should be larger than they are. Occasionally a school house in a town or city is surrounded by a couple of acres of land set apart for school purposes. How many country schools are as fortunate? Even in the older sections of the state, farm land is not so high priced that school grounds must necessarily be small. Figure out how many acres of land are commonly required for a bunch of ten or twenty steers. How much are the steers worth after occupying the land for say two years? How does their value compare with that of the ten or twenty, yes, thirty or forty school children that are crowded onto a half acre of land—crowded until they must use the public road for a play ground. Indeed a half acre is sometimes too much to be "wasted" on a play ground. There is no use to which farm land can be put—outside of home grounds—that will yield as good a return on the investment as school grounds properly cared for. Country school grounds should contain at least two acres, and might be larger to advantage. One of the greatest difficulties to be overcome in the ornamentation of school grounds is the lack of room—room for both plants and children.

What the School Grounds Should Contain.

It is not intended to list here all the things that are desirable parts of school grounds. Certainly nothing is included that should not some day be found on every country school ground in Nebraska. It is not expected that many schools will provide all these things at once. Indeed nothing is worse than to plant more things than can be properly cared for. The school house should of course be the main feature of the school grounds. If it were not for the house no grounds would be needed.

Next after the house and the necessary outbuildings and walks, the play grounds are of greatest importance. Of the plants that may be grown on school grounds, trees deserve first consideration. They are desirable for shade, for protection, and for ornament, and may

often be useful as objects of instruction. Indeed, trees are essential to good school grounds. Shrubs are hardly less helpful than trees. They should be used much more than they are. In the way of flowers for general planting, the hardy herbaceous perennials are best. They require less care than annuals and become better from year to year. Annual flowers are good plants to grow in the school garden. Lawn grass should not be overlooked, though it is often difficult to have good lawns on school grounds. A school garden should be provided for the cultivation of some of the easily grown vegetables, and a small nursery where tree seeds and cuttings of some of the easily propagated shrubs may be planted. Here also a few plants of strawberry, raspberry, and the like might be grown. The garden and nursery should afford many useful object lessons in the proper management of the soil as well as in the propagation and care of various plants. There is one other thing that should never be omitted from a school ground. There should be two or three bird houses. Have one house for wrens. If the holes are the size of a quarter the wrens will not be molested by sparrows.

The Plan of the Grounds.

In the ornamental planting of any place, whether school grounds, home grounds, public parks, the plan is perhaps the most important part. The difference between bare ground with a school house on it, and a school house filled with trees, shrubs, and flowers, is certainly striking, and yet the latter may be improved immensely, not by planting more or choicer plants, but by simply arranging in an artistic way the plants already there. Indeed, a place containing many of the choicest ornamentals may often, because of their being all jumbled together, receive less favorable notice than a place containing only the most common things from the woods, prairies, or neighboring dooryards, provided these are arranged properly. The plants need lose none of their individual beauty by an artistic arrangement that gives the place, as a whole, a beauty not otherwise attainable.

It may not be in place here to discuss the principles of landscape art, but there are some things with reference to arrangement that can not well be omitted. It is of first importance to remember that the place must be treated as a unit. The place as a whole should be a picture, with the school house as the main feature and with all the parts in harmony throughout. A landscape gardener would no more think of placing a star-shaped flowerbed near a naturalist group of shrubs and flowers than a portrait artist would think of putting a silk

hat on a man with a sweater. If the painting might represent a clown why should not the planting be called a "circus garden?"

If the school house is to be the central feature of the picture, it must have a setting, a background, a framework. It must not be hidden from the front. See how nicely this can be accomplished by following a well-known principle in landscape art to the effect that the planting should be massed at the sides and back, leaving the front and center comparatively open. Note also how well this type of planting fits around the play grounds. In massing plants, whether trees, shrubs, or flowers, it is better to use comparatively few kinds and many of a kind than to set a few plants each of many kinds. It produces a much better effect also to group the individuals of each kind together, arranging the groups with regard to size of plants, color of flowers, etc., than to mix the different sorts indiscriminately.

The arrangement of school grounds may best be discussed by reference to the accompanying diagram, which represents a school ground of one and one-half acres. The house faces the east, with the public road on the east and south. The house is set well toward the front and to one side, the better to afford room for the play grounds, three in all, one for the boys, one for the girls, and one for the smallest children. The play grounds are separated by walks, and the boundaries reinforced by groups of shrubs; otherwise they are bare of plants, though grass might be encouraged to grow in them if this could be done without restricting their use as play grounds. In most cases it would probably be best to attempt little in the way of greensward except in front of the school house. The coal shed is placed near the road for convenience in unloading fuel and is also conveniently near the school building. The walks lead to their destinations as directly as possible (curved walks are often more direct than straight ones and at the same time more graceful). The outhouses are sufficiently separated and well masked by trees and shrubs.

The trees are for the most part massed at the north and west sides of the grounds, both to furnish a background for the school yard and to afford protection from winter storms. In addition to these, a few trees are scattered about the south and east sides of the place to furnish shade and relieve the barrenness of the front yard. The larger shrubs and small trees are grouped in front of the larger trees at the north and west. The smaller flowering shrubs are massed in the curves of the walks. The only plants grown on the buildings are climbing roses on the school house and wild grape vine on the coal house. The hardy herbaceous perennial flowers are massed more or less irregularly in front of the shrubs. Flowers appear to much better advantage when

furnished a background of green than when standing alone in beds Flowerbeds of geometric patterns cut in the grass are never in keeping with the natural grouping of shrubs and trees. On school grounds there are other reasons also, why flower beds should be planted along the boundaries. One can learn these reasons by looking at almost any school ground. True, most school grounds have few plants other than weeds, but even these are unable to grow except in the corners and along the borders. If weeds can not grow in the center of the play ground, why place flowerbeds there? Only a few of the hardiest perennial flowers are provided for in the plan. Many other sorts might be added almost anywhere in front of the shrubs. They fit specially well into the depressions in the shrubbery border. These are things which can be added almost any time after once the trees and shrubs are established, and they can even be moved from place to place if desired.

On the plan suggested, the school garden is placed well to the rear, where it is somewhat protected from the winds by the trees and shrubs and yet is not sufficiently near the trees to be injuriously shaded or robbed of moisture by them. A second reason for placing the garden in the rear is that it does not harmonize well with the other planting. The part of the garden containing the annual flowers is, however, arranged in front of the vegetables in such a way as to unite fairly well with the masses of shrubs on either side.

What to Plant on the School Grounds.

As a rule, only the hardiest things should be planted on Nebraska school grounds. In particular cases, tender plants may be grown, but they require too much care to be generally useful. The number of hardy plants that are sure to succeed is now so large, and there are so many very desirable ones among them, that there is little use of wasting time with the things that have to be babied through the winter. Of course more kinds can be grown in the eastern part of the state than in the western, but there are many things that will succeed even in western Nebraska.

A considerable number of flowers, shrubs, and trees are listed below, though no attempt has been made to include everything that can or should be grown. From this list can be chosen things for almost any part of the state. It would be unwise to plant all of the plants suggested except in the very largest school grounds. It is, however, always well to have several kinds of trees, shrubs, etc., at every school, so that the pupils may come to know as many of them as possible.

The following are good trees for general planting. They succeed well in many parts of the state, even where it is rather dry: Honey Locust, White Elm, Hackberry, Green Ash, Russian Olive.

For trees that grow rapidly, at least while young, some of the following might be chosen: Russian Mulberry, Soft Maple, Boxelder, Cottonwood and Willow. The last two are among the best for valley and in the sand hills. The Mulberry is good to attract the birds.

Many Evergreens succeed in Nebraska. They grow as fast as most long-lived trees when once well established, and some of the Pines especially are very drouth resistant. The Evergreens are harder to transplant than broad-leaved trees, however, and grow much more slowly at first. They should be planted in masses at the rear, leaving the foreground for deciduous trees, which can be pruned up to better advantage. The Austrian and Scotch Pines are probably the best for eastern Nebraska, and the former should succeed even in the western part of the state. The native Bull Pine is especially adapted to western Nebraska, as the Jack Pine is to the sand hills. The Red Cedar and the Western Cedar are both good trees for school grounds. Of other evergreens the Black Hills White Spruce, the Colorado Blue Spruce, the Douglas Spruce, and the Concolor Fir are especially good. The firs and spruces are among the most attractive of ornamental trees.

Of the smaller ornamental trees, none are better than Red Bud Chokecherry, Wild Plum, and Prairie Crab Apple and its relative, Bechtel's Double Flowering Crab.

Among the shrubs and vines that are native to the state, the following should be considered: Elderberry, Sumac, Snowberry and Coralberry, Red Dogwood, Buffalo Berry, Sand Berry, Wild Rose, Wild Currant, Wild Gooseberry, Virginia Creeper, and Wild Grape. These hardy native shrubs are adapted to withstand the neglect and hard usage to which school grounds are often subjected. They can be had by simply going to the neighboring woods or prairies and digging them up. And yet, when properly cared for they are among the most attractive of shrubs. They are used commonly in parks and similar plantings even when they have to be purchased from nurseries. But then, some people do not like the wild bushes—"brush"—that grow so commonly all around. If there are any such among the readers of this, they of course have the privilege of "sending off" to some eastern nursery for some "rare" shrubs, such as Sambucus, Rhus, Symphoricarpos, Cornus Sanguinea, Ampelopsis, and the like. Of course they will get the same things, whether they send for these or dig up from the roadside the ones mentioned at the beginning of this paragraph. Fifty cents or a dollar apiece is a pretty good price to pay for a botanical name (the

plants could have been had free on the prairies), especially when the name is apt to be incorrect.

There are hardy shrubs and vines which it will pay to purchase for school grounds. They are things, however, which no one need send out of the state for. Many of them, in fact, can be obtained from neighboring dooryards. If this is impossible, buy them of some reliable home nursery. Of such plants the following are suggested. Snowball, Van Houtte's Spirea, Common Lilac, Persian Lilac, Mock Orange, Juneberry, Amur Tamarisk, Amur or Polish Privet, Yucca, Honeysuckle, Trumpet Creeper, Garden Roses, Harrison's Yellow Rose, Rugosa Rose. The last two are among the very hardiest of roses. Crimson Rambler and Prairie Queen are two of the best climbing roses for eastern Nebraska.

Hardy herbaceous perennial flowers are more desirable than annuals. When once established they require little care and become better with age. Moreover, many of them blossom early, before school is out for the summer, and some of them bloom late in the fall after school has begun again. All of the plants listed here are hardy, some in fact, are wild flowers. Many more might be added to advantage, but the following are suggested for trial first: Larkspur, both wild and cultivated, Bleeding Heart, Columbine, Peony, Dwarf Iris, German Iris, Tiger Lilly, Phlox, both wild and cultivated, Coreopsis, Penstemon, Blazing Star, Spiderwort, Golden Rod, Crimson Mallow, and Golden Glow.

Annual flowers are best grown in the school garden, but may be used, if desired, in the general planting. Many of them do well and most look best when massed in front of shrubs or other tall growing plants. Sunflowers and Castor Beans are good as a background for the smaller flowers. Some of these annuals bloom best in the fall after the school has begun, especially if not planted too early in the spring. Most of them require considerable care during the summer. Some of the annuals that should be tried are Petunias, Poppy, Nasturtiums, Zinnia, Marigold, Phlox, Verbena, Aster, Caliopsis, Balsam, Bachelor Button, Castor Bean, Stella Sunflower, Chrysanthemum-flowered Sunflower.

Planting and Care of School Grounds.

Do not plant the whole grounds at once. True, the work would probably be done better if the school board were to employ some competent man of the neighborhood to lay out and plant the grounds, but that would not leave any fun for the boys and girls. Let them do as

much of the work as possible, drafting their fathers and older brothers when necessary. Making a planting bee at some time in the spring might not be a bad notion. It is best not to wait until Arbor day, especially if wild things are to be dug up and planted, since they are often in full leaf by the last of April.

If only a part of the grounds is to be planted the first year it might be well to plant nothing but trees, planting the groups of shrubs the next year and the hardy herbaceous perennials the third year. It is usually desirable, however, to have some of the flowering plants started at once. Since the background of larger shrubs and trees should be planted first, however, in order to properly locate the flowering plants, it might be well to complete the planting on one side of the school ground the first year and plant another side the second year. At another time the shade trees could be planted about the front of the grounds, and still another season the shrubs could be set in the curves of the walks. The school garden can be started at any time, and should be planted at once. Even here it would be better to begin with a comparatively small garden rather than attempt too much at first.

In setting trees, shrubs, and plants, see that the holes are dug large enough for the roots and deep enough so that the trees will stand fully as deep as they stood before being removed. In the drier parts of the state it is well to plant trees and shrubs several inches deeper than they stood before. It is very important to see that the earth is firmed well about the roots. Some of the larger boys should pack the ground by treading it with their feet while the dirt is being thrown into the hole about the tree roots. Have the holes filled with moist soil, and the soil firmed to within about four inches of the surface of the ground. Then fill the remainder of the hole with loose, dry dirt and leave it dry and loose.

If it is thought necessary to water the trees at the time they are set, a good time to apply the water is just before the loose, dry dirt is added to the surface. It is not always necessary to water trees. If the ground is moist and the weather not too dry and windy, they will usually grow without watering. If they are to be watered, however, water them thoroughly. They had better be left without water than to use a single pail of water for two or three trees. Two or three pails of water are none too many for a good-sized tree. A little water simply moistens and packs the surface of the ground. In a day or so this dries out and "bakes," thus affording the most favorable conditions for rapid loss of water by evaporation from the surface of the ground. Newly planted trees and shrubs should be cultivated. They rarely do well planted in sod unless there is an abundance of moisture. Keep the

weeds down at all times, since they rob the plants of moisture. Keeping the surface of the ground loose with a hoe will also check the loss of water by evaporation. The trees and shrubs and many of the larger flowers may be mulched to advantage, using straw, hay, or any coarse material which can be obtained in the neighborhood. If nothing better can be had, mow the large weeds and use them for a mulch. They ought to be mowed anyway. A good time to apply the mulch is just before school is out for the summer. The very best way to keep the weeds down and hold moisture while school is in session is to cultivate the surface soil with a hoe or rake; then apply the straw just before school is out and let this mulch keep the weeds down and hold the moisture in the ground for you during the vacation.

The trees and shrubs will need some pruning. The shade trees in front of the school house should be pruned up high enough so that the limbs will not interfere with the people who may walk under them. Trees, however, which are massed at the sides of the grounds to serve as a background for the shrubs and flowers and also as a protection from winds, should not be pruned up very high. They should rather be encouraged to make a dense growth. The shrubs will need little pruning except the removal of weak or injured branches. Sometimes old shrubs that are not doing well can be helped by thinning out the top somewhat.

Most of the flowering shrubs and all of the hardy herbaceous perennials will need some fertilizing. True, they will grow in ordinary soils without this, but if some patron can be induced to supply the school with a load of fine, well-decayed barnyard manure, it will improve the shrubs and flowers wonderfully. It is ordinarily best to work this into the ground with a spading fork. Sometimes coarse stable litter will serve for both a fertilizer and a mulch. In this case of course it would be spread over the surface of the ground and allowed to remain during the summer, fall, and the following winter. It should be spaded in, however, the next spring and the ground kept cultivated during early summer.

If lawn grass is to be grown on any part of the school grounds, it should, of course, be mowed occasionally. It is best, however, especially in dry situations, not to mow the grass too short nor too late in summer. A dressing of fine barnyard manure applied in the fall will be found beneficial to almost any sod. In very dry places it would be best not to attempt to grow the common lawn grasses, such as blue grass and white clover, but to seed the ground to brome grass or even alfalfa.

What School Gardens Are.

School gardens may or may not be located on the school ground.

Where possible a garden should be grown at the school by the school children, but in addition to this, individual gardens should be encouraged by the school management. If these gardens are grown by school children under direction of the teachers, there is no reason why they should not be called school gardens. To identify them still more closely with the school an exhibition of the products grown by the school children in their individual gardens might be arranged, to be held as soon as school begins in the fall.

In some respects the individual gardens have a distinct advantage over a general school garden on the school grounds. They would doubtless be cared for better in the summer vacation at the homes of the children than at school. In fact the things that can be successfully grown in general gardens are few in comparison to what might well be included in individual gardens.

What School Gardens Are For.

The main purpose of a school garden is to interest school children in the growing of plants. As a secondary object school gardens may be used to give instruction in elementary agriculture. A good school garden should afford valuable object lessons in the proper management of the soil and in the propogation and care of various garden crops. Further, but rather incidentally, a school garden might provide material for elementary botanical studies on germination of seeds, the habit of growth of plants and the like.

Little Room Necessary for School Gardens.

The larger the garden the better, provided of course, it is well kept, for the more room there is the more kinds of plants can be grown. But if a large garden can not be had there is no reason to despair. A square yard of ground carefully tended is better than a half acre not well cared for or not cared for at all—as is so often apt to be the case. Even a small window box in which plants may be grown in winter, or for growing seedlings or cuttings during the spring, will serve very well the purpose of a school garden, and should be chock-full of suggestions to both teacher and children. In fact, suggestions are the best thing to grow in a school garden. In place of a box of soil, a dish of moss, such as can be had of any florist or nurserymen, is a very good place in which to grow seedling plants during winter. Moss is an almost ideal medium for starting plants, in that it holds moisture so well while admitting air in abundance. If the moss is put in a glass dish

the children can watch the growth of the roots as well as the tops of the plants.

What to Plant in School Gardens.

Plant anything that is desired. Let the children choose what they shall plant. They will take the more interest in the work. It will be found, however, that some things are grown much more readily than others, some things will not stand the neglect which the general school garden will usually be subject to during the vacation. Moreover, only a few annuals will last till school begins again in the fall.

In the plan presented with this article, only such things are included as should succeed in the general garden on the school grounds, and which are for the most part adapted to such gardens on account of tne time at which they mature. For the individual gardens at home many other things might be added. For instance, among annual flowers there might be added to the list Poppies, Nasturtiums, Marigolds, Verbenas, Balsams, Bachelor Buttons, Morning Glories, Sweet Peas, Ornamental Gourds, and Hyacinth Beans. In vegetables, Beans, Peas, Beets, Carrots, Parsnips, Cabbage, Cucumbers, Tomatoes, and others might be included in the individual gardens, but many of these would not be very suitable for the general garden.

There are some things not usually thought of in connection with school gardens that certainly should not be entirely neglected. These are the tree seeds and cuttings of various trees, shrubs and other plants. Some of the small fruits and perennial vegetables should also be included. In no better way can the pupils be taught the methods of propagating plants, by cuttings, layers, grafting, etc. Many phases of agriculture are hard to present in the common school because of the lack of equipment and material for illustration. In the propagation of plants, however, the materials are so seasily grown and require so little room that it would be a pity to omit them entirely. The school garden plan suggested in connection with this article provides for a small nursery. Many other things might be included to advantage but most of the general methods of propagation are illustrated. The Juneberry serves to illustrate propagation by suckers. It sprouts readily if a few of the roots are cut off near the plant. Blackberries, Red Raspberries, Chokecherries and others might be grown in place of Juneberries. The first three of these sprout readily without cutting the roots. The Juneberry might also serve to illustrate layerage by having a limb bent down and covered with earth, the tip alone being left exposed. Other plants that are propagated readily by layers are Black Raspberries and

Strawberry, included in the list, and grape and many ornamental shrubs not included. Rhubarb and Horseradish are easily propagated by division of the crown. They are simply taken up, divided and replanted Horseradish may be grown even better by cuttings. It will be interesting for the pupils to note that the tops grow from the end of the root that was originally up, even when the root is inverted in planting. Of the plants suggested for propagation by cuttings the Tamerisk is the most easily grown. It starts as readily as Willow and Cottonwood. Currants grow well from cuttings, especially if planted early in the fall. Spirea and similar shrubs are more difficult to start. Cuttings of these should be made in the fall or early winter and packed in a box of moist sand or earth, in a celler which is cool and moist but does not freeze. In the spring they should be taken out of the sand and planted in the nursery. Of the tree seeds mentioned, Black Walnut and Peach must be planted in the fall or kept moist over winter by being mixed with moist sand or earth. Freezing is thought to be a good thing for these seeds. The Ash and Honey Locust seeds are kept dry over winter and planted in early spring. The Ash is planted much as garden vegetables are. Honey Locust seeds must be scalded (not boiled) to insure germination. Put the seeds in scalding water and after cooling allow them to soak for a day or so. The Peach seedlings will afford practice in budding during the fall following the planting of the seeds. Apple seedings might be grown if desired and could be dug up in the fall and kept for practice in grafting during winter. To learn more about methods of propagation, consult such books as Bailey's Nursery Book, Goff's Principles of Plant Culture, or send to the United States Department of Agriculture, Washington, D. C., for Farmer's Bulletin No. 218 on "The School Garden."

The Plan of the School Garden.

No matter how small the school garden, it should be planned before being planted. As a rule it would be well to have distinct gardens, one for annual flowers, one for vegetables, and one for tree seeds, cuttings, etc. In graded schools the lower grades might care for the flower garden, the next higher grades for the vegetable garden, and the highest grades for the nursery. The vegetables and the things that are planted in the nursery should be in rows. The flowers may be planted in rows if desired, but they usually appear to better advantage grouped together in masses. If rows are to be used at all they should certainly be straight. Nothing looks more careless than crooked rows. In gar-

den planting it would pay even to use a line to make the rows by, in order to have them straight.

The taller plants are put at the back both to serve as a background of green for the smaller flowers in front and also to screen off the vegetable garden and nursery from the general ornamental plantings on the school grounds.

Such small things as radishes and lettuce may be in rows not over a foot apart. Salsify, Carrots, Beets, Parsnips, Onions and the like should have the rows from a foot to eighteen inches apart at the least. Bush Beans and Dwarf Peas will grow well with a space of eighteen inches to two feet apart. Cabbage should have two to three feet between rows, and Tomatoes (especially of the larger kinds) four or five feet. The flowers will grow well even if planted rather thickly. The individual plants, however, will be better and the blooms larger if the plants have considerable room. Most of these things should be planted rather thickly and thinned out after they are well started. The distances suggested here are for the general school garden.

For individual gardens, especially if the children are situated so they can use a horse cultivator in caring for the plants, the rows should be farther apart. This will be found a great saving of labor not only in school gardens, but in most farm gardens as well.

The Preparation of the Ground for Gardens.

The ground to be used for the growing of flowers, vegetables or other small plants should be very carefully prepared early in the spring. If it is where it will not be run over too much it would better be prepared in the fall. If the plat is small, spading would be more satisfactory than plowing. It should be spaded very deeply. If it is possible to secure some fine, well rotted barnyard manure, a good dressing of it should be applied to the ground and spaded in. Never use coarse stable litter for gardens or flower beds, as this material is apt to keep the ground so loose that it will dry out badly during the summer. If the soil is heavy, fine manure will make it lighter and therefore more easily worked. If the garden must be made in sandy land, the manure will be needed all the more to add fertility and to increase the water holding power of the soil. Care should be used to break up any lumps that there may be. After spading, the garden should be thoroughly raked until the surface is fine and mellow. It will not hurt to step on the garden occasionally in raking. After deep spading it will be all the better for some firming. Never disturb the ground with spade, rake, hoe or cultivator while wet. This is especially important in heavy soils.

If such ground is worked while too wet, it will puddle and later bake in the sun and wind.

For a window box indoors get some good garden soil. If convenient, also secure a little soil from new land, that is, land which has been broken up only a couple of years, and mix this with the garden soil, using equal parts of each. If the soil is heavy, add some sand. The sand will keep it from becoming soggy if overwatered and from becoming hard when dry. A little fine manure added to the soil will also help wonderfully. A good soil for window boxes is made by mixing equal parts of garden soil, sod, sand and fine manure. The boxes should be at least four inches deep and are better six or eight, since they will not dry out so quickly if they contain a good depth of soil. Sift the soil if possible, putting the coarser parts in the bottom of the box for drainage. For starting cuttings, or slips indoors, pure sand is better than any kind of soil.

Sowing Seeds, Setting Plants, Etc.

Many vegetable and flower seeds may be sown very early in the spring just as soon as the ground can be worked. Some of them, indeed, like Phlox, Poppies, Portulaca, Astors, Verbenas, Petunias, Calliopsis, Lettuce, Spinach, etc., come up early in the spring, from seeds self sown the fall before. Of the vegetables which should be sown early in the spring may be mentioned Onion, Salsify, Parsnip, Radish, and Lettuce. Carrots and beets are usually sown somewhat later, though they may be planted early. Turnips also do well when planted very early, though when grown for winter use they are not planted until midsummer. Some of the vegetables which should not be platned until the ground has become thoroughly warm are Beans, Cucumbers, Squash, Pumpkin, Melon, Tomato, Egg Plant, Pepper, Sweet Corn, Pop Corn, and Sweet Potato. Common potatoes are usually planted before frosty weather is past, but their tops are easily killed by freezing weather.

Care must be exercised not to cover small seeds too deeply. For the smaller vegetable seeds, one-half an inch is deep enough. Of the larger seeds, Peas can be planted three or four inches deep, while Beans are best not covered more than an inch or so. (The children should watch the Beans and Peas while they are germinating; they may be able to tell why Peas can be planted deeper than Beans). Some of the finer flower seeds, such as Petunia, should be covered very lightly, just a little earth being sprinkled over them. It is important that the ground be firmed about seeds so that they can absorb moisture better and germinate promptly.

In setting the larger plants, shrubs, trees, and the like, it is important to have the earth firmed well about the roots. A good way to accomplish this is to tread it with the feet as the hole about the tree roots is being filled. In setting smaller plants the earth can be firmed sufficiently with the hands. No matter how firm the soil is made about the roots, the surface should be left loose and dry.

The seeds planted in the window box may be covered less deeply than those planted outdoors, since the soil can be kept moist more easily. If the ground is moistened when the seeds are sown, and a pane of glass is fitted over the box, no more water need be applied until the seeds are well up. Pouring water on the surface of the soil where very small seeds have been planted is apt to wash them out badly. This can be prevented by laying a piece of coarse material like burlap upon the surface of the soil and pouring the water upon this. The burlap can be left on the ground to hold moisture until the seeds begin to germinate.

When moss is used to start seeds in, it should be soaked until thoroughly wet before the seeds are planted. A good way is to fill the dish containing it with water and, after the moss has taken up all the water it will, invert the dish to let the excess water run out, holding moss in place, meanwhile, with the hands.

The Care of School Gardens.

Keep the weeds down at all times. If they are allowed to grow they will rob the crops of much needed moisture. Cultivate the surface of the ground frequently with hoe and rake in case of the general school garden or with small-tooth cultivators where they can be had. These improvements are much more useful than watering pots in keeping plants vigorous. Do not wait until you can kill large weeds by hoeing. Keep the weeds from growing by stirring the surface soil frequently. The larger vegetables and flowers and such shrubs, small fruit plants and perennial vegetables as are grown in the school gardens, may be mulched to advantage, using straw, hay or any similar coarse material. The straw should not be applied to tender plants until the weather has become quite warm, say late in May. As was suggested in discussing the acre of school grounds in general, it might be well to mulch the plants in the school garden, just before school is out in the summer. The mulching will accomplish during the summer vacation what the hoe and cultivator accomplish while the school is in session. Potatoes are one of the vegetables most easily grown by mulching, and about the only one that can be mulched as soon as planted. Although mulching would seem especially adapted to overcome the difficulties of caring for

school gardens during vacation, it can be used to advantage for many plants even in the individual gardens at the homes of the children.

RESOLUTION.

Resolved, That the Nebraska State Horticultural Society, in session at York, do hereby wish to express their sincere thanks to the citizens of York for the courtesies and kind treatment received at their hands, and especially to Professor Parks, and the ladies for the splendid music furnished, and that we congratulate the citizens of York, on their horticultural advancement, and especially the beautifying of their homes.

J. A. YAGER,
G. A. MARSHALL,
W. G. SWAN,
A. J. BROWN.

ANNUAL MEETING

Proceedings of the Annual Meeting of the Nebraska State Horticultural Society, held in Agricultural Hall, at the State Farm, Lincoln, January 16, 17 and 18, 1906.

ANNUAL MEETING

The annual meeting of the Nebraska State Horticultural Society convened in Agricultural Hall, State Farm, Lincoln, Tuesday, January 16, 1906, at 2:00 P. M., with President Christy in the chair. Following is a copy of the program carried out:

PROGRAM

TUESDAY, JANUARY 16—10:00 A. M.

Arranging fruits and cut flowers for premiums.

2:00 P. M.

Invocation.....Rev. D. L. Thomas, Lincoln
The Apple Situation in the United States.Geo Van Houten, Lenox,Iowa
Development of Apple Orcharding in Southwest Nebraska.....
.....W. S. Morlan, McCook
Apple Orcharding in Northwest Nebraska.....E. F. Stephens, Crete
Secretary's Report.
Treasurer's Report.

WEDNESDAY, JANUARY 17—9:00 A. M.

Hardy Ornamental Trees.....J. H. Hadkinson, Omaha
Hardy Ornamentals.....C. S. Harrison, York
House Plants.....E. W. Dole, Beatrice

11:00 A. M.

Election of Officers.
Reports From Experiment Stations.

2:00 P. M.

Hon. Chas. Willis Ward, Chairman Plant Section, American Breeders' Association, presiding.

Breeding Grapes.....C. B. Camp, Cheney, Neb

Results From Work in Breeding Hardy Fruits.....
.....Hon. C. G. Patten, Charles City, Iowa

Methods and Results of Hybridizing Fruits.....
.....Theo. Williams, Benson, Neb

Breeding Grapes.....Prof. S. A .Beach, Ames, Iowa

Breeding Hardy Strawberries for the Prairie.....
.....Prof. N. E. Hansen, Brookings, S. D

THURSDAY, JANUARY 18—9:00 A. M.

Hardy Stocks for the Apple.....Prof. N. E. Hansen, Brookings, S. D

Apple Curculio.....Prof. Lawrence Bruner, University of Nebraska

Different Methods of Propogating the Apple.....
.....Prof R. A. Emerson, Nebraska Experiment Station

THE PRESIDENT: Mr. C. G. Marshall of College View will next read a paper on "Some Causes for Failures in Growing Fruit in Nebraska."

SOME CAUSES FOR FAILURES IN GROWING FRUIT IN NEBRASKA.

By C. G. Marshall, College View.

Thousands of dollars are spent annually by the people of Nebraska for trees and plants for the improvement of their homes, and a great part of this money is thrown away, because a very great per cent of these plants and trees never produce anything of value.

The man who drives through the country from one farm house to another, selling fruit trees, and listens to the story, that every man has to tell in regard to his successes and failures in trying to grow an orchard and small fruit garden, can hardly blame him for sometimes getting discouraged, and swear that he will never spend another dollar for fruit trees.

There are a great many reasons why so many farmers over the state are not very successful in growing an orchard, but according to my observation there are two main causes of failure. One is lack of knowing how to buy, plant and care for his stock, and the other is the crookedness of the agent or tree man, as he is commonly called.

It is astonishing how little the average man or woman in Nebraska, who plant trees and plants, know about them, and it is mostly their own fault, because they do not try to learn. Two years ago last summer I took the names and addresses of a number of farmers living in northeast Nebraska, and sent them to the Experiment Station and had them put on the mailing list. Since that time a number of bulletins have been sent on different agricultural subjects. I called on those men again last summer, and made it a point to find out how they liked the bulletins. I found that only about one man in four had read the bulletins on horticulture, while almost all had read the bulletins on other subjects.

The average farmer will read all his agricultural paper has to say on feeding stock, growing alfalfa, etc., because he thinks he might make an extra dollar or two by reading it, but because he does not see a few actual dollars hanging on an apple tree when it is two or three years old, he will not take the time to read literature on that subject.

Even if he does understand caring for his fruit patch, he will not take the time to cut the sunflowers in it until his corn is laid by and his small grain stacked.

Last summer I called on a number of men, who planted orchards last spring, and in looking over the trees the weeds would have to be parted to tell whether the trees were dead or alive, and in some cases, if the trees were not making the best showing, either the nursery man or the climate had to take the blame.

If a farmer's wheat is affected with wheat rust, chinch bugs or the Hessian fly has made ravages on his field, and his crop is a failure, he can tell you the cause, but if his orchard is affected with blight, scab, or borers havin riddled his trees, he will tell you, that fruit can not be grown in Nebraska, because soil and climate are not favorable.

The tree man or nursery agent has a reputation among the people, as bad, if not worse, than any other salesman, that travels over the country. When he starts work in a locality where he or the company he is working for is not known to be perfectly reliable, the people will whisper one to another, that there is a tree man in the neighborhood and they avoid him as much as possible, because they are afraid that if he gets them cornered they will surely be swindled, and you can not blame them, for they have been swindled, and are still being swindled. Not by the nursery man, but by tree jobbers. You will always find him in a new part of the country that is just being settled up. He will stay until the people learn to know him.

The first year or two he floods the country with a lot of worthless goods, or if he does deliver fair trees they do not satisfy the people, because he generally misrepresents the goods, by claiming too much for them. He has all kinds of schemes to encourage the people to take hold of his proposition. One man will go through the country selling grapes at so much per acre, which is almost always from two to five times their actual value, and sometimes carries another man with him, who agrees to buy the grapes after they are grown at a fancy price, to be made into wine by the same company that sell the grape vines, who according to the agent's story, has a plant for that purpose in connection with the nursery. And he will even draw up a contract to that effect.

Another will sell a peach orchard to a man for a fair price in cash, making his victim believe that the price he is paying is only one-half the actual value of the goods. The agent is to take one-half of the third crop for the last payment on the trees.

This last scheme was worked quite successfully through Knox, Cedar and Dixon counties, and as those counties very seldom raise even a few peaches, it was simply money thrown away on the part of the farmer.

Seven years ago last spring a man living in northeast Nebraska planted one hundred apple trees, fifty principally Ben Davis, Northwestern Greening and Wine Sap, bought of an agent representing one of our home nurseries, and the other fifty supposed to be Ben Davis, Northwestern Greening, and Wine Sap, bought of a man claiming to represent a nursery over in Iowa, but in reality a jobber. The trees he bought of the home nursery proved true to name, and last year off of those fifty trees he sold fifty dollars worth of apples, besides filling his cellar for winter use. The other fifty trees have borne a few apples, but there was neither Wine Sap or Northwestern Greening among them. They were all practically worthless except a few Ben Davis, that proved true to name.

Another man ordered seventy-five dollars worth of trees from a jobber, claiming to represent one of our home nurseries, to be planted next spirng. With the order was sixty plum trees and two hundred grape vines. The plum trees were all Pottawattomie, and the grape vines were Agawam and Elvira. I asked this man why he ordered all one variety of plums and why he ordered those varieties of grapes. He said the salesman claimed to be a partner in the nursery, recommending those fruits to him and told him that the Experiment Station recommended those varieties for his locality.

The tree jobber hurts horticultural interests of the state, because he generally works in the newer parts of the country, where quite a large per cent of the people don't know just how an orchard will perform in their locality, and if a few of the people are sold inferior stock or stock not adapted to that locality they will become discouraged, because, with the average farmer an apple tree is an apple tree, and if one is planted and it don't give the results desired, they will tell you that they have tried and failed, and that settles it with them. The average jobber will in time hurt the reputation of the nursery he is dealing with, because he almost always tells the people that he is representing the nursery direct, and the nursery man has to take about half the blame for the wrong that has been done.

I don't mean to say that every tree jobber is a rascal, for you will find honest men in almost every business, but there are a great many rascals among them.

The purchaser of nursery stock should buy his trees from the nearest reliable nursery, and if he buys through an agent he should make sure that this agent is representing the nursery direct, and if he

buys from a jobber he should know that the jobber is a man of his word.

My attention was first called to this by questions of the students in the School of Agriculture, while I was assisting in the Horticultural Department, and as I afterward went out as a traveling salesman of nursery stock in northeast Nebraska I was astonished to find things as they really are. And it certainly seems that something ought to be done to do away with some of the crookedness in this business, and to educate the farmer, so he can buy and care for his orchard intelligently.

DISCUSSION.

MR. KEYSER: I might say that in my work in Farmers' Institutes, a good many of these points come up. Men are really discouraged from the very things that Mr. Marshall brings out. It seems to me that it would be in order for us to have some legislation to do with this fruit business. When a man buys a tree and then has to wait ten or fifteen years for fruit, he ought not to be deceived so much. I thing there ought to be more buying of home nurseries.

MR. WILLIAMS: If the teachers in our schools keep on in this line of work, it will only be a few generations at least until we have the people educated up to these things.

MR. BROWN: How long do you suppose we would have to wait—two thousand years or more?

MR. WILLIAMS: About three generations.

MR. GREEN: While I am not exactly a fruit man, I have had a little experience along that line, and have always been interested in this tree man question. In Oklahoma they have a law to the effect that a tree jobber must be registered with the Horticultural Society in order to do business. He must have also a certificate of good standing. I believe it would be a good idea to get a copy of that law and read it. It certainly has some good points.

G. A. MARSHALL: I want to congratulate Williams on his good patience. But it looks to me like our main duty is to get something before the public that they will read and be interested in. I think education of the public is one of the solutions of this question. When the farmers become educated along these lines, the question will then be settled. The thing to do is to get them interested.

REPORT OF THE COMMITTEE ON CONSTITUTIONAL AMENDMENTS.

We recommend a change in electing the board of directors, amending article four in the constitution, so as to elect one director for one year, one for two years and one for three years, and afterward to elect every year one director to serve for three years.

We recommend a change also in article four, so that the secretary be elected by the Executive Board instead of by election at the annual meeting as heretofore.

We recommend a change also in article eleven, empowering the Executive Board to pay the secretary a salary of $1,000 per year, if they deem best, in consideration of his keeping an open office and giving his whole time to the work, spending at least eight hours a day in his office. It shall be his duty each year to get out a creditable annual report, issue monthly bulletins to each member, preparing articles as often as once a month for the leading papers, doing also all in his power to secure new members. This is to be done with the advice and direction of the Executive Board.

C. S. HARRISON,
G. A. MARSHALL,
A. J. BROWN,
Committee.

MR. BARNARD: I move that the report of this committee be accepted and taken up for consideration at ten o'clock tomorrow morning.

Motion carried unanimously.

G. A. MARSHALL: Now we don't want to go about this matter blindly. This committee has done considerable work this last summer in the way of inquiry. Mr. Harrison, Brown and I are the members of this committee as appointed. We have looked into the work of the secretaries of the Kansas, Missouri, Illinois, Iowa, Minnesota and Colorado societies. We have visited some of their offices, and this is the conclusion we have come to. This is a serious matter, and it is going to cause us to spend more money; it is going to be a step in advance, and will mean more work. We have inquired down at the Capitol building to see if we could get a room there, and we have

secured a room in case we want it for the office of the secretary. This is a good room, too.

In changing or amending the constitution it requires a two-thirds vote of all members present, and the amendment must be read at least one session before adopted. That is why we have brought this up now, in order that it might be considered tomorrow morning.

THE PRESIDENT: The next subject on our program is "The Apple Situation in the United States," by Mr. Van Houten, of Lenox, Iowa.

THE APPLE SITUATION IN THE UNITED STATES.

By Geo. H. Van Houten, Lenox, Iowa.

This is not a subject of my own choosing, and, as the first copy of program sent me failed to come to hand, did not have time to write and find out the line of thought it was expected for me to follow. As no one is at fault in the matter, it is mentioned merely to explain any failure, if such there should be, to follow plan or line of discussion proposed by those who arranged the program. Neither can I assume to speak with specific knowledge as to the apple situation in all, or any considerable portion of the United States, and yet, as an observer for many years, may be permitted to give views on the matter, and offer some suggestions.

Those who have been close observers for many years must conclude that the line of thought and discussion in horticultural meetings, and in the press of the country, have undergone considerable changes in the years that have passed. **Then,** it was a matter of hardiness of varieties, quality of fruit, best methods of propagation; with many incidental branches connected with the business. **Now,** the discussions turn more on spraying, markets, keeping of fruit, etc., while the idea of plant breeding by scientific methods, seems to have taken the place of the old notion of chance selection, or results from chance crosses and haphazzard work. It seems that with all our added knowledge of recent years, that we are not succeeding in producing fruit more certainly or more cheaply than in the days of our lack of experience. Of course, we can account for this on the theory that when the country was new, and there were few orchards, that the insect enemies had not accumulated, and that blight, rust, scab and other drawbacks were

not then as common as now. In the early days there was a local demand for all the fruit that could be grown, so that freight charges and the peculiar, if not desirable, experience with commission men had not arisen to disturb the temper and curtail the profits of the orchardist. Thus, new problems have arisen, and, some of them promise to be as hard to solve as were some of the older ones, that, at one time, were supposed to be the only ones that would arise to vex the apple grower.

When we visit different states and localities, we find that each has its troubles—its hopes and fears, but it is also noticeable that wherever you may go that there are brave hearts that do not become discouraged, and, no difference how many failures, they look forward hopefully. Should untimely frosts destroy prospective crops, yet hope steps in and says, "perhaps you will have all the more if you wait but until next year." So, when the cold winter destroys many trees, some orchardists say, well there will be more demand for the fruit of the trees that are left. It is beautiful to see this confidence and to know that hope seems to be an evergreen, that neither cold can chill nor blight kill.

In Kansas the watchword seems to be, "Watch and Spray;" in Missouri it seems to be, "Spray, Spray, Spray;" while Iowa and Illinois seem to have changed places with Missouri and they seem to say, "You will have to show us;" while the west, the far west, with the hope of youth and—possibly with the inexperience of combatting evils, that they may have later, say, "We have the only place to grow apples and other fruit," for we do not have winter-killing; blight is almost unknown; land is cheap, and our peculiar weather will permit us to successfully control insect enemies, fungus diseases and all other disadvantages that others must meet and fight less successfully. This may be true, but it will require time to demonstrate whether it is true or not.

From a general view, and from conclusions formed from reading and contact with people from different localities, it is safe to assume that during the last few years, plantings have not been such as to keep pace with the losses, the growth of population and with the constantly increasing demand per capita. A few years ago it would have been considered as almost unheard of extravagance for a laboring man, or one drawing low wages or living on a small salary, to buy fruit at prices that have ruled during the last few months, and yet we find fruit in the homes and on the tables of the classes named, and if present tendencies continue, it will require twice the fruit per capita of but a few years ago. Then, high prices almost or entirely cut off the purchases from the people under consideration, but now, no difference how high the price, purchases do not cease, and, many of the so-called

poorer classes, seem to buy more dollars worth of fruit when prices are high than when they were low, and with some the usual amount is purchased, for fruit is becoming, more and more a necessity, and, when people get in the habit of eating it, they do not desist, merely on account of higher prices; and some do not even diminish, to any great extent the amount used. Again, better, and it is to be expected, cheaper, transportation facilities will enable growers to reach more distant markets, and make a better distribution of products.

It is said that the orange growers of Southern California have secured a rate of $1.25 per hundred, for their output to any point in the United States, while a rate to any sea port of Europe has been obtained at a flat rate of $1.00 per hundred—that is 25 cents a hundred lower rate from California to Europe than to points in the United States. The apple growers of Oregon have secured special rates and have been shipping to Europe at prices close to or equal to 15 cents a pound, to the growers in Oregon, for specially packed Newton Pippin. Not many years ago I visited a place in Virginia, where the same variety, under the name, Albermale Pippin, were being sent to Europe at prices nearly as high, and recently have been informed that they are now getting as much as the Oregon growers for the same variety. It may be true—perhaps is true, that the localities getting such fancy prices, have soils and climates peculiarly suited to that particular variety, and that there are people in Europe who are willing to pay such prices for apples of their choice; and it may also be true that we, of the central west, cannot profitably produce such varieties, but we can grow as good apples, and, if proper methods are used, can work up desirable markets, for Jonathan, Grimes and others of our successful varieties having quality even superior to the one named as bringing such high prices.

Again, as the difficulties multiply, greater skill and better care will be required to insure success. This, many will fail to employ, so there is a more hopeful outlook for the intelligent, careful orchardist, and, if he has good soil and proper conditions, it seems to me to be a propitious time to plant. At any rate, it is the part of wisdom to care for what he has. The high price of land, and the great demand for pastures, cause many to pasture their orchards, and he who runs may read of destruction of trees almost everywhere in the central west; while population is rapidly increasing, and the demand is increasing at even a greater rate, while the facilities for reaching the consumer prognosticate constantly increasing demands, if not higher prices.

Few people, it seems, have a clear conception of the vast extent of land to the north of us, who cannot, or at least will not, raise fruit,

and more especially apples. As I happen to know something about the conditions there, I may be pardoned for speaking specifiically: Take Alaska, with its constantly increasing demands for apples and other fruits. It will take hundreds of years ,at the present rate, to develop Alaska; but the partial development, as at present, furnishes a market for apples; and with Alaskans, it is not a matter of price, for they buy extravagantly and recklessly, and increasing shipping facilities will cause a constant increase in demand. The constantly increasing Pacific ocean traffic will create a demand that apple growers are not and will not be ready for. But you may say that this market is far from us and that others are in better position to supply their demands. Admit that this is true, and then turn our eyes to the North, and what do we see there? A vast country—whose vastness is almost beyond our comprehension; and we see people going there by the thousands and tens of thousands, from America, from Europe, and, in fact, from almost all the countries of the world, and the rich lands and enormous crops will enable those people to buy; and we must supply them or they must go without apples to eat. It is true that we have no direct means of reaching them; for lines of transportation are indirect, and now overtaxed to convey people and their effects to this new land of the North, and their products, new as the country is, to market; and while their energies have been, and for a time will be, directed to improving lands and raising grain, yet in the near future there will be a market in the Northland that will not be supplied, unless apple growers properly consider the situation and get strenuous. It may be that your neighbor on the north will produce enough apples for their own use, but it will take many years to do this, while North Dakota and Canada will not even make a serious attempt to do this. Then there are the mines, our growing towns and cities, and our diversified industries constantly add to the classes who are consumers and not producers; so that the prospects are that those who produce things from Mother Earth will have greater rewards in the future than they have had in the past.

It is true that there are more in the way of drawbacks now than years ago, but there are better means of contending with adverse circumstances and conditions; but the very fact that conditions are less favorable, will make success for the ignorant or careless doubtful, if not impossible; while intelligent application will get better returns and greater rewards. So, it is safe to assume that there are brighter prospects ahead, for intelligent, industrious apple growers, while the careless and slip-shod grower will soon be eliminated, leaving the entire field for those who are more worthy of success.

In past years the **know how**, or the effort to **learn how**, has en-

gaged the time and attention of the planter; but for the future, economy of handling, best methods of protecting the crop from insect enemies and fungus diseases; better methods of picking, packing and handling; methods of reaching markets and finding customers, will engage their attention—all of which will be sufficient to engage the best intelligence and most persistent energies of producers, and such will succeed, and only such can succeed, and the sooner growers and others interested find this out the better it will be for all concerned.

I recently heard of a man who thought that Angora Goats would be profitable, and as his apple trees happened not to have a crop, he thought to utilize his orchard for a goat pasture. This plan worked well—especially well for the goats. He still has his heard of goats, but he has no orchard, and for those who will not give their trees proper care, it is recommended for them to use their orchards for goat pastures, as being the speediest method of getting rid of their apple trees. But the man who has a good orchard, with intelligence and energy enough to care for it, it is safe to assume that no other investment promises better returns, for the capital and energy necessary to properly care for the trees. We see in almost all lines of business that people are specializing and devoting better directed efforts on certain lines. This is particularly true in the stock business, as well as in business generally, and it seems that the time has come for specializing in fruit growing, and, while it may not be necessary for one to devote his entire time to growing apples, there is in the business enough to engage the time, capital, energy and best ability of any man, with the prospect of great success for intelligent effort along this line.

The present is a time of sharp competition, and he who would succeed must read aright the signs of the times. He who can best forecast the future will be in condition to profit by the changes that are so rapidly and constantly taking place. It seems unsafe to predict what will be, and yet the prediction is ventured that those who invest money and well directed energy in the soil and its products, will reap reasonable rewards for their efforts. The very rapid increase in population and wealth, the constantly increasing proportion of our people who are consumers rather than producers, point, unmistakably, I think, to real estate investments, and points (however much we may deplore it) to a landed aristocracy in this country. But he who proposes to thrive by the products of the soil should properly direct his energies to meet changing conditions.

Close observers must notice the tendency in our country to approach old-world conditions, and, while we may deplore this tendency, no one well informed will deny that there is such a tendency. The

causes that led up to changes in the older countries of the world are operating here now and will probably continue for ages to come. There, comparatively few own their own homes, while here the tendency is in the same direction. Young men now are not, as a rule, seeking lands and homes, but are seeking salaried positions and are rapidly drifting away from such a line of work and occupation as will fit them to take the initiative; but are not only willing but anxious to leave the soil and its management to others, while they go into the centers of population and engage in so-called business, and in case of failure in that line, they engage in some kind of labor, for pay, rather seeking present wages, even if low, rather than to engage in some productive work on their own account, where each can secure—not the average wage, but the result of his own exertions. In other words, so many people are now willing to accept the rewards of mediocre ability, that it is easy to predict that the few who do direct their energies along the lines indicated, will be rewarded away above the average, while the majority will tend downward, until in the not distant future, we may expect classes; not, of course, as in Eupore, based on birth or position or descendency from, so-called noble ancestry, but the other kind of class distinction, based on wealth. When those days shall come, the successful horticulturist or farmer will be regarded as the rich of the old world today are regarded. This may not be a desirable condition, especially for the great masses of the future, but who doubts but that this country is coming, surely, if but slowly, to that condition. If, in the future, our aristocrats are not worse than we may expect from successes gained in horticulture, well will it be for our country. In fact, the successes, financially speaking, of the producers will retard the evil tendencies that seem to be coming, so, if we cannot induce people to own homes of their own, we may induce them to make their homes more desirable, and, by furnishing them with the best of fruits enable them to better satisfy the appetite and be the better satisfied with their condition. So it is the mission of the horticulturist, one branch of the business being represented by the apple grower, to make home more beautiful and to enoble our people by educating the aesthetic side of our natures and bringing them closer to nature and to nature's God.

APPLE ORCHARDING IN NEBRASKA.

By E. F. Stephens, Crete.

With the help of his windmill and to some extent, by very careful cultivation, almost any farmer can grow a sufficient amount of apples for his own use, but commercial orcharding will be almost entirely confined to the valleys and to the areas that can be brought under irrigation.

There are within the state some 2,500 miles of irrigating canals. Nearly all of these are in the western half of the state; a large proportion being in extreme western Nebraska. The Platte river alone supplies about 1,200 miles of irrigating canals, watering some 560,000 acres. This area is being increased by the work of the United States in the construction of the Pathfinder reservoir and the system of canals supplied therefrom. This reservoir is expected to supply water to large areas in eastern Wyoming and western Nebraska.

The soil in northwestern Nebraska is usually fertile and well suited to orcharding. Chemical analysis has shown that in many places soil in semi-arid regions contain three times as much potash, six times as much magnesia and fourteen times as much lime as the average soil of the middle states. This is doubtless due to the fact that plant food has been stored for countless ages and has not been leached away by heavy rainfall.

Doubtless elevation, producing cool nights with sunny days, coupled with the native fertility of the soil, which is unlocked by irrigation, explains the beautiful color and excellent quality of the apples grown in Colorado, Idaho and the semi-arid regions of Washington and Oregon.

In eastern Nebraska our older orchards are now troubled by fungus diseases. We also have insect enemies. In the semi-arid climate of far western Nebraska the aridity of the atmosphere is such that fungus spores are not readily disseminated. Since very little fruit has so far been grown in that section, there are yet comparatively few codling moth. No doubt the shipments of wormy fruit into western Nebraska will ultimately disseminate them, yet at this time the orchards in the extreme western portion of the state have not been sprayed and are very nearly free from wormy fruit.

Northwestern Nebraska is liable to waves of 40 degrees below

zero. This compels selection of hardy varieties. Until recent years the planting of orchards in western Nebraska has been seriously handicapped by the fact that early plantings were made with varieties better suited to eastern Nebraska, Missouri or Arkansas. Frequently the planter, purchasing trees, has been influenced by the agent's plate book rather than guided by safe experience and sound judgment. Even Japan plums have been freely planted and varieties of apples which could not endure the elevation, bright sun and rapid winter evaporation with its attendant sun, scald of limbs and trunks.

We should study the experience of orchardists in Montana, the Dakotas and Minnesota. In selecting varieties to be planted in far western Nebraska it is well to be guided by the successful work of other localities under similar conditions.

In one of the most successful orchards of my acquaintance, twenty miles from the Wyoming line in the Platte valley, Ben Davis, Winesap, and Jonathan, have suffered seriously from sun scald. Yellow Transparent, Whitney No. 20, Duchess, Wealthy, Iowa Blush and Northwestern Greening, succeed. To this list add Florence and Hyslop Crabs, Patton's Greening, Longfield, Hibernal, McMahan's White and Wolf River, as varieties likely to do well.

Near Rushville, Mr. Jules Sandoz has been planting trees for many years and is quite successful in growing trees and fruit without irrigation, depending entirely on cultivation. This gentleman has experimented with more varieties of fruit than any other party in northwestern Nebraska.

Fruit trees in western and northwestern Nebraska commence bearing at an earlier age than in the eastern portion of the state. Prof. G. D. Swezey of the State University states that the annual evaporation of water from given surface in eastern Nebraska is thirty inches in one year. Evaporation rapidly increases westward, until at the higher elevation and in the dryer atmosphere of western Nebraska evaporation from a water surface is sixty inches annually. Elevation and rapid evaporation act as a check on excessive growth and lead to early formation of fruit buds.

Irrigation gives an abundant water supply. This enables the apple tree to bear a crop of fruit and also to set fruit buds for the coming season. Under such conditions the orchards of western Nebraska come into bearing earlier than those located in the eastern portion of our state. Supported by irrigation, they can bear each and every year, instead of every other year, as we expect them to do where we are depending on the annual rainfall.

In far western Nebraska the elevation is such that trees bloom much later than in the eastern portion of our state. During the last

ten years orchards near the Wyoming line have apparently suffered less from late spring frosts than orchards of the writer in Saline county.

It is wise to plant heavy shelter belts. Experienced orchardists plant trees six inches deeper than they grow in nursery row. The trunks of the trees should be protected summer and winter from too rapid evaporation and sun scald. Burlap, corn stalks, cane or vaneers may be used. The planter who desires to do more should bank up the trunks of the trees with earth to the height of twelve to eighteen inches. This work is usually done in November. In our branch orchards this method, where used, has been worth all it cost.

In the most trying locations those who can find time to do yet more, should also follow the suggestions of Prof. Green of Minnesota. Box in the trunks of fruit trees, then fill this box up to limbs with earth. This method surely guards against all loss by sun scald.

In far western Nebraska we have the soil, climate and railroad facilities for successful work. That district, however, lacks the most important element, trained horticulturists who give to fruit growing their first and best care.

DISCUSSION.

PROFESSOR EMERSON: I would like to inquire as to the distance in planting trees in northwest Nebraska as compared with this part of the country.

MR. STEPHENS: That depends on whether the planter has the nerve to cut out. If so, he could get good results from close planting for the first few years, and then he could remove some of the trees later. Young irrigated trees will endure closer planting than is practiced in the eastern part of the state.

HOUSE PLANTS.

By E. W. Dole, Beatrice.

It is possible for every lover of flowers to possess such a floral treasure as a window garden, no matter how humble the home or its surroundings. Indeed, the smaller and more poorly furnished the home, the more necessity there is for a window garden, for, while it is practically inexpensive, it adds a pleasure to living that can come from no other source. A mistake which many window gardeners make, is attempting to grow too many plants in a limited space, or to grow in the same window, plants requiring different temperatures. Flowers to do their best and keep healthy, must have plenty of space for sunlight and air to get all around them. One will get more satisfaction from a few specimens well cared for, than from a large number of poorly tended plants.

An overheated, dry atmosphere or escaping gasses from imperfect stoves or old fashioned gas jets, are injurious to plants. Their foliage should be washed at intervals to remove dust and insects. On wash day one might dip the plants in the suds, then rinse with clear water, and there would be little trouble from insects.

Daily watering may be successful with many plants, but this cannot be considered a fixed rule. Semi-aquatic plants may be grown with the pots standing in saucers or jardineers of water, but most plants require to have their soil become dry enough before watering to admit some air, which aids decomposition of vegetable matter and counteracts the excessive acid in the soil. This does not mean, however, that the soil should lose all trace of moisture. When watering a plant, put on plenty, or it may not reach the bottom of the pot and the lower roots may suffer while the top of the soil keeps moist. The frequency of watering should be governed by the heat and moisture in the room, the activity of plant growth, and the season. During short days of winter, plants which seem to slack their growth and take a rest, should have less water until new growth begins. Plants that are root bound and have an abundance of foliage, require more water than those freshly potted, or weak or severely cut back.

The elaborate preparation of soil, the use of commercial fertilizers, etc., which we sometimes read about, do not necessarily apply to our rich, black, western soil. Rooted cuttings or young seedlings need

only a well rotted sod or rich garden soil mixed with one-quarter its bulk of sand. When shifting well established plants into larger pots, use a potting soil, composed of three parts soil, one part rotted manure and one part sand, pulverized and mixed by sifting with a sand sieve.

A few of the most popular and successful house plants are here discussed:

Palms enjoy either sunlight or partial shade. Some varieties of easy culture and vigorous habit are Lalania Borbonica, (Fan Palm), Kentia Belmoreana, K. Fosteriana and Areca Lutescens.

The India Rubber tree, with its large, thick, glossy leaves, is very ornamental.

The Boston and Pierson Ferns are very graceful, decorative plants, of easy culture, and well suited with either sun or shade. They want plenty of moisture. We are frequently asked how to get rid of the scales that appear in rows on the under edges of the old fern fronds. Don't be scared about the scales that line up like a regiment of soldiers. These are only spores or seed pods.

The dainty Asparagus Plumosus, called Lace Fern, is of bushy habit until it attains the age of about two years, when it becomes a climber.

Asparagus Sprengeri makes a fine vase or hanging basket plant for the hall, porch or yard. It a rank feeder, requiring a rich soil, a large pot, and plenty of water to produce a rapid growth, and yet it endures lots of abuse. If kept too long without re-potting, this plant will burst the pot with the expansion of its succulent roots.

The most conspicuous autumn flowers are the Chrysanthemums; in varieties innumerable, ranging in color through the various shades of pink, yellow, bronze, red and white. The young plants are topped in May or June and again in July, to make them branch freely, and the large flowering varieties are made to produce gigantic blossoms by pinching off the side buds as they appear in the fall, leaving only one bud to bloom on a branch. They require rich soil, and liberal watering until the flowers are open. If allowed to wilt, they will lose their lower leaves and the flowers will be dwarfed. If kept cool after they come into bloom, the flowers will last several weeks. They flower profusely during October and November.

Azaleas trained in the form of broad, low bushes, are imported from Holland with the flowering buds already formed. They require an abundance of water at all times, but need very little heat. By moving them into a warm temperature they may be brought into bloom at any desired time in the winter. After the flowers are open, keep them cool, and they will last several weeks. Their large double and semi-double flowers, in various shades of red, pink and variegated, and white, literally cover the bushes.

Cyclamens and Primroses are very desirable plants for an east window in a moderately cool room. They remain in flower a greater part of the winter. Care must be exercised not to keep their soil saturated nor let it get very dry.

Fuchsias and Begonias are not as popular as they were before cut flowers came into such general favor, though the leading varieties of Begonias of both, free flowering and fancy foliage types, are of easy culture, thrive in partial shade, and deserve a place in east window collections.

Hydrangeas, propagated from cuttings in the fall, are grown continually for one year, then rested by keeping cool and rather dry during November and December. In January they are moved into a temperature of 60 degrees at night, given liberal watering and full sun, and as they become root bound shifted into larger pots or fed with liquid manure, and they will flower by Easter. Their demand for water increases as the flower buds progress, and any lack of water will result in smaller flowers. Their immense panicles of white or lavender pink flowers literally hide the plant when well grown, and last for months.

Carnations, which are making such wonderful strides in the cut flower markets, are also useful as potted plants. Bushy, short stemmed, early flowering varieties, are best suited for house culture. The insufficient light of the dwelling would make long stemmed varieties too slender. Early varieties yield a sufficient crop of flowers to pay for the outlay before the short, dull days of winter affect them. They grow stronger and produce larger flowers in a moderately cool room. Among the good varieties for pot culture are: Harry Fenn, crimson; J. H. Manley and Crusader, scarlet; Mrs. T. W. Lawson, Enchantress and Marquess, pink; Stella, variegated red and white; Dorothy Whitney, yellow; Gov. Wolcott and Boston Market, white.

The Rose, the queen of the cut flower market, has been more

sought after by flower lovers and more extensively pushed by plant growers, and yet is more seldom seen in the window garden than any other common plant; because it is more particular about its treatment and has more natural enemies than most plants. Roses are grown to perfection in well lighted greenhouses, where the skilled grower ventilates, without letting a strong draft strike the bushes when the outside temperature is below 60 degrees, keeps an even temperatur of 58 to 60 degrees at night and 70 to 80 degrees in daytime, and grows them in well drained benches containing five inches of rotted sod soil, in which an abundant and even moisture can be maintained. The leaves are thoroughly sprayed, especially on the under side, on bright days, to drown red spiders, and a weekly fumigating with tobacco smoke or vaporized tobacco extract kills ophis. Those who can approach these conditions may succeed fairly well with some kind of roses in pots. When the young growth is matured and the pot filled with roots, shift the plant into a size larger pot, and the new soil will cause a fresh growth of flowering branches. Re-pot in this way every two or three months, when growth seems to stop. Following are some good roses for pot culture: Clothilda, Soupert, LaFrance, LaDetroit, Ivory, Golden Gate, Souv. De Wootton, Sunrise, Mad. Abel Chatenay, Helen Gould, Mad. Jos. Schwartz, Perle Des Jardines. Among the new introductions, Baby Rambler, a hardy, ever-blooming, red, Polyantha rose of the Crimson Rambler type, stands pre-eminently without a rival. The color and appearance of the flowers and foliage closely resemble Crimson Rambler. It propagates readily, is of upright, bushy form, attains a height of two feet, is said to be hardy, grows vigorously in either pots or garden, commences blooming when only two inches high and the large plants carry from twenty to forty flowers in a cluster. The Baby Rambler is the most monumental definition of the phrase "perpetual bloomer" that has ever been produced in a rose.

One method of getting roses in full bloom for Easter, is to take up ever-blooming tea or hybrid Tea Roses from the garden about the middle of November, and pot them, plunge the pots in the garden, water thoroughly and cover with litter. As the cold increases, add litter enough to keep the soil from freezing. About the first of January, bring them into the cellar or a cool room. Spray the branches daily and keep the soil moist. When they leaf out, remove them into a light, warm place and you will have a large crop of flowers in about three months. Soupert and the ramblers force readily in this manner.

Geraniums. At the mere mention of them everyone exclaims, they are so common! Yet we can not get away from the fate that they are the standard house and bedding plants, because of their many shades

of bright, cheerful colors, their free and continuous flowering habit and their ease of culture under varying conditions. Do not pot up Geraniums more than one size at a time, for they will not bloom until root bound, besides there is danger of overwatering, and rotting the roots when in larger pots than the roots can quickly fill. Many new varieties of Geraniums are disseminated every year and a few of them prove to be meritorious.

Ivy Geraniums have proven very useful for filling hanging baskets.

Pelargoniums, commonly called Martha Washingtons, when in full bloom are the most showy of all geraniums, but their flowering period is only during spring and early summer. The small flowering Pelargoniums, known as Pansy Geraniums, come into bloom earlier, last later, and bloom much freer than the large flowering sorts. These plants delight in a cool, dry air and are, therefore, especially well adapted for the window.

Cella tubers should be potted about September 1 in very rich soil. After they begin to grow, they will stand all the water you can give them. A large pot and a warm sunny window suit them. During July and August let them dry up completely, then knock off the old dirt before repotting.

Tulips, Hyacinths, Narcissus, Easter Lilies, etc., should be obtained and planted as soon as on the market, for they deteriorate with long exposure. Easter Lilies want 6-inch pots. The others may be planted one or two in a 4-inch pot, or from three to six in a 5 or 6-inch pot, or bulb pan, and set them in a cool cellar, or better still, in the garden. Water thoroughly and cover with three inches of soil. If the weather is warm, put on a little straw to keep the sun from starting the buds before the roots are formed. Later, add mulch as needed, to keep the pots from freezing and bursting. Easter Lilies and Paper White Narcissus should be brought in in November, or as soon as the leaves begin to come through the soil, because they will not bear freezing. The Hyacinths, Tulips, and Narcissus Von Sion are more hardy and may be brought in at intervals during the winter for succession. They will bloom in from three to five weeks after coming in, the time depending on the heat of the room and the lateness of the winter. This seems a tedious process, but the beautiful and fragrant flowers produced by these bulbs will repay you for your work, if work you can call it, to care for these charming little home companions. It is rather recreation than work.

The Secretary read the following communication from the Southwest Iowa Horticultural Society:

Randolph, Iowa, Dec. 18, 1905.

Hon. Geo. H. Van Houten, Lenox, Iowa.

Dear Sir: I take great pleasure in appointing you as a delegate to the State Horticultural Society of Nebraska from the Southwest Iowa Horticultural Society, and bespeak your royal welcome as that is a matter of history with our sister Society of Nebraska.
honorary life member of our society.

F. P. SPENCER,

President Southwest Iowa Horticultural Society.

G. A. MARSHALL: I move that Mr. Van Houten be made an honary life member of our society.

Motion carried unanimously.

MR. VAN HOUTEN: I want to thank you for that vote. I feel very grateful indeed for this honor. I am glad to be able to be back and meet you again. While I have been at times far away, yet some of the most pleasant hours I have had have been spent in reviewing times with old horticultural members. Thank you. (Applause).

On motion the secretary's and treasurer's reports were accepted and referred to the auditing committee, consisting of C. H. Green, C. B. Camp and J. A. Yager.

The chairman appointed C. H. Barnard, A. J. Brown and J. H. Hadkinson as the committee on obituaries.

Meeting adjourned to 9:00 A. M., Wednesday, January 17.

SECOND SESSION.

WEDNESDAY, JANUARY 17—9:00 A. M.

Mr. C. S. Harrison moved that article four of the constitution be amended, providing for the election of one director for one year, one for two years, one for three years, and afterward to elect every year one director to serve for three years.

Motion carried unanimously.

MR. HARRISON: I move also that article four be changed so that the office of secretary be filled by the Executive Board instead of by election at the annual meeting.

Motion seconded.

MR. HADKINSON: I would like to ask if the secretary will be a servant of the board.

G. A. MARSHALL: I was one of that committee on amending the constitution. Mr. Harrison was the father of that idea. It was not new. When he visited the Minnesota Society, one of his main objects was to gather information relative to the work this committee is doing. He has looked into the matter thoroughly, and we could find no objection to his ideas. We hold the Executive Board responsible for what the Secretary does. The Secretary does the work and the Board gets credit for what he does. Therefore, the Executive Board should be the people to select their man. The Board consists of all the officers and the three directors, eight men in all.

MR. DUNLAP: This thing seems to me to partake of a political nature now. Of course politics is one of the duties of American citizenship, but I believe it would be better to hold things down.

MR. CAMP: This is a government of, for, and by the people. It is a whole lot better now than when it began. Why cannot our association be the same?

MR. BROWN: There is no politics at all in this; it is simply a matter of business. It is just this way. We elect our Board of Di-

rectors first, and then they select who they want to serve them. After thinking this matter over, I have come to the conclusion that these eight men, with six months to deliberate the question, can select a better man for secretary than the whole society can in ten minutes. With this change we propose to increase the duties of the secretary, establish an open office in Lincoln, and broaden our work generally.

MR. BARNARD: This business was delegated to a committee, and was looked into thoroughly. The secretary does what the Board wants him to do. The secretary has nothing at all to do with the management of this society. Now, if you are going to hold the Executive Board responsible for everything, then give them power to select a competent man. We people who have gone through and served as officers all see the wisdom of this, and heartily concur in this resolution. I am certainly for the resolution.

MR. MEEK: It appears that there are only a few who know anything about the resolution. Now, it is important to study this matter. If you pass the resolution today, it is carried for good. If it lies a year, people will have time to think about it, and they can then do things intelligently.

MR. HARRISON: We have been studying a year on this as it is, and besides a year is a good long while to wait. We have lots to do, and this is a growing country. This question was announced and explained yesterday, and now is the proper time to consider it.

MR. GREEN: I don't believe there are any on the floricultural side who have expressed their views yet on this question. As a member of the Board for the past three years, I want to say, that when that resolution was first read by Mr. Harrison, I felt that I would vote against it. I was much opposed to it. But after thinking it over, I have come to the conclusion that it is a good thing,—that it is a step in the right direction, and we certainly ought to provide for this change.

When put to vote, the motion carried, twenty-one voting in favor and eight against.

MR. HARRISON: I have one other amendment to offer.

We recommend also a change in article eleven, empowering the Executive Board to pay the secretary a salary of $1,000 per year, if they deem best, in consideration of his keeping an open office and giving his whole time to the work, spending at least eight hours a day in his office. It shall be his duty to get out each year a creditable annual

report, issue monthly bulletins to each member, preparing articles as often as once a month for the leading papers, doing also all in his power to secure new members. This to be done with the advice and direction of the Executive Board.

Motion carried unanimously.

The following communication from the Iowa State Horticultural Society was read:

Des Moines, Iowa, Jan. 11, 1906.

To Whom It May Concern:

This is to certify that Mr. C. G. Patten of Charles City, Iowa, is a duly appointed delegate of the Iowa State Horticultural Society to represent it at a meeting of the Nebraska State Horticultural Society, to be held in Lincoln, Nebraska, January 17th-19th, 1906.

Yours respectfully,

WESLEY GREENE,

Secretary.

Mr. Patten was unanimously voted an Honorary Annual Member of the Nebraska State Horticultural Society.

The report of the auditing committee was accepted and the committee discharged.

MR. BROWN: In view of the events of the last two or three days, I move that the Executive Board procure some suitable place down in Lincoln for our annual meeting.

Motion carried unanimously.

On motion, which was carried unanimously, it was decided that a suitable memorial of the late Robert W. Furnas be prepared, and, with his photograph, be inserted in the next annual report.

HARDY ORNAMENTAL TREES.

By J. H. Hadkinson, Benson.

When I received word that the Society, through the Secretary, assigned the above subject to me, I wondered if they had in mind the ornamental trees as classified in the general nursery catalogue, or if they intended to allow me to put my own definition on this, which I am going to take the liberty to do, and it is:

Trees that are hardy in any respective locality and are well trained, are ornamental. I shall have to let the reader be the judge of hardiness, except in localities where I shall quote them found growing and doing well in our state. A reliable way to find out the hardihood of trees is to skirmish as close as possible to the locality where they are to be planted, and find out how the respective variety that you wish to plant is thriving and under just what conditions. Then use as near as possible these conditions and plant the tree or trees decided upon. Do not get disappointed on first trial if it is a failure, for we all have these experiences of planting, and fail with some kinds once in a while and after getting disheartened, find that a neighbor had succeeded probably with less care than we had used.

Trees are almost human, not excepting tender varieties, for they will not flourish or grow fat on wind and sun; they might on sun and water or wind and water, but to get plain facts, thorough cultivation is essential, also thorough care after planting. This is especially true for the first few years, but even so in future years when we experience a season of continual dry weather. Hardy ornamental trees are planted like any other kind. Good generous holes should be dug, eight to twelve inches deeper than needed, also much wider, then the bottom should be filled in with six to twelve inches of rotten straw, hay or trash of a similar nature, and covered with soil six to eight inches, owing to the size of the trees to be planted. This material in the bottom acts as a reservoir for water for future use of the tree. If the trees are planted with a frozen ball of dirt, fill in with fine dirt previously prepared and covered with fresh stable manure to prevent freezing. Never use frozen chunks; in fact, use fine dirt all the time, well worked in amongst the roots and leave no air pockets.

The reason why trees succeed so well when the holes are slushed with water, is that this water percolates through the soil and causes

all the air spaces to be filled with slush and dirt, therefore making it a solid mass. A tree does not have to be drowned to live. If you use too much water on trees planted in a retentive or clay soil, you lessen the chance of their living. If the soil is porous, you cannot injure them so easily, but you can make the soil sour,—"continuous dampness" is the proper term. If soil has been soured, a little air-slacked lime or pulverized charcoal worked into the soil will sweeten it.

After trees are properly planted, they should be carefully staked, either by using three wires placed high enough up on the stem of the tree to prevent shaking, and three stakes driven down at equal distances in a circle around the tree, to which wire should be fastened, leaving the trees perfectly upright when finished. Or, a two-by-four or pole six or eight feet long can be used alone by driving it into the ground at an angle of about 45 degrees and leaving it about three or four feet up the stem of the tree. This stake method is a good one, for the stake can be put in a line with the tree row, if planted in rows, and therefore be out of the way of the horse cultivator. Where the wire and also the stake comes in contact with the tree, they should be covered with burlap or some soft material and the stake bound tightly to the tree, either with rope or wire. If wire is used, put some burlap around the stem of the tree.

We have some fine native ornamental trees, viz.: Oak, Ash, Elm, Maple, Walnut, Hackberry, Linden, Redbud and Haws, the latter grow along the esatern edge of the state. I will name a few of the less common varieties, and state where growing.

Buckeye is found in good size in the eastern part of the state.

Catalpa Bungeii is growing in Omaha, and the writer saw some fine specimens in York, Neb., planted three years ago.

Japan Walnuts were also seen in York, also Magnolia acuminata. This latter tree grows south of Plattsmouth, a specimen twenty-five feet high growing there.

Golden Poplar, twenty feet high, is growing in Omaha, also some specimens of red and white flowering Thorn.

Tulip trees seem to do well both north and south, for at Table Rock and Fremont fine specimens may be found.

In Wyuka Cemetery, Lincoln, a specimen of deciduous Cypress may be found, though of somewhat retarded growth.

Magnolia Soulangeana is growing to a height of eight feet in Omaha.

Hard Maple, Norway Maple, and even Schwedler Maple are to be found in the eastern portion of the state.

Maiden Hair trees, six inches in diameter, are also found in the eastern portion of the state, and even Sassafras to the height of twenty-five feet, which in some states is a nuisance.

At the State Experiment Station, Lincoln, can be found some good, thrifty specimens of Russian Oak, growing almost as fast as a Maple.

Of native shrubs, I might mention Snowberry, (Red and White), and several varieties of Sumach, which all help greatly in planting screens.

With these and many other trees and shrubs, why is it not possible to beautify our homes and public grounds? Let us wake up and try.

DISCUSSION.

MR. HARRISON: How about Tree Lilacs?

MR. HADKINSON: They do fairly well.

MR. YAGER: In our section of the state there are some very fine Persimmon and Tulip trees. Some of them are twenty-five feet high. They are a very hardy and desirable tree. They can be grown successfully, and this shows that some trees that were not hardy formerly are now being planted successfully, and that they do well. The Tulip tree is certainly a fine and beautiful tree. I think anyone intending to plant for ornamental purposes will do well to investigate the Tulip tree.

MR. HARRISON: Plant a hundred trees like the White Pine and out of that hundred there will be sure to be two or three hardy ones. There have been thousands of Tulip Trees planted in Nebraska. The hardy ones will survive; some of the trees will be acclimated.

MR. BARNARD: We have had a Tulip Tree for about thirty years. It has bloomed very full every year, and is perfectly hardy. In handling the Tulip Tree, the roots will stand very little abuse; the tree

is quite tender when young. Later it seems to become a good deal hardier. It stays in bloom for two or three weeks, and is certainly one of the finest ornamental trees we have.

MR. HARRISON: Did you save seed from it?

MR. BARNARD: I have never paid much attention to the seeds.

MR. CAMP: I have five Tulip Trees. One of them is about twenty-five feet high, but it does not bloom.

MR. HARRISON: They do not bloom until they get age.

MR. BARNARD: Ours blooms very well.

QUESTION: Would you recommend the White Birch for this country?

MR. HADKINSON: Yes, sir; every time. It is a fine tree.

THIRD SESSION.

2:00 P. M.

JOINT SESSION WITH THE AMERICAN BREEDERS' ASSOCIATION.

Hon. Chas. Willis Ward, Presiding.

THE CHAIRMAN: I will not take up any time at all addressing you, as we have quite a long program on for this afternoon. The first paper is by Dr. Bessey, on "Crop Improvement by Utilizing Wild Species."

CROP IMPROVEMENT BY UTILIZING WILD SPECIES.

By Charles E. Bessey.

It has been a favorite belief of mine for many years that there are yet many wild species of plants which might well repay cultivation and improvement. We must bear in mind the fact that every plant now under cultivation was at one time wild, and that at some place some man first began to give it that care which finally brought it to its present state. For many plants the steps in the modification from the wild to the cultivated state are lost, as is the case for Wheat, Oats, Rye and Barley, of which the wild forms are not now certainly known. But that they were slowly evolved by cultivation, variation (mutation, if you please) and selection, can not be seriously doubted. We have only to consider the history of the development of the many excellent varieties of grapes from the American species of Vitis (**Vitis labrusca**, yielding the Concord, Martha, Isabella, Catawba, etc.; **V. aestivalis**, yielding Cynthiana, Cunningham, etc.; **V. Vulpina**, from which we have the Clinton, Taylor, Elvira, etc.; **V. rotundifolia**, yielding the Scuppernong, Thomas and other southern varieties), in order to be assured of the fact that a wild species can be greatly changed in a comparatively short time. The same story is told by the varieties of American plums, evolved from the wild **Prunus americana** and other allied species. Our Gooseberries were likewise derived from a couple of well-known American species (**Ribes oxycanthoides** and **R. cynosbati**). So, too, our Raspberries are the more or less modified fruits of the native American species, **Rubus strigosus**, the wild red raspberries, and **Rubus occidentalis**, the wild black raspberries.

This list might be considerably prolonged, but it is unnecessary. It is not my purpose to enumerate all the cultivated varieties which have been derived from wild species within so short a time that we are still familiar with the process. These that I have cited will serve to emphasize by contention that cultivated varieties have been derived from wild species, and that this is a comparatively easy process. I hold that it is possible to derive many more varieties than we now have from wild species, and that we may greatly enrich and enlarge our list of farm and garden crops by bringing under cultivation still more wild species. In the following paragraphs I have attempted to make some suggestions as to a few wild species selected from a long list, that I think are more or less promising. I may venture the hope that one or more of you may have the inclination as well as the time and means for undertaking the improvement of some of these wild species.

Of the ordinary cereals, Wheat, Oats, Rye, Barley and Maize, there are some wild relatives that in my opinion are likely to repay attempts at cultivation.

WILD WHEAT.

While we have no wild species of the wheat proper (**Triticum**) in North America, we have many species of the closely allied genus Agropyrum, the so-called "Wild Wheat Grasses," at least one species of which is a promising subject for the experimental plant breeder. I refer to the commond Wild Wheat Grass of the Great Plains (**Agropyrum occidentale**), a perennial, erect grass, attaining a height of two to three feet, and terminating in a loose head five to six inches long, composed of numerous, many-flowered spikelets. The grain is long and narrow and, like that of wheat, is hairy at the apex, and grooved on the upper side. Altogether this Wild Wheat Grass already shows many resemblances to ordinary wheat, and the differences are such as it is reasonable to hope may disappear under cultivation and selection. In fact, when one compares this American Wild Wheat, with its strong, erect stem, its long head, and its many-flowered spikelets, with the weak stemmed, small-headed and few-flowered **Aegilops ovata** of Europe, one is compelled to say that the American plant is by far the more promising. If our plant had had but a fraction of the careful cultivation and selection which have been given to the European species, I am confident that it would have yielded a much more productive cereal than we have in our present varieties of wheat. Moreover, since the American plant is a long-lived perennial, it is possible that from it we may yet obtain a perennial cereal.

WILD BARLEY.

Here we have a cereal of which we have not only several wild species of the genus to which it belongs (**Hordeum**), but we have also a closely allied genus (**Elymus**), containing a number of species, several of which are likely to repay efforts to improve them. It is unfortunate that the English name, which is usually applied to the grasses of this genus is "Wild Rye," for instead of being closely related to the rye (**Secale**) it is indeed referred, not to the sub-tribe **Triticeae,** but to the **Elymeae,** which contains the Barley grasses, including the cultivated species (Hordeum sativum).. In this related genus **Elymus** there is a common, tall-growing perennial wild grass, **Elymus canadensis,** to which we ought to apply the name "Wild Barley," and which will certainly repay cultivation. In its wild state it is from two to five feet in height, and it produces barley-like heads four to twelve inches in length, filled with a great number of cylindrical grains, which, as in cultivated barley, are adherent to the chaff. The probable advantages of introducing this barley are the perennial habit of the plant, the stouter stems, and the much larger and more productive heads.

Among the wild species of American plants there are many which have a considerable forage value. Thus in a recent paper on "The Grasses of Nebraska," published in the Annual Report of the Nebraska State Board of Agriculture for 1904, I said, "it is interesting to note that of the one hundred and fifty indigenous species listed above, fully one hundred and thirty have more or less value for forage." In this great number, which would be greatly increased by taking the whole country, there must be many which will repay cultivation. I will at this time call attention to but two out of all this number, both belonging to the tribe of Grama Grasses (**Chlorideae**), characterized by having their heads one-sided, that is, with the two rows of spikelets arranged on one side of the axis. Here is where we find the true Buffalo Grass, as well as most of the other grasses to which this name has also been applied upon the Great Plains.

BLUE GRAMA.

This slender, fine-stemmed grass (**Boutelona oligostachya**) varies in height from six to twenty inches in its wild state, but under slight cultivation it has been increased to two feet or more. It is palatable and nutritious, and constitutes a considerable proportion of the "wild hay" obtained from certain localities in the West. Experiments made upon it at the Nebraska Experiment Station show that it is a promising grass for introduction in the drier regions of the Great Plains.

This grass (**Atheropogon curtipendulus**), called also in some places "Side-oats Grama," is, like the preceding, a native of the prairies and plains of North America. It has a coarser, erect stem, which bears many short, slightly depending spikes on its upper portion. It is regarded favorably by the plainsmen as yielding a good quality of wild hay, and experiments made upon it at the Nebraska Experiment Station show that it can be easily increased in height, and that it is easily propagated.

CLOVERS.

In passing I may refer to the Bird-foot Clover (**Lotus americanus**) as a possible addition to the list of small forage plants. In its wild state it is highly nutritious, and it makes a palatable hay. I have had also for many years the feeling that among the many wild species of clovers proper (**Trifolium**) to be found in the Rocky Mountains, some might repay cultivation. The selection and cultivation of these might be a work worthy of being undertaken by a breeder who hoped to add another clover to those we now grow from the Old World.

Man long ago selected and cared for a considerable number of plants to serve as everyday food for himself and his family. These garden plants are mostly very old, and have been in common use for ages. Yet we must not forget that one of our best vegetables, the Tomato, is of very recent introduction. I shall take the time today to suggest but three possible additions to what we now have.

BUFFALO PEAS.

Every one on the Prairies and Plains knows the Buffalo (**Astragalus crassicarpus**), a low-growing perennial which blossoms early in the spring and produces large numbers of thick, fleshy pods, each of which contains several small seeds. Tradition upon the Great Plains assures us that these fleshy pods were long ago found to be palatable and nutritious by the emigrants who in the early days crossed the Plains in slow-moving caravans which stopped once or twice a day for rest and food. About thirty years ago I collected a considerable quantity of the fresh pods and had them cooked for dinner. While the cooking was not as carefully done as it might have been, the result was a dish which resembled "stringed beans" in taste. Ever since that experiment I have been more than ever assured that in this common prairie plant we have a most promising addition to the list of our garden vegetables. It awaits the developing skill of a breeder of plants.

TOMATO CHERRIES.

For many years the settlers upon the Great Plains have annually used the fruits of the native **Solanum triflorum,** a thrifty, spreading and ascending, much branched plant, which is pretty closely related to the common Black Nightshade **(Solanum nigrum).** The plant to which I refer has had a number of local names applier to it, but I prefer the one I have used, namely, Tomato Cherry. The fruits are blackish, nearly half an inch in diameter, and are flattish at the ends. When cooked they are used in pastries of various kinds, which are much relished by the inhabitants of the Central Plains. It has often occurred to me that this fruit was worthy of the serious attention of the plant breeder, and I commend it to such of you as are able to undertake the work of improvement and amelioration.

GROUND NUTS.

It may be possible that we de not need to add another starch-bearing tuber to the list of our vegetables, since we have the Potato, which, under good conditions, yields such enormous quantities of excellent tubers. The Potato is one of the greatest additions to the food stuffs of the world, and I often wonder how the people of the Old World ever managed to live without it. It is an admirable vegetable, and fully meets all the requirements of a cheap, starchy food. And yet there is an old adage which admonishes us to "never put all your potatoes in one basket," which for the present occasion may be interperted as a suggestion not to grow our starch-bearing tubers all from one species of plant. It is with much feelings that I suggest to you the development of the Ground Nut **(Apios apios)** to be a supplementary tuber-bearing plant in our gardens and fields. The plant is a twining perennial, and is a member of the great family of the legumes **(Leguminosae).** In the wild state it produces small tubers from half an inch to an inch in diameter, and as I have often proved by trial, these are very good to eat. Am I not justified in suggesting that in this plant, which belongs to an entirely different family from that which contains the Potato, we have a promising form for improvement? It is highly improbable that any of the diseases of the Potato plant or tuber should pass over to plant or tuber of the Ground Nut, and for this reason alone the introduction of the latter would be desirable.

May I ask your attention next to half a dozen native fruits which appear to me to be waiting for some one to invite them into our orchards:

THE PRAIRIE APPLE.

It is unfortunate that the two species of wild apples found in the United States should so generally be called "crab apples." They are in fact, native wild apples, and there is little doubt that had the common apple of the Old World (**Malus malus**) not grown well in New England, Pennsylvania and Virginia when attempts were first made to transplant it to our soil between two and three hundred years ago, the wild species would have been brought into cultivation. Had that taken place, we should doubtless have been eating luscious native apples in this country for many years, as we have been eating native grapes. Many years ago I urged the horticulturists of Iowa to turn to the western wild apples (**Malus ioensis**) as a promising species to be improved and brought under cultivation. A few years ago I wrote in the same strain to the Nebraska horticulturists (Annual Report Nebraska State Horticultural Society, 1894, page 9). I wish here to urge upon you the desirability of taking up this promising native species, and of giving it that treatment which will quite certainly evolve from it a new apple. That this will be done in the course of time I have no doubt at all, the only question is how soon will our breeders take it up.

DWARF WILD CHERRY (**Prunus demissa**).

This is an upright shrub or less commonly a small tree, having thickish, blunt-serrate leaves, and large, black-purple, edible fruits. In shape, the cherries are flattish with a thickish flesh, and are from one-third to one-half an inch in diameter. When unripe they are quite astringent, and this is probably what has given them the unfortunate name of Choke Cherry, but when ripe they are excellent eating in the fresh state, and when made into pastries I can vouch for their excellence by practical experience. The cherries are clustered in racemes, as in the Wild Black Cherry, to which indeed this Dwarf Cherry is closely related. Many years ago I called attention to this as worthy of introduction for its promising fruit, and I cannot refrain from urging upon the plant breeders in this meeting the desirability of taking it up for development.

NEBRASKA SAND CHERRY (**Prunus besseyi**).

This low shrub which resembles the Sand Cherry (**Prunus pumila**) of the eastern United States, and which for many years was supposed to belong to that species, has attracted the attention of many growers for the past decade or more. As it occurs on the Sand Hills of Central

Nebraska, it rarely attains a height of more than two feet, but low as it is, it is often loaded with fruit. The cherries are on short stalks in umbellate clusters, as in the common cultivated cherries, globose in shape, half an inch or more in diameter, and when ripe a very dark purple in color, and sweetish in taste. By simple selection of the wild plants, a considerable improvement has been made upon this cherry as it is grown in the gardens and orchards of many people in Central Nebraska. Still better results have been obtained by the more scientific methods employed by Professor Hansen. He has shown that this is one of the best of our wild cherries for experimental work in breeding and cultivation.

BUFFALO BERRY.

The tall shrub or small tree which is universally called the Buffalo Berry **(Lepargyraea argentea)** is a near relative of the Russian Olive **(Elaeagnus angustigolia)**, which it resembles in its silvery foliage and yellowish flowers. The fruits are spherical, about a quarter of an inch in diameter, red, or less commonly, a clear amber color, and of a pleasant sour taste, somewhat resembling that of ripe cranberries. The fruits are produced in abundance in clusters on the twigs, and ripen in the latter part of the summer. The tree is perfectly hardy and easily propagated, and would, in my opinion, repay the care which would be necessary to develop it into a desirable addition to our too short list of acid fruits for garden or orchard cultivation.

LOW SUMACH.

Often when tired and thirsty in my botanizing upon the plains or in the broad canyons I have refreshed myself by gathering a handful of the small red fruits of the Low Sumach **(Rhus trilobata)**, placing them a few at a time in my mouth, and allowing the sour flesh to dissolve. Whenever I have done so I have wondered whether these dense clusters of red drupes might not be so improved as to make them profitable to cultivate for this pleasant acid. I commend this pretty bush, with its dense clusters of sour red drupes, to your careful consideration.

HAWTHORNS.

Nowadays the botanist who does not refer to the Hawthorns (of the genus **Crataegus**) in any paper of his is a rarity, but you need no fear that I am going to lead you into the amze and confusion of the recent systematic botany of the species. I wish merely to call your a

tention to the fact that some of the species have fruits which are very sweet and palatable. I bear in mind now one bush in the Sand Hills of central Nebraska from which I ate the most deliciously sweet fruits that I have ever found on the Hawthorns. There are very good reasons for believing that the Hawthorns are very pliant in nature (hence the many forms which have been interpreted, erroneously I think, as species), and no doubt they will continue to be so in the hands of the intelligent breeder. (Applause).

BREEDING GRAPES.

By C. B. Camp, Cheney

Mr. President, Ladies and Gentlemen: From boyhood I have had a love for experimenting with plant life. For thirty years I have sought information from all available sources relating to the work being performed along the line of Horticulture and Plant Breeding The farm on which I reside was purchased in 1878. In the fall of 1879 an order for nursery stock was placed with the Phoenix Nursery Co. of Bloomington, Ills. Among the plants ordered were a number of grape vines. From this initial planting dates our experimental work in Nebraska. While our experiments are by no means confined to breeding grapes alone, but include other fruits and berries as well as nuts; yet as this paper is devoted to breeding grapes the above allusion to our other experimental work must suffice for the present. I have carefully studied the work performed by such able investigators as Dr. G. Englemann, A. S. Fuller, G. W. Campbell, Jacob Moore, E. S. Rogers, Professors Bailey and Munson, Messrs. John Burr and Luther Burbank, and a host of other men who have embellished horticulture with their labors.

Every year since 1880, trees, plants, and vines, of various kinds, and from many states, have been set out on our grounds. After a residence of fourteen years in Nebraska there were growing on our grounds sixty varieties of grapes. This collection included most varieties recommended as standard varieties for this northwestern country. Of this collection of grape vines not more than a half dozen could be relied on as profitable commercial varieties. In order, therefore, to provide additional hardy commercial varieties containing excellent table qualities and adapted to the climatic conditions of this northwestern country, I was led to enter into the work of breeding hardy varieties of grapes. Two general systems of plant breeding were adopted as well as one auxiliary system. The first system used "natural fertilization of the flowers," according to the theory advanced by Mr. John Burr of Leavenworth, Kansas. "He held that nature selects under the environment the pollen most congenial to perpetuate its species and never makes a mistake." The second general system used is that known as "artificial" or forced fertilization of the flowers, as practised by such able experimenters as Dr. Bailey of Cornell University; Professor Munson of Denison, Texas, and Luther Burbank of the Pacific Coast.

The third or auxiliary system consists of artificial fertilization of the flowers of closely related varieties, applying to plant breeding, the principle of "line breeding" as followed by poultry fanciers.

In the spring of 1891 a vineyard was set with vines obtained of Chas. A. Green, Rochester, N. Y., with a view to natural cross fertilization of the flowers according to the theory of Mr. John Burr. Having previously observed the dates or blooming season of a number of grape varieties, and prepared a record for future use, I was enabled to place perfect flowering varieties in conjunction with pistillate, or female flowered varieties of same season of blooming. The intention in arranging the plat of parent vines was to constitute the environment such that the seeds of the pistillate varieties would be necessarily one-fourth foreign, or vinifera, and three-fourths American. Five years later when the parent plants were well established, being the season of 1896, such fine clusters of grapes were produced that the largest and most perfect clusters were taken from Brighton, Herbert, Agawam, and Delaware vines, the two former being pistillate flowered and the two latter perfect flowered varieties. This division was purposely made for comparison of results. The largest and most perfect berries were selected out from the clusters, their seeds secured and planted. The young plants were carefully tended during their first season's growth. Any plants showing weakness of growth or diseased foliage were removed at once. Also during their first season's growth they are closely watched and a record kept of the several plants in each lot, showing a difference in foliage, arrangement of tendrils, color of petioles or leaf stalks, etc., and plants selected for transplanting into trial grounds each differing in some particular. In this way I hope to save all valuable varieties that originated from that season's collection of seeds with the minimum of labor and expense. From the seedling vines grown in the year 1897 by the John Burr system, forty-five of them have fruited and the fruit from a number of them has been exhibited at the Nebraska State Fair. The large majority of vines originating from seeds of Brighton and Herbert, both pistillate verieties, fertilized by the John Burr system, have proven remarkably good as a whole. Not a single purely staminate vine was produced in this experiment.

The vines originating from seeds of Agawam and Delaware under the Burr system and grown the same season as the above described lot, namely, 1897, have not proven of very great value. I attribute their lack of value to the fact that under the Burr system of fertilization, they being perfect flowered varieties were self fertilized and reverted toward their respective native ancestry. However, there are two or three vines of this lot of seedlings worthy of more extended trial. This

collection of forty-five vines presents three rather remarkable features. About one-half of them have continuous tendrils, nearly one-fourth regularly intermittent tendrils, and the remaining one-fourth have partly intermittent and partly continuous tendrils on the same cane. I have with me a cane showing this peculiar feature in a wonderful degree, and will exhibit the peculiarity at the close of my paper. In order to determine the degree of cold the seedling vines can endure, two canes are grown from the ground, one is laid down upon the ground and covered with earth, the other is left fully exposed upon the trellis. A record of the temperature of the weather is kept during the winter; also a record of the condition of the exposed canes the following summer.

The second system of plant breeding is that of "artificial fertilization of the flowers." It is generally believed by our leading plant breeders that this system will produce hardier and better varieties, with the minimum of time and labor. Since the plant breeder, by this system, has under his control the pollen grains that influence the character of the embryo plant, it stands to reason he should be able to breed plants yielding the kind and quality of fruit he desires. Since 1897 our work has been largely along the line of this system of plant breeding. Our experience seems to teach that pistillate flowered varieties are more readily and to a greater degree impressed by cross fertilization than perfect flowered varieties. Accordingly we have used, mostly, pistillate varieties as the mother plants. "Wyoming Red" has been used as a mother plant and has yielded fruit of fine quality and of three colors—white, red and black. The clusters of these seedlings are usually small to medium size, and the berries rather small. I do not think Wyoming Red will anywhere near compare with Herbert as a mother plant for the raising up of a class of grapes possessing large clusters, very large berries, of excellent table qualities, and last but not least, ability to endure cold of 25 to 30 degrees below zero. I have with me a cane of a Herbert seedling that endured 27 degrees of cold last winter, fully exposed on the trellis, yielded a good crop of fruit the past season; was exhibited at our State Fair. It is perfect flowered, capable of yielding large crops of most excellent fruit when standing alone. Herbert seeds have yielded several varieties on our grounds that are worthy of investigation by intending planters. To prevent infringing upon the time of other and abler men, I must pass over some interesting experiments I have made with seedling vines in the second generation. I pass to March, 1902. During this month I secured of Professor T. V. Munson of Denison, Texas, a consignment of his school of vines, consisting of twenty-four varieties. His "America" vine, as most of your are aware, is composed of the two species combined, Lincecumii, or Post-Oak, and

Kupestris. I used as a male parent a seedling of Brighton in conjunction with "America." This cross was made June 14 to 18, 1904, seeds saved of best berries from the America vine and planted in the fall of 1904. The seeds are planted in a specially prepared seed bed, put in drills and covered about one and one-half inches deep. A fence board was then laid along on top of the drilled row to prevent any animals from making tracks in or disturbing in any way the seed bed. Last season was their first season's growth. At the close of the season there were left, after the season's culling of weak and diseased palnts, twenty vines. Of these twenty plants, four have continuous tendrils. I consider that a remarkable feature, since these seedling vines are supposed to contain the blood of four species. This peculiarity was pointed out to Professor Emerson during his visit at my place last summer.

From Professor Munson I secured the vine "Ponroy." It is a pistillate variety of the species Doaniana. With it I used pollen from a Bacchus vine. I found the Ponroy yielded fruit of very good quality for a wild vine. Its clusters are small, ten to fifteen berries each, yet its mature berries are as large as Ives seedling. Last winter one vine fully exposed upon the trellis endured a temperature of 27 degrees below zero and sent out a cane, at the upper arm, four and one-half feet above the ground, set two clusters of grapes, and carried them to maturity. The vine, however, was badly crippled by the severe cold, showing it had passed through the limit of its endurance to cold. The Bacchus vine was used as a male parent with Ponroy, in the hope of giving additional hardiness and enlargement of cluster to the Doaniana seedlings. The next cross in prospect is to mate these Doaniana seedlings with a parent yielding fine table qaulities.

From Professor Munson I secured his "Xlnta" vine. It was produced by crossing a Post-Oak hybrid with Munson's America. Upon it I used the pollen of a Brighton seedling. This cross was made two years ago but as none of the seedlings have as yet borne fruit they are passed with the above notice.

From Professor Munson I secured two varieties of Lincecumii, or Post-Oak species, being "Jaeger 43" and "Early Purple." These two native or wild vines from the Panhandle country of Texas are not hardy enough to endure the Nebraska climate. About 10 degrees below zero is their limit of endurance without protection. They are very late in blooming, being June 20 to 25 last summer.

From Mr. J. Smelter of Carver, Minn., I secured one dozen cuttings of his "Dacota," a vine claimed to have endured 50 degrees below zero and borne a good crop of berries the following season, after being fully

exposed. These cuttings were received in December, 1902. These vines produce clusters quite similar in size and shape to well-grown Bacchus clusters, that is, long, cylindrical clusters, berries somewhat larger than Bacchus. They are of better quality. As a male parent to give hardiness to varieties, this one is par excellent, I believe. I have a cane of the "Dacota" here if any one cares to examine it. In concluding this paper permit me to say, if my humble efforts at breeding grapes prove of no advantage to the horticultural interests of my adopted state, I have the satisfaction of knowing I made an honest and earnest effort. (Applause).

BREEDING GRAPES.

By Prof. S. A. Beach, Ames, Iowa.

Mr. Chairman, Ladies and Gentlemen: When I was a young man, I followed Horace Greeley's advice and came West. I found a very congenial home in the prairie state of Iowa, and one of the most enjoyable periods of my life was when I was in college and a sub-freshman in the classes of Dr. Bessey. I feel yet the inspiration to work which he gave us in his class room.

About breeding grapes: In about the year 1848, a man whose health was failing, felt that it would be good for him to get some outdoor work for at least part of the time, and consequently he took up the future of growing grapes. It was in the northwestern part of Massachusetts, and no grapes would ripen up well in that climate. They had the old varieties, Isabelia, Catawba, etc., but these would not ripen well in this atmosphere except occasionally. This man kept on experimenting with seeds and grape seedlings, planting them alongside the fences. He wanted to get a good grape which would ripen early. A few years later he got a good variety of grapes and sold them for $5 a vine. He named this grape after the town in which he lived —Concord. That was the origin of the Concord grape.

At that time we did not have the California grapes. There was a good deal fo money made in growing grapes. Grapes like the Isabella would sell for 18 cents a pound. There was a lively interest in grape growing and breeding. About the time that Mr. Bull was originating the Concord, interest was aroused also by the introduction of a hybrid known as Allen's Hybrid. There was a great deal of interest manifested along many horticultural lines in that part of the country just then. Marshall P. Wilder was very busy advancing the interests of horticulture at that time. In the vicinity of Boston some of the finest pears in the country were grown. There was really a great interest in these horticultural matters. This interest in the planting and growing of grapes was well sustained until the '70s.

Today in the state of New York there are probably sixty thousand acres planted to grapes. Outside of California, New York is the leading state of the Union in the production of grapes. The most important district for grape vineyards is along the south shore of Lake Erie. Perhaps you would be surprised to know that in some twenty-five thousand acres of grapes in this region 90 per cent are Concord. Then there are Worden, Moore's Early, Niagara, and some other of the Con-

cord seedlings. There are also a few Delaware and a few other varieties, but the main bulk are Concord or have Concord blood. And all this in fifty years from the time Mr. Bull produced the Concord grape. Today the Concord is the leading table grape of the world. A very large per cent of grapes are grown for table use, but the Concord is the recognized leader.

Now, the question is: Does the Concord fill the bill to our entire satisfaction? I think not. The Concord is a very good grape, but there are other varieties of grapes that are better than the Concord in one way or another. There are grapes which are better than the Concord in size, some are better in quality, some perhaps are better in productiveness. The Concord will yield from three to five tons per acre And when you look at it from a commercial or money point of view, it makes lots of difference to a man whether he gets two or three tons to the acre. So from the commercial side the Concord is certainly our leading grape.

Throughout all these years there has been a great deal of work going on in the growing and breeding of grapes. Some of this work is very interesting. Between this work and the mere taking up of chance seedlings there are all gradations. Many of the resulting grapes are of unknown parentage. Some men have experimented with the cross-fertilization of the blossoms, and followed the seedlings up just to see what they would get. Others breed grapes by making careful crosses and knowing exactly what the parentage is. Now if we are going to make any real progress at all in the matter of breeding and growing grapes, it seems to me, that these methods of gambling with grapes of unsound or unknown parentage have been practiced long enough. It is time for us to work something different. If we are to make any real progress, we must know just what there is in the grape we are using as a parent. Most of our material is composed either of hybrids or crosses. Only in a few cases do we know exactly what the parent grapes are. In very few cases indeed do we know what the grandparents are. I believe the time has come when we should adopt a systematic and scientific way of getting at this and knowing what we have as parents. Learn something about the hardiness of these vines; learn something about the particular habits, tendencies and characteristics of these vines. We can thus get very valuable and reliable information. Those who are breeding grapes for the money alone cannot afford to take the time to do this. Those who have followed the grape business and nothing else have not made much money out of it. There is not much inducement for men to take up the business of breeding grapes for commercial purposes, but it should receive attention from some one.

I believe the place to do this work in breeding is at the experiment stations. Work of this kind has been carried on at the Geneva, New York station, since 1892. About 225 grape seedlings at this station represented many thousands of vines. Still some things of value have been produced. The main question in breeding grapes has not been "how to breed good grapes," but it has been "how to breed grapes." If some one produces a good grape, maybe a still better one will be produced in ten years, but we want to know the principles of these things. That is the work the experiment stations should take up. If this work were taken up by the experiment stations throughout the country, they would receive help from many sources. Let them work for the common welfare of the country. (Applause).

DISCUSSION.

C. S. HARRISON: I stood by the old original Concord grape down there in that New England town, and I said: You grand old mother, you don't know what you have been doing; you cannot know the value that has gone forth from you. I was certainly inspired as I stood there and thought of what that one grand old vine meant to the world.

MR. VAN HOUTEN: Everyone who has attempted to breed plants, at least in years past, feels that he has wasted a large share of effort simply because he did not know how. I am very glad that Professor Beach, Mr. Patten and others have been investigating the principles of plant breeding. I believe they have started on the right track. Mr. Patten has been able to find out the principles, the "know-how" and to discover the laws of nature whereby things are brought about. We are now marching along the lines which the successful stock breeders have in the years just passed. With Mr. Patten, Professor Beach and other investigators following this work up, we have now come to a time when we can announce successful methods and principles.

MR. KEYSER: I would like to ask Professor Beach if his experience has been the same as Mr. Camp's,—that is, in regard to pollen.

PROF. BEACH: It is very easy to cross pistillate varieties, because you take one like the Herbert and then the Concord and you will be sure to get a cross between the Herbert and Concord. It is quite easy to cross grapes where you have the pistillate flower. You look over the commercial vineyards of the country and you will find very few of them that have grapes with European blood in them. In breeding hardy grapes for the middle west I would be very careful about using grapes which have European blood in them. In breeding grapes for table use, however, go in for quality.

FOURTH SESSION.

THURSDAY, JANUARY 18TH, 9:00 A. M.

The following letters from the Omaha Commercial Club and the Omaha Florist Club were read by the Secretary:

OMAHA, January 15, 1906.

Mr. Lewis Henderson, Secy Omaha Florist Club, Omaha, Neb.

Dear Sir: The Commercial Club of Omaha, representing the general business and professional interests of the city, desires to extend, through you, to the Nebraska State Horticultural Society, an invitation to hold its July meeting in Omaha. We hope you will make this invitation a hearty and cordial one, and assure the members of the Society that Omaha will be delighted to have them here and get the benefit of their special knowledge on a subject of so much interest to our citizens.

We have in Omaha a splendid park and boulevard system in which considerable attention has been given to the development of flowers, plants and shrubs, and we are anxious to have the opinion of the members of the state body in this direction and their suggestions as to what may be accomplished in the future. We also have in Omaha a large number of private places, such as lawns and conservatories, in the care and development of which the members of your Society are interested and which we would be glad to have them see. For all of these reasons and for the additional reason that Omaha is always pleased to welcome the members of any society in our state, we ask the State Horticultural Society to meet with us in July.

Yours very truly,

E. J. M'VANN, Commissioner.

OMAHA, NEB., January 11, 1906.

We, the Omaha Florist Club, in session assembled, herewith extend a hearty invitation to the Nebraska State Horticultural Society, to hold their Summer meeting in Omaha during the Summer of 1906, and if accepted, we promise to make the meeting as pleasant and comfortable as possible. Respectfully,

J. J. HESS, President.

LEWIS HENDERSON, Secretary.

MR. SWAN: I move that the Society accept this invitation, and have the next Summer meeting at Omaha.

Motion carried unanimously.

MR. HADKINSON: The idea of this meeting is to meet in Riverview or Hanscom Park, and have probably a two days' session. Lunch will be provided at the Park, and a very enjoyable meeting had. We are going to try to get some other associations to meet here at the same time and have a general good time.

The following communication from Hon. E. M. Pollard, Washington, D. C., was read by the Secretary:

WASHINGTON, D. C., January 12, 1906.

Mr. L. M. Russell, Lincoln, Neb.

My Dear Sir: Your favor of January 8th is received. I wish to thank you most heartily for this list of names which you have sent. It will be just what I will want when I come to mail my farmers' bulletins on spraying.

The Secretary of Agriculture has promised to have prepared a special bulletin on the Spraying of Apples, for the benefit of the fruit growers of my district. This bulletin will deal with nothing but the codling moth and the scab fungus that have been working such destruction in the apple orchards. I hope I will be able to arouse the fruit growers of my district to the importance of this question and give them practical information that will enable them to successfully combat these pests.

I have also been promised that a few demonstrations on spraying to control these pests will be made this coming spring. If the State Horticultural Society, at their mid-winter meeting, can devise some plan by which they can assist in this work, I will be very thankful for such action.

I regret that it will be impossible for me to be present. I assure you, however, that I will be with you in spirit and that you have my best wishes for a profitable as well as a pleasant meeting. I hope you will express for me to the boys the compliments of the season and my personal regards. Very truly yours,

ERNEST M. POLLARD.

MR. SWAN: Our Southwestern Fruit Growers' Association received a letter from Mr. Pollard, and he said further that he was trying to get an appropriation of $10,000, and that he wanted to get one orchard sprayed in each county in the state. Our Society got up the following resolution, and adopted it unanimously:

WHEREAS, Our worthy fellow member, Hon. E. M. Pollard, in the United States Congress, is working for an appropriation from the Government to get assistance in combating the insect pests in our state. Therefore, be it

RESOLVED, That we appreciate his efforts in our behalf, and will give him all the aid in our power to get governmental help in ridding the orchards of our state of injurious insect pests, and that a copy of this resolution be sent to Hon. E. M. Pollard, Washington, D. C., and to the Hon. James Wilson, Secreary of Agriculture.

Respectfully submitted,

W. G. SWAN.

REPORT OF COMMITTEE ON FREIGHT AND EXPRESS RATES.

We, the Committee appointed by the President of the Horticultural Society, would respectfully report that we visited the General Freight Officers of the Burlington, Northwestern, Union Pacific and Missouri Pacific Railroads in Omaha. We were kindly received and given ample time to properly present our case of excessive charge in fruit rates in Nebraska. Each officer of the lines visited promsied to do all in his power to assist in securing a speedy reduction in the rate on apples, and we have the honor to report that they reduced the classification from 5th Class to Class B, making a reduction of about 25 per cent in the rate in this state, as shown by the following rates:

	Class 5th.	Class B.
From Geneva to Omaha	20 cents	15 cents
From Geneva to McCook	40 cents	25 cents
From Geneva to Alliance	59 cents	39 cents
From Geneva to Hastings	18 cents	12 cents

The Committee was ably assisted by W. G. Swan, who represented the Southeastern Fruit Growers' Association, and assisted the Committee by producing statements showing the magnitude of the industry and amount of fruit grown in the southeastern part of the state.

We also met the officers of the Adams and American Express Companies, who were also willing to assist in reducing the rates on small fruit, and we have the pleasure of reporting that the express rate has been lowered, and shippers report a reduction of from 5 cents to 20 cents per crate on small fruit.

We found the express and freight agents anxious to gain information about the fruit industry and they were willing to concede the

justice of our claim for a reduction of rates, and promtply put them into effect. Respectfully submitted,

PETER YOUNGERS,
E. M. POLLARD,
GEO. A. MARSHALL,
C. B. PARKER.

MR. PARKER: In this work the committee was very ably assisted by W. G. Swan.

MR. BROWN: I move that the report of the committee be accepted and the committee continued for one year.

MR. BARNARD: I think this is a good proposition, as the prospect is good for a big crop of fruit next year. This committee could do considerable work yet for the good of the fruit business, and I move to amend Mr. Brown's motion by having an appropriation of $100 added for the committee to work with.

MR. BROWN: I consent to that amendment.

Motion carried as amended.

MR. MARSHALL: The committee which was appointed to divide the state up into fruit districts and fix up a list of recommended fruits has done the work and the Society has accepted the work. It may also be necessary in continuing this committee for some few changes to be made from time to time.

MR. YAGER: I move that the committee be empowered to act and make such changes as they deem necessary.

Motion carried unanimously.

THE PRESIDENT: We will now hear from Professor N. E. Hansen of the South Dakota Experiment Station, on the subject, "Siberian Crabs as a Hardy Stock for the Apple, in Nursery and Orchard."

SIBERIAN CRABS AS A HARDY STOCK FOR THE APPLE IN NURSERY AND ORCHARD.

Professor N. E. Hansen, South Dakota Agricultural College, Brookings, S. D.

This subject may not interest the peach belt people of southern Nebraska. But on your northern border, and especially as you go westward where the snowfall is light and the severest cold may come without snow on the ground, the subject assumes more importance. I have presented this matter at various times before our northern horticultural societies, because in that section root-killing of apple stocks occurs very frequently. But it is only in such winters as 1898-9, when the severest cold came in early February with the ground bare, that the disaster is so general over many states as to compel general notice to be taken of the situation. The money losses of thousands of farmers who suffer from root-killing of unmulched apple trees do not usually reach our ears, but when a nursery loses three hundred thousand apple grafts in one winter, we are apt to hear about it at the next horticultural meeting. However, as the trouble only occurs at the south about once in fifteen or twenty years, nurserymen continue their old methods, as it is expensive and slow to make a change, and if suitably practiced there will be no need of making any change. However, I maintain to propagate our apple trees in such a manner that mulching is necessary is to put your apple orchard on crutches, which may be taken away at any time. In Russia, at the northern borders of orcharding, I learned in the course of two trips to Russia in 1894 and 1897, that great trouble was formerly experienced from root-killing of the ordinary commercial apple stocks. In southern Russia, at the large nurseries at Kiv, where French pears are raised successfully, ordinary apple seed is used for stocks, either from their local apples or imported from France or Germany, as happens to be the most convenient. At the north, however, it was found that no seedlings of the common apple, Pyrus malus, would stand dhy winter freezing with the ground bare, say 40 degrees F. below zero. It was not until they went outside of the **Pyrus malus** species that sufficient hardiness was found. This was in the pure Siberian crab, **Pyrus baccata,** represented in our old orchards by the Cherry and Yellow Siberian crabs, and by **Pyrus prunifolia,** which is considered by Professor Bailey to be a group of hybrids of **Pyrus malus** and **Pyrus baccata.** In the United States the crabs of the

prunifolia type are far more common in cultivation owing to larger size of fruit. It is a question whether there has been any real gain in many cases in hybridizing these two species, as the pure **Pyrus baccata** appears freer from blight than some of the hybrids that have originated accidentally under cultivation.

In Russia the method pursued is to plant one year seedlings of Siberian crabs in nursery row in the spring and bud them the following August or crown-graft the succeeding spring. A tree of this kind with a two-year top is equal to any ordinary three-year root-grafted tree and of very smooth, strong growth. The ultimate effect on the tree in the orchard of the baccata stock was to dwarf the tree slightly, but to make it bear at least two years earlier.

In the prairie northwest nurserymen have long deluded themselves and their customers with the idea of using a long scion on a short root, so that the tree would ultimately get on its own roots. This will do very well far enough south, but there is a considerable area of the northwest where all the scion-roots of the hardiest varieties winter-kill at times. If nurserymen desire to send into this section trees that will live, they must wholly reform their present method of propagation.

Some say we should raise our nursery seedlings from hardy apple varieties, such as Duchess and Wealthy. This would do for a time, as we go northward, but I learned by experience at Brookings in the winter of 1898-9 that no seedlings of the common apple, even Hibernal, Wealthy, Duchess and many more, are sufficiently hardy. The Russians long ago learned to discard all the varieties of the **Pyrus malus** species for hardy stocks.

Some say, plant a cover crop to protect the roots over winter. Very well for some localities, but for a considerable area of the northwest the trees need every ounce of moisture that falls. Furthermore, the season is often too dry, and the cover crop seeds fail to germinate.

If we were always sure of sufficient snowfall it would solve the problem, as snow is the best mulch in the world. This explains why root-killing is not a factor of consequence in the North Atlantic states or other moist regions with abundant snowfall.

Can a nurseryman afford to raise trees of this kind? No, he cannot sell trees on this stock in competition with the ordinary root-grafted trees. It would make apple trees cost as much as budded plum or cherry trees. In the end it may be necessary, however, to find

some way of doing the work in winter, as this winter piece-root grafting explains why American apple trees are considerably cheaper than in Europe, with their cheaper labor and higher priced land. It may be that whole root grafts, with very short scions, may answer very well, but I regard it essential that the whole root system should be of the crab.

As to whether pure Pyrus baccata or hybrid crabs are best for stocks, is probably largely a matter of locality. For a considerable district, such as northern Iowa, Nebraska and southern Minnesota, probably either will do. As we go northward the one essential is absolute hardiness, which is found only in the pure Pyrus baccata.

Where shall we get seedlings? There are many old trees of the Yellow Siberian, Red Siberian and Cherry crab scattered about over the northwest. These have been neglected of late years, bing suprseded by the larger fruited hybrids. Fruit of these neglected trees should be gathered, and the seed saved.

How shall we get a constant supply of the seed? Every nurseryman should have an orchard of these small fruited crabs, especially for raising seed. One advantage of an orchard of pure Pyrus baccata would be that there would be less temptation to put the small fruit on the market.

I present this subject to the Society at this time to set you to thinking on the subject. I do not anticipate that you will change your commercial methods of piece root-grafting in the southern part of the state, as root-killing winters do not come often enough, but at the north it would be indeed wise to look into the matter and experiment for yourself. Meanwhile, do not forget the crutches every fall, by which I mean a good mulch, applied before severe freezing to protect the tender roots. And tender roots are indeed the lame part of successful apple culture in our prairie northwest.

DISCUSSION.

MR. C. S. HARRISON: I notice that Professor Green has these cross seedlings of Hybernal, etc., that are very satisfactory for southern Minnesota at least. What is your experience with them?

PROFESSOR HANSEN: It is a question of snowfall. They have more snowfall than we do. In Iowa, Missouri, etc., when there was no snow, apple grafts were killed. The whole thing simply brings up to

the question of stocks. You know what a famous young scientist said, "It would have been better for the horticultural world if the art of budding and grafting had never been invented." Some of these things have led us to believe that there is something in that. Whether we get these things that we want is another question.

MR. PATTEN: Did I understand you to recommend buying the root graft?

PROFESSOR HANSEN: One way we recommond to do is to handle the stocks exactly as you would the Mahaleb stocks. The ultimate effect of these stocks is that they make the tree more dwarfy and cause them to bear two years earlier. They are also easier to spray.

MR. HARRISON: Would you not advise grafting on the roots and get the combination of the root and scion for this country?

PROFESSOR HANSEN: Mr. Patten has tried piece-root grafting on Siberian stocks, and it has not been a success. Down here I would use the prunifolia. If you are not catering to the North Dakota trade, that need not bother you.

MR. BROWN: You have got to have the root of this hardier than the stock above ground?

PROFESSOR HANSEN: Exactly. There is something about alternate freezing that no apple in the world will stand.

MR. BROWN: Your Duchess top, for instance then, would live in the open air, while the root would perish in the ground?

PROFESSOR HANSEN: Yes, sir.

MR. BROWN: What is the objection to this grafting process?

PROFESSOR HANSEN: It is a matter of physical union. Sometimes, for instance, you bud cherry on Mahaleb stocks, but you would not want to graft them.

MR. MARSHALL: A question of information,—Is the idea on this budding and grafting just to get the graft above ground?

PROFESSOR HANSEN: Yes, sir; exactly.

MR. PATTEN: Do you find that the seedlings of the Yellow Crab are perfectly hardy up there with you?

PROFESSOR HANSEN: Yes, sir; absolutely hardy.

MR. KEYSER: Do you mean to say that you had as much trouble with the stock killing, whether from the scion or not?

PROFESSOR HANSEN: The scion roots were just as tender.

THE PRESIDENT: California has her Burbank, so has Nebraska. We will now hear from Mr. Theodore Williams, of Benson, on "Methods and Results of Hybridizing Fruits."

METHODS AND RESULTS OF HYBRIDIZING FRUITS.

By Theodore Williams of Benson.

Gentlemen of the American Breeders' Association: I feel honored to be invited to speak before such an eminent body of men from all parts of this and some other countries. With so many noted men to speak, in a limited time, I can only give a few facts from my experience, and not attempt to illucidate them. Upon your program I am assigned to speak on Methods and Results of Hybridizing. It is not of my choice. We do not regard hybridizing as necessarily the best method of getting good fruits from breeding. We made a great many hybrids with stone fruits, apples and a few pears. From the little prairie sand-cherry, pollinated with wild goose and the product pollinated with Quackenboss, we have the Victor Sand-Cherry plum, one and three-quarter inches in diameter, considerable larger than a silver dollar, a valuable fruit. A dozen years ago we pollinated the Miner with the Canada blue grass (Quackenboss). We got a plum we named Red Glass, and have grown it largely for years. A few years ago we inbred Red Glass to Quackenboss, and we have Red Glass Junior; the three looks like an Americana, is unusually thrifty, extremely large, green leaves. This is surely one of the best hardy plums for the northwest in existence.

To produce a free-stone plum from the Wild Goose, we used the combined Pollen of Tragedy Prune and Wolf Plum on Wild Goose. The seedling and fruit shows all its parents. The fruit is a free-stone, with the pulp sweet and fine as the little French Prune, to eat.

With the combined pollen of Jonathan and Martha Crab on Ben Davis, we have a hardy Crab-like tree, fruit size and quality of Jonathan, and so beautiful that the fruit has always been taken by the birds or people, before maturity.

Last August we took some scions wtih fruit buds and bark-grafted them near the house. It was no use; soon there was but one specimen of Jonathan apple in existence, and that is photographed here with the danger sign overhead, and the string running from apple to shotgun.

Our Native and the Japanese plums cross as easily as corn, and probably along with the Indian and Chinamen, have had a common

origin. We have fruited more than one thousand seedlings, apple and Pyrus Baccata crab. Much of this work was for the purpose of testing the value of stock upon which to grow apples. We have crossed the little Baccata apple, which is not as large as a cherry, with most of the well known apples, and obtained some as large as the Wealthy. Some of these crossed with high-flavored apples give small crabs of great beauty and quality. One of these here is a sweet one a little larger than a silver dollar. We call this Economy crab, because it is always fair and free from worms, is cooked whole for sweet-pickle, canning or preserving. It is as firm as the Golden Russet pear, and as good as a pear. Every family would need ten or fifteen bushels put up for winter, and the trees can be planted by the fence side in entire neglect, and grow them by wagon loads for even pigs and cattle.

The greatest power in breeding is mind over mind. The mind of the older and stronger over the weaker and undeveloped. With all flowers, fruits, animals, or human beings, mind rules the existence from before birth till after death. To create we must be educated in our own mind to know what we want before we can expect success in calling upon nature's laws in breeding.

The human being should be bred so as to attain the happiest, most useful and highest spiritual existence possible, under the reliable, divine environment and man's erroneous judgments.

The individual has many wants to be supplied, as he journeys through life, more varied than he can attend to himself. He needs the assistance of others, therefore, he should be eduacted in the proficient production of something that will supply the wants of others in return for what he receives. Animals, fruits and flowers need the same education. To successfully educate in breeding new beings, we must understand their main mental characteristics. These are the same in all living things, but in the plants and less emotional orders our human mind is not often intelligent enough to penetrate and perceive the beautiful individuality of some of our apparently inert friends.

Justice prevails in human beings and the Divine Power approves of it by allowing the most just peoples to rule. Now, if our horses did not have a sense of justice the same as man, we could not ride behind them in safety; they know well enough the power of their heels, and that we are behind them. In the trees and flowers we educate a sense of justice, and they give us beauty and nourishment in place of poison. So closely virtue and vice blend that it is hard to know where one leaves off and the other begins. All life has a tug of war across the line. Even plants commit crimes and are immoral. We have prototype of the tenderloin woman in the Wild Goose Plum, who

cohabits freely with every fruit that has a pit, and brings forth her horde of paupers, that being nearly all mule, give no return for their existence, and there are some plants that even commit murder, and then devour their victims. One is the Sundew, a Welsh plant, and the other is the Venus Fly-Trap, found on the east coast of North America.

Except for the purpose of proving an experiment, we never masculate and hand pollinate the blossom. It is an outrage upon nature's sensitiveness, and will not provide fruits of as fine quality as by other and better methods. We bring congenial sorts in close communion by bark-grafting them together under stimulating conditions that will cause improved size, productiveness, beauty and quality.

We cannot mention many of the fruits, we have produced; we were raised where the Talman grew in perfection, and we have reproduced the Talman that will bear here. We wished for the Seckle pear and we have it on a healthy, hardy tree, free from blight and productive. We have wished for the hardiest types of peaches that would reproduce themselves from seed, so that we could grow them with a kind of intelligent neglect, by the fence rows.

We have them in the small white, and large type of red and yellow. We have had them in such abundance that people have come for them with baskets, buggies, carriages, wagons and automobiles.

By desiring it and breeding for it, out of more than a hundred seedlings we have a hardy apricot, which is large and very beautiful. It is of better quality than the California apricots are when they reach this market. It has survived where all other hardy sorts but the woody Russian have gone down. In 1904 it bore such a marvelously beautiful crop, in 1905 it met with 33 degrees below zero, in the winter, and 12 degrees below freezing after blooming, yet last season it bore apricots.

In the growing of apples we must have all the vigor we can get, which means a hardy root and healthy top, and plenty of pollin to keep the fruit from dropping before maturity. The nursery should grow the sorts most suitable for a given locality in large quantities cheaply. The planter can, without trouble, insert the sorts he prefers. For ages topworking has been done by tying in a bud or by a split limb, and wedge-graft. That kind of grafting will blight and kill the tree. It is too tedious and expensive to be practiced. Now we have here a new and simpler manner of grafting that is worth millions to horticulture. More than fifty years ago I did topgrafting, and have been familiar with the most advanced methods of propagating ever since, and yet, with all these years, though it is only recently that we have evolved the principle in such simple perfection that it seems incapable of further improvement.

In this method we like scions three or four inches long, of the sort we wish to increase, getting them from the new growth as soon as the terminal buds have formed. We slope these scions with a sloping cut, and run them beneath the bark of the tree we wish to improve by the aid of two cuts less than an inch long. The first cut is made on a line with the growth of the tree, the second parallel with the first, one-fourth of an inch away, three-fourths of an inch lower down. Across the top of the upper cut the knife is drawn, raising the bark, behind which the scion is pushed between the two cuts, tying it in. It is necessary that the tree that is grafted should be in an active state of growth, with plenty of descending sap, which spreads over the cut surface of the scion. Healing and growing being instantly. No tying or waxing used. If one chooses to be careful, one hundred growing scions can be had from one hundred scions set.

CONTINUATION OF BUSINESS.

MR. BROWN: I would like to say a word for the benefit of our visitors. In regard to the way this meeting of ours has been conducted, —interrupted so many times and changing rooms, etc. We don't usually conduct our meetings in this way, and we don't intend to again. I would like to have our visitors understand our position before going home.

And now, Mr. Chairman, we have Mr. Greene, the secretary of the Iowa State Horticultural Society, with us this morning. That society has always been a kind friend of ours, and I move that Mr. Greene be made an honorary life member of our society.

Motion carried unanimously.

MR. GREENE. Friends and Gentlemen of the Nebraska Horticultural Society: I am very glad indeed to be here and meet with you again, and I thank you for this kind honor. Now I am well aware that it is past lunch time, and I am not going to take any of your time at this late hour. I have enjoyed the meeting immensely and I certainly feel well repaid for coming here. I have especially enjoyed this paper given by Mr. Williams this morning. Again I thank you for this honor which you have done me. (Applause).

MR. MARSHALL: Professor Beach of Iowa is with us again this morning, and I have just learned that he has not yet been recognized by our society. I move that he be made an honorary life member of our society.

Motion carried unanimously.

The following resolution was adopted by the society:

RESOLVED, That it is the census of the Board of Directors that inasmuch as Mr. G. W. Alexander and Mr. C. B. Camp, having exhibited some choice new grapes for the advancement of horticulture in the state of Nebraska, that the Board suggests that in order to test the merits of the grapes in the state that each experiment station be furnished two vines to determine their adaptability to the state. With the safeguard that no roots, cuttings, or buds shall be disseminated without the written consent of the owner.

REPORT OF COMMITTEE ON FINAL RESOLUTIONS.

As we have been favored with the presence, council and knowledge of our co-workers, Messrs. Van Houten, Patten, Greene, Hansen, and Beach, from our sister states, also our local Burbank, Mr. Theodore Williams of Benson. Be it

Resolved, That we tender a sincere vote of thanks to these gentlemen respectively. Be it further

Resolved, That we tender a vote of thanks to the various papers who have favored us by reporting the proceedings of our meeting.

J. H. HADKINSON.
J. E. ATKINSON,
A. J. BROWN,

Report accepted and committee discharged with thanks.

REPORT OF COMMITTEE ON OBITUARIES.

WHEREAS, Death has removed from our midst our co-workers, Hon. R. W. Furnas, A. S. Godfrey, H. J. Kent, C. A. Hale and Hiram Craig, active members, and Professor J. L. Budd, an honorary life member of our society; therefore, be it

Resolved, That we recognize the noble efforts of these our brothers to build up our state and beautify our homes, and that in the death of these our co-workers we, as individuals, and the society at large, has sustained an irreparable loss. Therefore, be it further

Resolved, That a copy of these resolutions be sent to each of the families of our deceased brothers, and that they be spread at large

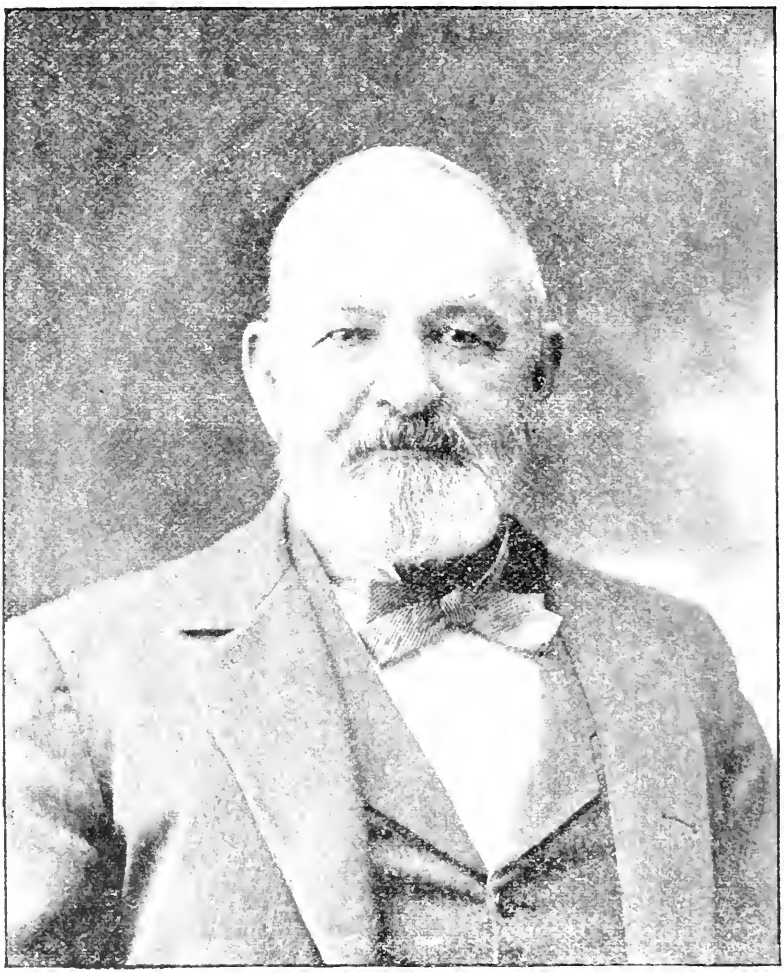
A. J. BROWN,
J. H. HADKINSON,
C. H. BARNARD.

Report of committee accepted and committee discharged.

Meeting adjourned.

ROBT. W. FURNAS.

Born near Troy, Miami County, Ohio, May 5, 1824.



Died in Lincoln, Nebraska, June 1, 1905.

AUTOBIOGRAPHY OF ROBERT WILKINSON FURNAS.

Robert W. Furnas, whose death occurred on June 1, 1905, was born on a farm, near Troy, Miami county, Ohio, May 5, 1842. His father, William Furnas, and mother, Martha Jenkins, were both born at Newberry, South Carolina, the father in 1804,, and mother in 1800; his grandfather, Thomas W. Furnas, was born in Charleston, South Carolina, in 1762; his great-grandfather, John Furnas, was born at Standing Stone, Cumberland, England, date not known. The date and birth of ancestors on mother's side of the house not known. Ancestors on both father's and mother's sides were Friends, or Quakers. Robt. W. was a twin; the brother died in infancy. Rachael, the only other child of William and Martha Furnas, died at the age of 18 years. The father and mother, William and Martha, died within a few days of each other, of cholera, at Troy, Ohio, in the year 1832.

Robert W. Furnas was raised by his Grandfather Furnas, until 12 years old; then until 14 years old was "chore boy" in the general store of Singer & Brown, Troy, Ohio. At 14 years of age was apprenticed to the tinsmith trade, with I. W. Hart, Troy, Ohio, serving four years as tinsmith. At the age of 18 he was again apprenticed to Rich. C. Langdon, of the Licking Valley Register, Covington, Kentucky, where he served a full four years' term, in detail, learning the art of printing. After the expiration of his term as apprentice, he, with A. C. Sparhawk, for some years conducted a book and job printing house in Cincinnati, Ohio. During this time was publisher of several periodicals . While a resident of Cincinnati, in 1845, was married to Miss Mary E. McComas. Eight children were born to them—six boys and two girls.

In the year 1846 he returned to his native county, purchased, published and edited the Times at Troy, the county seat. After a term of years, he retired from the newspaper business, and engaged in clock, watch, jwelry and notion trade in same town. Was also village clerk and deputy postmaster. On the completion of the Dayton & Michigan railroad to Troy, he entered into the employ of that company as railroad and express agent and conductor.

In March, 1856, he came to Brownville, Nebraska, bringing with him a printing press and outfit, and again venturing in newspaper business, he established, published and edited the Nebraska Advertiser, still published in Nemaha county. In 1858 he published and edited the Nebraska Farmer, being the first agricultural paper published in Nebraska. In the fall of the same year he came to Nebraska he was

elected to the council branch of the territorial legislature, serving for four consecutive years. Was elected by the legislature public printer and printed the laws and journals of the fourth session of the legislature. During his first session, he was author of the first common school law for Nebraska; also of the law creating the Territorial, now State, Board of Agriculture. During his term as legislator he introduced and secured the passage of many acts of both local and general importance, never failing in securing the passage of a bill when introduced. He was conspicuous in the passage of an act declaring against holding slaves in Nebraska.

At the breaking out of the war between the states he was commissioned by then Acting Governor J. Sterling Morton colonel of territorial militia, and afterward commissioned by Acting Governor A. S. Paddock brigadier general in same service for district south of the Platte river. Without solicitation on his part, was appointed and commissioned by President Lincoln, March 22, 1862, colonel in the regular army. Was mustered in the service by Lieutenant C. S. Bowman, Fort Leavenworth, Kansas, May 22, 1862. Under this commission he organized three Indian regiments from the "Indian Nation," composed of Creeks, Seminoles, Choctawh, Chickasaws and Cherokee Indians, commanding the brigade. With these Indians he fought several successful battles against white confederate soldiers on the border of Missouri and in the Indian Territory. In this campaign Colonel Furnas had with him as members of his staff and Indian advisers the two noted Seminole chiefs, Opotholoho, then said to be over 100 years old, and Billy Bow-Legs. These two Indian leaders, it will be remembered, were conspicuous characters in the Florida-Seminole Indian war of 1838. While in this service Colonel Furnas captured the celebrated Cherokee Indian chief, John Ross, and family, sending him to Washington, D. C., for conference with the president of the United States. This terminated trouble in the Indian Nation. Was detailed from this service with a special commission from the noted "Jim Lane," to recruit in Nebraska. Recruited largely the Second Nebraska Cavalry; entered that service as a private; was commissioned captain of Company E; when regiment was completed, was, by Governor Alvin Saunders, commissioned colonel of same, and served under General Sully, in his northern Indian expedition against Sioux and other hostile Indians north near British Possessions. The Second Nebraska Cavalry successfully fought the battle of "White Stone Hill" against the treble number of the Sioux Indians. After the expiration of term of services was honorably mustered out. Soon thereafter, and without his knowledge until after, was appointed by President Lincoln agent for Omaha Indians in northern Nebraska, serving near four years. During that time had charge also of the Win-

nebago and Ponca Indians. During his term as Indian agent, from a condition of annual support by the government he elevated the Omahas agriculturally to the production and sale of 40,000 bushels of surplus corn in one year. Through his efforts the mission school was increased from thirty-five pupils to one hundred and forty-five.

In 1872 was elected governor of Nebraska. After term of service expired, returned to Brownville, where he has since, and to date, been engaged in farming, fruit and forest tree growing.

His educational advantages were very limited; never attended school over twelve months; obtained good practical education by efforts while in a printing office, and over midnight lamp.

Was a member of G. A. R. and military order of Loyal Legion of the United States.

Since a resident of Nebraska has held numerous official positions not above named, among them was also colonel of the First Regiment, South Platte Militia; was seven years President of the Nebraska State Board of Agriculture; eight years vice president of the American Pomological Society; three years postmaster at Omaha Agency; was one of the first regents of the Nebraska State University, and for two years president of the board; one term president of Nebraska Soldiers' Home; one year special United States pension agent.

Politically, originally, "old line whig;" latter days, republican.

Member of Methodist Episcopal church until he came to Nebraska; since here, Presbyterian.

Was Grand Secretary and Grand Master of I. O. O. F. of Nebraska; also Grand representative to United States Grand Lodge same.

In the Masonic fraternity Robert W. Furnas was initiated, passed and raised in Franklin Lodge No. 14, Troy, Ohio, April, 1852. In November, 1853, he received the chapter degrees in Franklin Chapter No. 24, and October, 1854, received council degrees in Franklin Council No. 14. He participated in the formation of the Grand Lodge of Nebraska and was Grand Secretary from 1858 to 1861, and again from 1869 to 1872, and was Grand Master from 1866 to 1867. He received the order of knighthood in Columbia Commandery No. 2, Washington, D. C., in March, 1865; Scottish rite degrees to thirty-second degree in Washington, D. C., and the thirty-third degree at Omaha in 188—. He was also Grand Patron of Grand Chapter O. E. S. and Grand Commander and Grand Recorder of the Grand Commandery of Nebraska. Many minor offices in the lower bodies were also filled by him with honor and fidelity to the fraternity. His eminent fitness and efficient work led to his constant preferment and increased the debt of the order to him.

Was delegate to a convention held at Topeka, Kansas, 1857, by Kansas and Nebraska citizens, to form a state constitution for a state to be composed of northern Kansas and southern Nebraska.

Was president of Trans-Missouri Irrigation Convention, held at Denver, Colorado, in 1873.

Was alternate United States commissioner to Philadelphia Centennial Exposition, 1876; was United States commissioner to Cotton Centennial, New Orleans, 1884-85; member of the executive council, and also special commissioner of the United States to American Exposition at London, 1886.

Was one of the eight United States commissioners-at-large World's Fair, Chicago, 1893; president of the Nebraska Territorial Pioneers' Association; first, and for five years, president of the State Historical Society; was six years president of the International Association of Fairs and Expositions; and also president of the American Association of Fairs and Expositions; was United States commissioner for Nebraska; was twenty-two and a half years Secretary of the Nebraska State Board of Agriculture.

The last official trip he made to Lincoln he brought with him the copy for his twenty-second and last annual report as Secretary of the Nebraska State Board of Agriculture, which volume testifies to his vigilance, care and thoroughness of not only this but his life's work.

Robert W. Furnas was more than a distinguished citizen. He was esteemed universally with a profound regard amounting to reverence. A leading spirit in all movements for general advancement and prosperity, inaugurated with a view of improvement, social, political and industrial. His constant devotion to educational, agricultural and historical interests, and success in promoting and advancing sentiment for Nebraska's welfare, is a monument testifying of his patriotism and faith in the state's substantial resources and future welfare.

The military history of Robt. W. Furnas appears without blemish, no stain mars his political record, and his social life was an example worthy of emulation. In every capacity he manifested steadfast zeal, always fulfilling every duty and position acceptably and shrinking from no responsibility. Force of character, upright principles, and value of reputation were marked features in the conduct of his life. Such was the path chosen by Hon. Robt. W. Furnas, and he kept in the middle of a peaceful, pleasant road. His lifelong motto was, "Leave this world something the better for having lived in it," and to this end the best years of his life were most unselfishly devoted.

CITY TREES.

By Charles E. Bessey.

The following list of the trees growing on the University Campus has interest as showing what species may be grown in the heart of a rather smoky city. The Campus is bounded by Tenth, Twelfth, R and T streets, and includes about twelve acres inside of the fence and an acre or two in the "parking space' between the fence and the curb-stone. The first planting appears to have been of Cottonwoods about thirty-three years ago, since which other species have been added to the present time. Some trees which were on the Campus for a time have disappeared on account of the erection of buildings on the ground where they stood. Thus the Red Elm (Ulmus fulva) and the Chestnut (Castanea dentata) have disappeared within the last few years, along with a number of promising conifers.

This list is the combined result of the work of a class of advanced botanical students, who did the work last year under my personal direction. It is my intention to continue the work until the list includes all of the species of trees grown in the city. I think, however, that in its present form it will have a considerable value as showing what species do best under the conditions found in this city.

FAMILY PINACEAE.

Pinus L.

Pinus laricio austriaca Endl.....Austrian Pine
Grows very well, and makes a good tree.

Pinus silvestris L.....Scotch Pine
Grows well, but does not make quite as good a tree as the Austrian Pine.

Pinus ponderosa scopulorum Engel.....Bull Pine
Looks much like the Austrian Pine, but is far more difficult to grow.

Picea canadensis (Mill) BSP.....White Spruce
Is not very successful in the smoky air of the city.

FAMILY SALICACEAE.

Populus L.

Populus occidentalis Britt.....Common Cottonwood
Still growing well, although over thirty years old.

Populus deltoides caroliniana.....Carolina Poplar
Beginning to show injuries, although not over ten or twelve years old.

Salix L.

Salix vitellina aurea Bailey.....Yellow Willow
A pretty, ornamental shrubby tree.

FAMILY FAGACEAE.

Quercus L.

Quercus macrocarpa Mich X.....Bur Oak
Growing thriftily, and ten to twelve feet high.

Quercus robur L.....English Oak
Making a very good growth, and now fifteen to twenty feet high.

FAMILY ULMACEAE.

Ulmus L.

Ulmus americana L.....White Elm
One of our best trees.

Ulmus campestris L.....English Elm
Grows well, but not as pretty a tree as the White Elm.

Ulmus scabra Mill.....Camperdown Elm
A pretty and very odd looking tree of the "weeping" habit.

Celtis L.

Celtis occidentalis L.....Hackberry
An excellent tree.

FAMILY MORACEAE.

Morus L.

Morus alba tatarica (L.) Loud.....Russian Mulberry
Good grower, and quite desirable.

FAMILY PLATANACEAE.

Platanus L.

Platanus occidentalis L.....Plane Tree
One of the best of city trees.

FAMILY POMACEAE.

Malus Hill.

Malus ioensis (Wood) Britton.....Wild Crab Apple
A fine looking, round-topped tree.

Malus malus (L.) Britton.....Apple
Looks well on large grounds.

Crataegus L.

Crataegus coccinea L.....Hawthorn
A very desirable and successful tree.

FAMILY DRUPACEAE.

Prunus L.

Prunus demissa (Nutt.) Walp.....Western Wild Cherry
Grows well, and forms a small tree.

Prunus cerasus L.....Sour Cherry
Looks well on large grounds.

Prunus serotina Ehrh.....Wild Black Cherry
Successful grower in the city.

Prunus padus L.....Bird Cherry
Forms a bushy, small tree.

Prunus virginana L.....Choke Cherry
Worthy of planting.

FAMILY CAESALPINIACEAE.

Gymnocladus Lam.

Gymnocladus dioica Koch.....Kentucky Coffee Tree
A striking tree which thrives well.

Gleditsia L.

Gleditsia triacanthos L.....Honey Locust
A successful tree in the city.

FAMILY SIMARUBACEAE.

Ailanthus Desf.

Ailanthus glandulosa Desf.....Tree of Heaven
Grows well, and worthy of cultivation.

FAMILY ANACARDIACEAE.

Rhus L.

Rhus glabra L.....Sumac
A small, shrubby tree, which looks well on large grounds.

FAMILY CELASTRACEAE.

Euonymus L.

Euonymus atropurpureus Jacq.....Wahoo
A shrub or small tree, which does well.

FAMILY ACERACEAE.

Acer L.

Acer saccharinum L.....Silver Maple
One of the most easily grown trees.

Acer platanoides L.....Norway Maple
Grows slowly, and probably not wholly hardy.

Acer negundo L.....Box Elder
One of the most easily grown trees.

FAMILY TILIACEAE.

Tilia L.

Tilia americana L.....Linden
Grows well when fully rooted, but a little hard to start.

FAMILY TAMARISCINEAE.

Tamarix L.

Tamarix gallica L.....Tamarisk
A beautiful addition to any grounds. It dies back a good deal each winter, but the roots are hardy.

FAMILY ELAEAGNACEAE.

Elaeagnus L.

Elaeagnus angustifolia L.....Russian Olive
One of the prettiest trees for planting.

FAMILY OLEACEAE.

Fraxinus L.

Fraxinus lanceolata Borck.....Green Ash
The only species which is fully hardy with us, unless we except the Red Ash, of which there are some trees in the city.

FAMILY BIGNONIACEAE.

Catalpa Scop.

Catalpa speciosa Warder.....Catalpa
A beautiful and most successful tree for city planting.

MEETING OF NORTHERN FRUIT GROWERS.

Report of C. S. Harrison as Delegate to the Minnesota Horticultural Society.

On December 5 the horticultural clans gathered not only from Minnesota, but also from the northwest, to attend the annual meeting of the Minnesota Horticultural Society at Minneapolis.

The program was packed with a feast of good things. The papers were short and to the point. President Wedge of Albert Lea was detained by illness in his family, and Professor Green, so well known throughout the west and northwest, presided. His prompt methods made the exercises go off in a lively manner.

The president's address is on the plan of our president's message, reviewing the past and forecasting the future. The present system of horticulture was built upon the ruins of the old system, an entirely new set of fruits were brought into existence. It took a brave, patient army of Luther Burbanks to inaugurate a new system.

But the president pushed the matter further. He proposed that the whole army go to work and save a few seeds of the very best fruits and plants and attend to them with care, and if they were in a hurry, graft into older trees to hasten the fruiting. Splendid as present results were, he thought there might be an improvement both in the quality and longer keeping fruit. Most of the apples so far secured are summer and fall varieties, and the great want is a winter apple, hardy enough for the great northwest. But we would remark that if a long keeper was found, it would be a late grower, and it is possible the frosts would catch it before it could ripen.

The Fruit Exhibit.

It is a matter of amazement that such splendid apples can be grown so far north. I have seen many fruit exhibits, but I do not remember anything surpassing this in size and beauty. There were the Wealthy, and numerous seedlings from it. Patten's Greening proved a wonder for size, quality and hardiness. Wolf River was simply immense. McMahon is very large and attractive. There was quite a prize offered for the best seedling apples, and faithful judges spent a day in testing them and deciding on their merits.

The wonder is that a state so far north, battling with such adversities, should have the most flourishing state horticultural society

of any in the union. Just think, it has now a membership of about 2,000, and the aim for next year is 2,500. The question comes up, how was this success achieved?

For years the society jogged along in the old way. Their plan was like Nebraska's, to elect secretary and treasurer in open meeting each year. This plan is radically wrong, and why? The office of the secretary is one that pays the best salary, and of course there are many candidates for it, and often a favorite will be sprung upon the meeting, who may not be at all fitted for the work. After a half a century of this method we notice that the Massachusetts society has now changed its constitution so that the secretary is elected by the trustees. That was exactly what the Minnesota society did years ago. A set of careful, intelligent directors were elected, and it was their business to take time and hunt up a good secretary.

They chose Dr. Latham. He was a nurseryman, a man of excellent judgment and of rare executive ability. He has been in for several years. He is the nucleus around which a splendid society has been built. They pay him $1,200 a year. He has no other business or calling. He gives himself entirely to his work.

Does it pay? Wisdom and brains always pay. He has brought the society up to its present states of efficiency. The office pays for itself. He collects in about $1,800 a year, and that pays his salary, the rent of the rooms, and the stenographer. The society loses nothing by getting the very best man to be had.

The Nebraska society should follow suit and carefully select a board of directors and leave them to choose a secretary. He should be a man of first class ability, with no other business to attend to. He should have an office and keep open door and be ready to go out and visit different sections of the state. Such an office would pay. Fifteen hundred annual members should be secured in a year. Those pay their $1 a year and get the annual report. This, instead of being a rehash, warmed over and over and rehashed, should be filled with fresh information, and be absolutely worth $5 a year to each member. It should be gotten out in good shape and not be allowed to pass out into the world with a dozen glaring blunders to the page. We need a report which will be something more than wadding.

Strawberry Crop a Failure.

The first thing was several papers on the strawberry. In most parts of the state the crop was a failure. They blossomed well and gave good promise, but just as the fruit was swelling a blight swept

over almost the whole state and wiped out the crop. We remember that strawberries in Nebraska were at least a partial failure.

There was a sharp discussion over the cause. Some said the ground was dry in the fall and winter, and so the plants were badly damaged. Some said they were so enfeebled that though they could put out leaves and bloom, as soon as the strain of fruit bearing came on they were unequal to the task and so succumbed.

Professor Hansen of the South Dakota Agricultural College, one of the brainiest men we have and one of the most patient investigators, laid the axe vigorously at the root of the tree and told the cause of all the trouble. He said:

"The strawberries you are raising have too weak constitutions. The parents of our present strawberries came from South America and they are too tender and you will always have trouble with them. I do not want a strawberry that I have to mulch. I throw away thousands that show the least weakening. I want a plant that will stand out in the open in Dakota, where there is no snow on the ground and it is 40 degrees below zero. You couldn't do anything with eastern or southern apples and you will always have trouble with the present race of strawberries."

The Keynote of Success.

The professor then gave an outline of his experiments. He had gathered wild strawberries whenever he could find them in the northwest, and was crossing them with the hardiest tame ones, saving all that could endure the test and rejecting all that were too tender. Luther Burbank is quoted as saying: "You must build up a horticulture in your own location and develop what you have and here is the keynote of success."

Professor Hansen is doing wonders with the sand cherry. He is gathering wild raspberries from Manitoba and the Black Hills, raising seedlings from that that are hardy. He rejects everything that kills back in winter.

By the way, the professor will visit the Nebraska Horticultural Society at the annual meeting in Lincoln and will also address the Forestry Society Thursday afternoon. He will tell us about forestry in Europe and America. The professor is doing a grand work for forestry and horticulture in the northwest.

Addressing the Agricultural Students.

Professor Maine, who is at the head of the Minnesota Agricultural Society, has insisted for the last three years that I should make the college a visit and address the students. It is always a welcome task. The students are of a fine order. Hundreds of young men and women are fitting themselves to love the farm and adorn it. Some way we seem to fit well.

After the address the professor hustled me down to St. Paul, where the business men of the city were giving a grand reception to George H. Maxwell of irrigation fame. The banquet was a splendid affair. It was held in the old Merchant Hotel, which was built about fifty years ago, and is one of the landmarks in the progress of the great northwest. Mr. Maxwell is a man of ideas, with a strong man back of them. He is an orator and forms out his thoughts red-hot. He not only advocates irrigation, but also the small farm of 100 acres, well kept, so that it will give a family place, comfort and contentment, and avoid the tremendous strain of the large farm half worked.

Thursday afternoon was given to the Forestry Society, of which the veteran, I. M. Loring, is president. Mr. Loring is called the father of the great Minneapolis park system and seems conversant with the forest conditions of Europe and America. He gave a splendid address, well reinforced with stereoptican views.

The meeting was also addressed by George H. Maxwell, chairman of the national irrigation committee. The reports from more experiment stations were in the main very satisfactory. There is intense interest in the production of new fruits, especially apples and plums.

March of Fruit Belt Northward.

It has been proved that there is no portion of Minnesota or the Dakotas where the ironclad apples cannot be grown. They have also marched northward and invaded Manitoba. A Mr. Stephenson of Nelson, Man., now has an orchard of 300 bearing trees, which this year were loaded with apples, and more than 1,000 people came to see them, and even adults born in the north, never before in their lives saw growing on trees.

One of the most interested visitors was W. G. Scott of Winnipeg, who for twenty years was treasurer of that city. Mr. Scott has resigned his office to conduct a nursery near that metropolis of the north. Take all in all, the meeting was a splendid success.

REPORT OF VALENTINE EXPERIMENT STATION.

By C. M. VanMetre, Director, Valentine.

The year 1905 was very favorable for fruit growing, excepting the extremely low temperature of five weeks in January and February. This destroyed all peach buds.

A Fungi did considerable damage to the gooseberries, but we got a little of the fruit. We had a fine lot of strawberries, a few raspberries, and some currants.

There was a good crop of the light juiced cherries, a few dark juiced cherries. There was also a fine crop of the Americanna plums, also some Russian plums. The Tatage is very fine in quality.

We had a very good crop of crab apples and some apples. There was one small Patten's Greening tree that was a beauty to behold. One specimen was twelve inches in circumference. Many other younger trees of this variety made a fine showing. We have specimens of this in good condition in the cave at this time, January 15. We have also fine specimen's of Wealthy in good condition, and the N. W. Greening and Jennet. We had fine Jonathans and Longfields, the most of which were in the young orchard. But one light cultivation was given during the entire season, the rainfall being ample.

The strawberries placed here for experiment were neglected. I was ill through the spring months a great deal, and failed to give them the proper attention at that time. Therefore, I will not ask you for more stock to experiment with unless there is something that the Society wishes to have tried.

REPORT OF THE CHAMBERS EXPERIMENT STATION.

By J. L. Coppoc, Director, Chambers.

Mr. President and Gentlemen of the State Horticultural Society: I beg leave to submit to you my report of the work done at the Chambers Experiment Station, and the results of that work, during the year 1906. The weather conditions were about the same that obtained during the preceding year. There was an abnormal rainfall during the fore part of the season, while in the latter part it was rather dry, although there was sufficient moisture in the ground to prevent any injury to trees or shrubs. I received from the society

fifty-five apple trees, including ten varieties, all of which lived and made a fair growth. I was somewhat surprised to find that the Jonathans made the best growth of any kind on trial. I received also one dozen each of the Concord and Worden grape, all of which lived and made a very good growth. I got a good stand and an excellent growth of blackberries, raspberries and dew berries. These latter, including the grapes, have been sadly neglected in this part of the state, but we are waking up to the fact that by proper care in selecting the right varieties and by proper management, we can produce at least sufficient of these delicious fruits for home use. The grapes were kept free from weeds and the soil loose by the use of the cultivator and hoe all summer, and after the vines were dormant in the fall they were cut back to two or three buds, and covered with earth, and after the ground was frozen they were covered with three or four inches of stable manure.

The berries were cultivated and hoed the same as the grapes, and after the leaves had fallen they were mulched with old prairie hay. I received a Crimson Rambler rose and a Sweet Brier for trial, both of which lived and made a fair growth. There were transplanted at this station, ornamental trees and shrubs as follows: Russian Olives, White Birch, Red Wild Cherry, Hackberry, Red Elm, Hop tree, Siberian Pea tree, five varieties of Lilacs, Snowball, three kinds of Spireas, and one Syringa. One each of the following were lost because of being planted on too low ground: Siberian Pea tree, Hop tree and Wild Red Cherry. There was planted also a row of Thurlow Willow cuttings. One of the trees which grew from these cuttings was measured about the last of September. It measured 9 feet and 6 inches in height and 8 feet and 6 inches in spread of limb. It would require but a very short time to make a good wind break of this tree.

Bearing Trees.

This has been an off year for fruit of all kinds with us; but as a result of the use of ashes for fertilizer and thinning, the fruit in 1904, the Ben Davis, Maiden Blush and Roman Stems were loaded with fine fruit. Experiments in thinning fruit has proved that it pays well to take off a part of that which forms where it is too thick, as what remains will be larger and better colored and besides the fruit buds have a better opportunity to develop.

Varieties.

The Ben Davis has yielded the largest crop of apples this year of any kind we have in bearing. The Maiden Blush trees have borne good

crops every year since they came into bearing, but last year they blighted some. In fact, this was the case with all the bearing trees. The Roman Stem were loaded with fine apples as usual. The prettiest tree I have is an Iowa Blush. It is just coming into bearing at seven years of age. This variety seems to be slower in coming into bearing than some others, but when it gets to be of some age, it is a good tree.

Cherries.

Of the eight varieties of sour cherries that we are testing, the most satisfactory are the following, in the order in which they are named: Early Richmond, Montmorency, English Morello, Wragg and Ostheim. The Terry has failed to meet my expectations. The only sweet cherries we have (the Yellow Glass and the Vilne Sweet) are a failure.

Plums.

The Wolf Plum holds its own at the head of the list of plums. All other kinds were a total failure last year on account of a late freeze; although there are several of the Americannas which do well here. The hardiest of the European and Japanese varieties seem to be hardy in tree, but rather tender in fruit bud.

Pears.

We are doing but little with pears at this station. We have some cross-fertilized trees which have not yet come into bearing, being only three years old. The trees are doing well, making a good growth, and showing no signs of blight.

Experiment With Fertilizers.

We have been experimenting with wood ashes, alone and in combination with different kinds of barnyard manure for several years. These experiments have been on bearing apple, cherry and plum trees. My time will not allow of a full report of this work, but briefly stated, I find, that for apples on light, sandy soil, a mixture of ashes and horse manure, half and half, or one part of sheep manure to two parts of ashes, gives good results. For plums on rich land (and this is the only kind of land suitable for this fruit) the same treatment given to apples will succeed quite well. For cherries, more ashes and less manure is required. In fact one bushel of wood ashes to the tree, well

worked into the soil, will increase the yield from ten to thirty per cent. When the mixture is used, the ashes should be well worked into the soil before the manure is applied.

In closing I wish to say that it gives me pleasure to be able to report that north central Nebraska is not to be turned oved to the tender mercies of flocks and herds, roaming at will, over our hills and plains with no health producing fruits and no inspiring flowering shrubs and plants to beautify the scene; but with the help of this society we will determine what varieties of these are most congenial to this soil and climate, as the years go, and which leave more homes supplied with luscious fruits and ornamental trees and blooming flowers.

All of which is respectfully submitted.

Mrs. John Leinhart made the following report of stock furnished her:

April 15, 1905, I received from Mr. J. L. Coppoc, 5 Raspberries, 5 Snyder Blackberries, 3 Thurlow Willows, and 4 Tamarix. In setting out any plant or tree I always dig a large hole, putting old dirt in the bottom and packing the dirt well around the roots. The berries were set on the east slope of a sandy hill. None of the Raspberries lived, but all the Blackberries lived and made a good growth. The Tamarix were set in black sandy loam. The Willows were set in rich black and rather wet soil. All except the Willows were cultivated by hoeing, and they were mulched with coarse manure. The Willows were cultivated with cultivator. Both Willows and Tamarix lived and made a good growth.

Of the shrubbery received of Mr. Coppoc, in the spring of 1904, consisting of 2 Pea trees, 2 Snowballs, 2 Russian Olives, 1 Syringa, 2 Rosa Rugosa, 4 Spireas, 3 Honeysuckles, 2 Russian Privet, 1 Golden Elder, all lived over the winter and made a good growth this summer, except the Golden Elder, which died.

REPORT OF THE COMMITTEE ON REDISTRICTING THE STATE.

We, your committee, to whom was referred the matter of redistricting the state and revision of the list of fruits and ornamentals recommended for general planting in Nebraska, beg to submit the following report:

APPLES.

For District No. 1, comprising the counties of Richardson, Nemaha, Otoe, Johnson and Pawnee, we recommend the following varieties of apples for general planting:

Summer—Duchess, Cooper's Early White, Cole's Quince, Early Harvest, and Sweet June.

For second choice we recommend Red Astrachan.

Autumn—Wealthy, Maiden's Blush, Famuse, Dyer and Warfield.

Winter—Grime's Golden, Winesap, Jonathan, Gano, Ben Davis, Salome, N. W. Greening, Missouri Pippin,, and Virginia Beauty.

For District No. 2, comprising Cass, Sarpy, Douglas, Washington, Burt, Dodge, and Saunders counties, we recommend the following for general planting:

Summer—Duchess, Yellow Transparent, Cole's Quince, Dyer, Sweet June, Red Astrachan, Red June, Chenango Strawberry, Early Pennock, Early Harvest, American Summer Pearmain, Benoni, and Summer Hagloe.

Autumn—Wealthy, Utter's Red, Maiden's Blush, Ramsdell Sweet, Fulton Strawberry, Flora Belle, Plumb's Cider, Famuse, Warfield, Porter, Fulton, and McMahon's White.

Winter—Ben Davis, Gano, Wine Sap, Windsor, Jonathan, Grime's Golden, Janet, N. W. Greening, Salome, Ingram, Black Twig, and Isham Sweet.

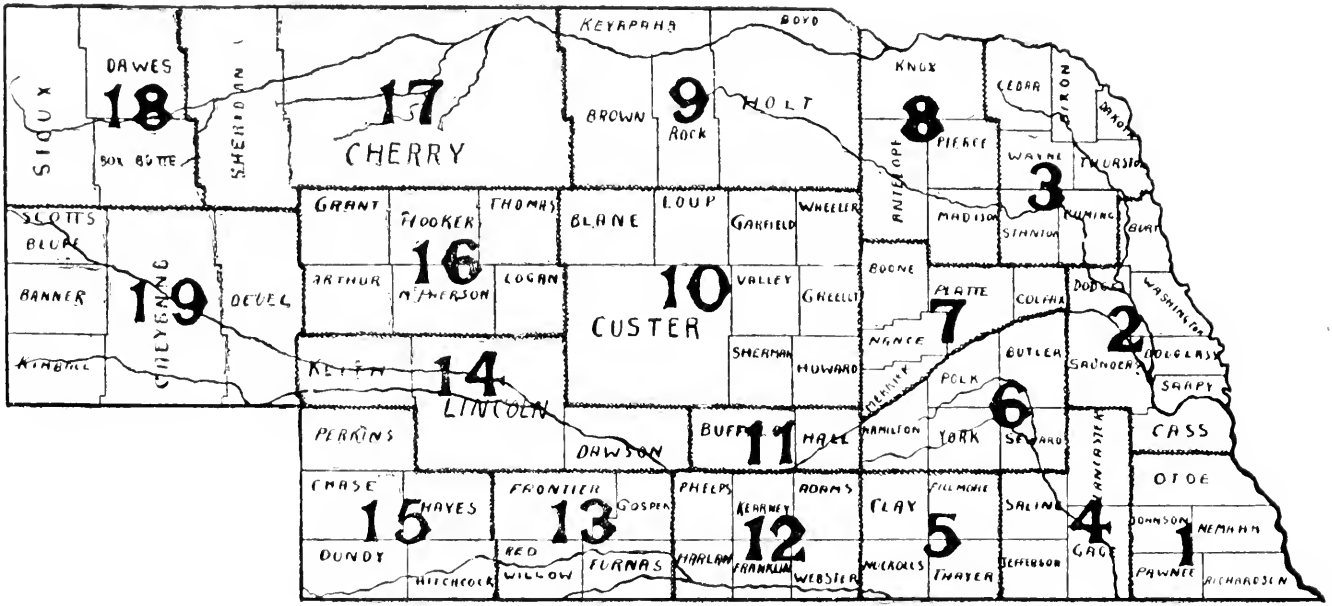
For second choice we recommond Missouri Pippin and Iowa Blush.

For District No. 3, comprising Stanton, Thurston, Wayne, Dakota, Dixon, and Cedar counties, we recommond the following varieties for general planting:

Summer—Duchess and Yellow Transparent.

For second choice, Red Astrachan and Sweet June.

For trial, Summer Hagloe.


DAWES
18
SIOUX
BOX BUTTE
SHERIDAN
17
CHERRY
KEYAPAHA
BOYD
BROWN
9
ROCK
HOLT
KNOX
8
CEDAR
DIXON
DAKOTA
PIERCE
WAYNE
THURSTON
ANTELOPE
3
MADISON
STANTON
CUMING
BURT
GRANT
HOOKER
THOMAS
BLAINE
LOUP
GARFIELD
WHEELER
SCOTTS BLUFF
BANNER
19
CHEYENNE
DEUEL
16
ARTHUR
MCPHERSON
LOGAN
10
CUSTER
VALLEY
GREELEY
BOONE
NANCE
7
PLATTE
COLFAX
DODGE
WASHINGTON
2
SHERMAN
HOWARD
BUTLER
SAUNDERS
DOUGLAS
SARPY
KIMBALL
KEITH
14
LINCOLN
POLK
6
CASS
PERKINS
DAWSON
BUFFALO
11
HALL
HAMILTON
YORK
SEWARD
CHASE
15
HAYES
FRONTIER
13
GOSPER
PHELPS
KEARNEY
ADAMS
CLAY
FILLMORE
SALINE
ANTELOPE
OTOE
4
GAGE
JOHNSON
NEMAHA
1
DUNDY
HITCHCOCK
RED WILLOW
FURNAS
HARLAN
FRANKLIN
12
WEBSTER
NUCKOLLS
5
THAYER
JEFFERSON
PAWNEE
RICHARDSON

Autumn—Wealthy, Utter's Red, Flora Belle, Famuse, and Ramsdell Sweet.

For second choice, Maiden's Blush and Plumb's Cider.

For trial, Warfield and McMahon's White.

Winter—First choice for entire district—N. W. Greening, Salome, and Janet.

First choice for south half of district—Ben Davis, Gano, and Wine Sap.

Second choice for entire district—Iowa Blush and Missouri Pippin.

For trial, Windsor.

For District No. 4, comprising Gage, Jefferson, Saline, and Lancaster counties, we recommond the following varieties for general planting:

Summer—Yellow Transparent, Duchess, Cooper's Early White, Early Harvest, Red June, and Sweet June.

Autumn—Wealthy, Maiden's Blush, Famuse, and Utter's Red.

Winter—Ben Davis, Gano, Wine Sap, Jonathan, Grime's Golden, Missouri Pippin, and N. W. Greening.

For District No. 5, comprising Thayer, Nuckolls, Fillmore, and Clay counties, we recommend the following varieties for general planting:

Summer—Duchess, Cooper's Early White, Cole's Quince, Early Harvest, Red June, and Sweet June.

Autumn—Wealthy, Maiden's Blush, Famuse, Dyer, and Warfield.

Winter—Ben Davis, Gano, Wine Sap, Jonathan, Grime's Golden, Janet, and Missouri Pippin.

For District No. 6, comprising Seward, Butler, Polk, York, and Hamilton counties, we recommend the following varieties for general planting:

Summer—Yellow Transparent, Early Harvest, Cooper's Early White, Red June, Duchess, Summer Queen, and Sweet June.

Autumn—Wealthy, Maiden's Blush, Utter's Red, Patton's Greening, Wolf River, Peerless, and Snow.

Winter—Wine Sap, Missouri Pippin, Ben Davis, N. W. Greening, Janet, Salome, Walbridge, Ingram, M. B. Twig, Gano, Jonathan, Iowa Blush, Grime's Golden, York Imperial, Minkler, and Rome Beauty.

For District No. 7, comprising Colfax, Platte, Boone, Nance, and Merrick counties, we recommend the following for general planting:

Summer—Yellow Transparent and Duchess.

For second choice, Sweet June.

For trial, Summer Hagloe.

Autumn—Wealthy, Utter's Red, Ramsdell Sweet.

For second choice, Plumb's Cider, Flora Belle, Famuse, and Maiden's Blush.

For trial. Warfield.

Winter—Ben Davis, Gano, Wine Sap, Janet, and N. W. Greening.

For second choice, Iowa Blush and Missouri Pippin.

For trial, Salome, Black Twig, and Windsor.

For District No. 8, comprising Madison, Pierce, Antelope, and Knox counties, the following varieties are recommended for general planting:

Summer—Duchess and Yellow Transparent.

For second choice, Red Astrachan and Tetofska.

For trial, Summer Hagloe and Sweet June.

Autumn—Wealthy and Utter's Red.

For second choice we recommend Plumber's Cider, Flora Belle, Snow, Ramsdell Sweet, and Maiden's Blush.

For trial, Warfield and McMahon's White.

Winter—First choice for entire district—N. W. Greening, Salome, and Janet.

To be added for south half of district—Ben Davis, Gano, and Wine Sap.

Second choice for entire district—Iowa Blush, Missouri Pippin, and Walbridge.

For trial in entire district—Windsor.

For District No. 9, comprising Holt, Boyd, Keya Paha, Brown, and Rock counties, we recommend the following varieties for general plant-

Summer—Duchess, Yellow Transparent, and Summer Hagloe.

For trial, Red Astrachan.

Autumn—Wealthy and Utter's Red.

For trial, Maiden's Blush and Plumb's Cider.

Winter—Salome, N. W. Greening, Janet, Iowa Blush, Wine Sap, Walbridge, and Ben Davis.

For District No. 10, comprising Howard, Greeley, Wheeler, Garfield, Valley, Sherman, Custer, Loup, and Blaine counties, we recommend the following varieties for general planting:

Summer—Yellow Transparent, Early Harvest, Cooper's Early White, Duchess, and Sweet June.

Autumn—Wealthy, Maiden's Blush, Utter's Red, and Patton's Greening.

Winter—Missouri Pippin, Ben Davis, N. W. Greening, Salome, Walbridge, Janet, Gano, Jonathan, Iowa Blush, and Grime's Golden.

For District No. 11, comprising Hall and Buffalo counties, we recommend the following for general planting:

Summer—Yellow Transparent, Early Harvest, Cooper's Early White, Red June, Duchess, and Sweet June.

Autumn—Wealthy, Maiden's Blush, Utter's Red, Patton's Greening, Wolf River, and Snow.

Winter—Wine Sap, Missouri Pippin, Ben Davis, N. W. Greening, Janet, Salome, Walbridge, M. B. Twig, Gano, Jonathan, Iowa Blush, Grime's Golden, and York Imperial.

For District No. 12, comprising Adams, Webster, Franklin, Kearney, Phelps, and Harlan counties, we recommend the following for general planting:

Summer—Yellow Transparent, Early Harvest, Cooper's Early White, and Duchess.

Autumn—Wealthy, Utter's Red, and Plumb's Cider.

Winter—Wine Sap, Missouri Pippin, Ben Davis, N. W. Greening, Salome, Gano, Jonathan, Iowa Blush, Grime's Golden, and Janet.

For District No. 13, comprising Furnas, Gosper, Frontier, and Red Willow counties, we recommend the following varieties for general planting:

Summer—Duchess and Cooper's Early White.

Autumn—Wealthy and Maiden's Blush.

Winter—Wine Sap, Missouri Pippin, Janet, Ben Davis, and Gano.

For District No. 14, comprising Dawson, Lincoln, and Keith counties, we recommend the following for general planting:

Summer—Duchess, Early Harvest, and Yellow Transparent.

Autumn—Wealthy and Utter's Red.

Winter—Ben Davis, Wine Sap, Janet, Missouri Pippin, and Jonathan.

For District No. 15, comprising Hitchcock, Hayes, Perkins, Chase, and Dundy counties, we recommend the following for general planting:

Summer—Duchess and Yellow Transparent.

Autumn—Wealthy, Utter's Red, and Famuse.

Winter—N. W. Greening, Ben Davis, Gano, Janet, and Wine Sap.

For District No. 16, comprising Logan, Thomas, Hooker, McPherson, and Grant counties, we recommend the following for general planting:

Summer—Duchess.

Autumn—Wealthy.

Winter—Walbridge, Iowa Blush, and N. W. Greening.

For District No. 17, comprising Cherry and Sheridan counties, we recommend the following for general planting on dry land with good care:

Summer—Duchess.

Autumn—Wealthy.

Any varieites recommended for districts 3, 8, or 9 will do well in most places in district 17.

For District No. 18, comprising Box Butte, Dawes, and Sioux counties, we recommend Duchess and Wealthy, but they must be given good care.

Any varieties recommended for districts 3, 8, or 9 will do well in most places of district 18, under irrigation.

For District No. 19, comprising Deuel, Cheyenne, Scotts Bluff, Banner, and Kimball counties, we recommend the following varieties for general planting:

Summer—Duchess, Yellow Transparent, and Cooper's Early White.

Autumn—Wealthy.

Winter—Ben Davis, Gano, Janet, Grime's Golden, Iowa Blush, and N. W. Greening.

APRICOTS.

For District No. 2, we recommend the following varieties of Russian apricots for general planting: Alexis, Budd, and Moorpark.

For Districts 6, 10, 11, 12, and 13, we recommend the Russian varieties of apricots.

For District No. 7, Russian apricots are fully as hardy as the hardiest peaches.

ASPARAGUS.

For Districts 6, 10, 11, and 12, we recommend Conover's Colossal and Palmetto.

For District No. 15, we recommend Conover's Colossal.

BLACKBERRIES.

For Districts No. 1 and 4, we recommend Snyder and Early Harvest.

For Districts 2, 3, 5, 6, 8, 10, 11, 12, and 14, we recommend Snyder.

For District No. 7, blackberries are unsuccessful except in damp seasons and favored locations. Snyder, and for trial, Stone's Hardy.

For District No. 9, we recommend Snyder, for trial only.

CHERRIES.

For Districts 1, 4, 14, and 19, we recommend Early Richmond, Montmorency, and English Morello for general planting.

For District No. 2, we recommend Early Richmond, Montmorency, English Morello, or Wragg, and Dyehouse.

For District No. 3, we recommend Early Richmond, Montmorency, and English Morello.

For trial in District 3, we recommend Terry, Baldwin,, and Ostheim.

For Districts 5 and 15, we recommend Early Richmond, Montmorency, English Morello, and Dyehouse.

For District No. 6, we recommend Early Richmond, Dyehouse, Large Montmorency, English Morello, and Ostheim.

For District No. 7, we recommend Early Richmond, Montmorency, English Morello, or Wragg.

For trial in District 7, we recommend Dyehouse, Baldwin, and Terry.

For District No. 8, we recommend Early Richmond, Montmorency, and English Morello.

For trial in District 8, Terry and Baldwin.

For District No. 9, we recommend Early Richmond, Montmorency, English Morello, and Terry.

For Districts 10, 11, and 12, we recommend Early Richmond, Large Montmorency, English Morello, Baldwin, Dyehouse, and Ostheim.

For Districts No. 13, we recommend Early Richmond, Dyehouse, and Ostheim.

For District No. 16, we recommend Early Richmond and Montmorency.

For District No. 17, we recommend Early Richmond, Montmorency, English Morello, and Dyehouse.

For trial in District 17, Early Morello and Terry.

For District No. 18, we recommend Early Richmond, English Morello, Montmorency, Dyehouse, and Terry.

CRAB APPLES.

For District No. 1, we recommend Whitney No. 20, Hyslop, and Siberian.

For Districts 2, 3, 5, 7, 9, 14, 15, 16, and 19, we recommend Whitney No. 20, Hyslop, Florence, and Martha.

For District No. 4, we recommend Whitney No. 20, Hyslop, Florence, Martha, and Siberian (Red and Yellow).

For District No. 6, we recommend Whitney No. 20, Florence, Martha, Golden Beauty, Hyslop, and Transcendant.

For Districts 10 and 11, we recommend Whitney No. 20, Florence, Martha, Golden Beauty, and Hyslop.

For District No. 12, we recommend Whitney No. 20, Florence, and Martha.

For District No. 13, we recommend Whitney No. 20 and Florence.

For District No. 17, we recommend Whitney No. 20, General Grant, and Virginia.

For District No. 18, we recommend Whitney No. 20, Florence, Hyslop, Transcendant, and Martha.

CURRANTS.

For Districts 1, 4, 14, and 19, we recommend Red Dutch, Victoria, and White Grape.

For District No. 2, we recommend Victoria, Cherry, White Grape, Fay's Prolific, and North Star.

For District No. 3, we recommend Victoria, White Grape, Cherry, and Fay's Prolific.

For District No. 5, we recommend Cherry, La Versailles, Victoria, Prince Albert, London Market, Red Dutch, and White Grape.

For District No. 6, we recommend Victoria, Cherry, Versailles, and White Grape.

For Districts 7 and 8, we recommend Victoria and White Grape.

For trial in Districts 7 and 8, we recommend Cherry, Fay's Prolific, and London Market.

For District No. 9, we recommend Victoria, White Grape, Cherry, Fay's Prolific, and London Market.

For Districts 10, 11, and 13, we recommend Victoria, Cherry, Versailles, and White Grape.

For District No. 15, we recommend Red Dutch, Victoria, Cherry, and White Grape.

For District No. 16, we recommend White Grape, Victoria, and Cherry.

For district No. 17, we recommend White Grape, Victoria, and London Market.

For District No. 18, we recommend Victoria, White Grape, White Dutch, and Red Dutch.

DEWBERRIES.

For Districts 5, 6, 10, 11, and 12, we recommend Lucretia Dewberries.

JUNEBERRIES.

For Districts 5, 6, 10, 11, and 12, we recommend Dwarf Juneberries.

GOOSEBERRIES.

For District No. 1, we recommend Downing, Houghton, Industry, and Red Jacket.

For Districts 2, 3, and 8, we recommend Downing, Houghton, and Champion.

For District No. 4, we recommend Downing, Houghton, and Industry.

For Districts 5, 7, 9, 10, 11, 12, 13, 14, and 15, we recommend Downing and Houghton.

For District No. 6, we recommend Downing and Pearl.

For Districts 16, 17, and 18, we recommend Houghton.

For District No. 19, we recommend Downing, Houghton and Smith's Improved.

GRAPES.

For District No. 1, we recommend Concorn, Worden, Moore's Early, Niagara, Moore's Diamond, and Woodruff Red.

For District No. 2, we recommend Concord, Worden, Moore's Early, Agawam, Brighton, Pocklington, Moore's Diamond, and Woodruff Red.

For District No. 3, we recommend Concord, Worden, Moore's Early, and Pocklington.

For trial in District 3, Brighton, Agawam, and Moore's Diamond.

For District No. 4, we recommend Concord, Worden, Moore's Early, and Niagara.

For District No. 5, we recommend Concord, Worden, Moore's early, Duchess, Agawam, and Brighton.

For District No. 6, we recommend Concord, Worden, Moore's Early, Elvira, Niagara, Wyoming Red, and Pocklington.

For District No. 7, we recommend Concord, Worden, Moore's Early, and Pocklington, for general planting.

For second choice in District 7, we recommend Elvira.

For trial in District 7, Moore's Diamond and Brighton.

For District No. 8, we recommend Concord, Worden Moore's Early, and Pocklington for general planting.

For trial in District 8, Moore's Diamond and Brighton.

For District No. 9, we recommend Concord, Worden, Moore's Early, Pocklington, and Moore's Diamond. Grapes should be covered in winter to insure success.

For District No. 10, we recommend Concord, Worden Moore's Early, Elvira, Niagara, and Wyoming Red.

For Districts 11 and 12, we recommend Concord, Worden, Moore's Early, Elvira, Niagara, Wyoming Red, and Pocklington.

For District No. 13, we recommend Concord and Elvira.

For Districts 14 and 15, we recommend Moore's Early, Worden, Elvira, and Concord.

For District No. 16, we recommend Concord.

For District No. 19, we recommend Concord and Moore's Early.

PEACHES.

For Districts 1 and 4, we recommend Alexander, Early Rivers, Triumph, Hale's Early, Russell, Champion, Crosby, Hill's Chili, Heath Cling, Salway, and Wright.

For District No. 2, we recommend Alexander, Early Rivers, Triumph, Russell, Champion, Bokara, and Wright for general planting in Cass and Sarpy counties, and for trial in balance of district.

For District No. 3, we recommended Alexander, Triumph, Champion, Bokara, and Wright, for trial only.

For District No. 5, we recommended Amsden, Alexander, Hale's Early, Early Rivers, Russell, Cooledge, Champion, Triumph, Heath Cling, Wright, Smock, and Hill's Chili.

For Districts 6 and 11, we recommend Alexander, Early Rivers, Triumph, Hale's Early, Russell, Champion, Crosby, Hill's Chili, Wright, and Bokara.

For District No. 7, we recommend Alexander, Triumph, Champion, Bokara, Russell, and Wright, for trial.

For trial only in Districts 8 and 9, we recommend Alexander, Champion, Bokara, and Wright.

For District No. 10, we recommend Alexander, Triumph, Russell, Bokara, Hill's Chili, Crosby, and Wright.

For District No. 12, we recommend Alexander, Early Rivers, Triumph, Hale's Early, Champion, Crosby, Hill's Chili, Wright, and Cooledge.

For District No. 13, we recommend Alexander, Early Rivers, Hale's Early, Triumph, Russell, Champion, Hill's Chili, and Wright.

For District No. 14, we recommend Alexander, Early Rivers, Champion, Crosby, and Wright.

For District No. 15, we recommend Alexander, Early Rivers, Russell, Hill's Chili, and Wright.

For trial in Districts 17 and 18, we recommend Alexander and Wright.

PEARS.

For District No. 1, we recommend Kieffer, Bartlett, Sheldon, and Seckel.

For District No. 2, Kieffer, Flemish Beauty, Sheldon, Duchess, and L. B. De Jersey.

For District ..o. 3, for trial only, we recommend Kieffer, Flemish Beauty, Sheldon, Duchess, and L. B. De Jersey.

For District No. 4, we recommend Duchess, Flemish Beauty, and Seckel.

For District No. 5, we recommend Flemish Beauty and Bartlett.

For District No. 6, Flemish Beauty, Seckel, Duchess, and Lincoln.

For District No. 7, for trial only, we recommend Kieffer, Sheldon, and Flemish Beauty.

For Districts 8 and 9, for trial only, Kieffer, Sheldon, Flemish Beauty, and L. B. De Jersey.

For Districts 10 and 11, for trial only, we recommend Flemish Beauty, Seckel, Duchess, and Lincoln.

For District No. 12, for trial only, Flemish Beauty, Seckel, and Kieffer.

For trial only in District No. 13, Seckel, Sheldon, and Flemish Beauty.

For District No. 19, we recommend Flemish Beauty, Bartlett, and Kieffer.

PLUMS.

American varieties—Wild Goose, Wyant, Wolf, Forest Garden, De Soto, Stoddard, Hawkeye, Cheney, Weaver, Robinson, Pottawattomie, Miner, and Hammer.

European varieties—Lombard, Shippers Pride, Green Gage, Shrop, Damson, Bradshaw, German Prune, and Tagge.

Japanese varieties—Burbank, Abundance, and Wickson.

For District No. 1, we recommend Abundance, Wyant, Forest Garden, Burbank, and Wild Goose.

For District No. 2, we recommend Wild Goose, Wyant, Wolf, Stoddard, Hawkeye, De Soto, Forest Garden, Lombard, Shippers Pride, Green Gage, Shrop, and Damson, for general planting.

For trial in District 2, we recommend Burbank, Abundance, and Wickson.

For District No. 3, we recommend Forest Garden, De Soto, Lombard, Shippers Pride, and Green Gage, for general planting in entire district.

First choice for south half of district, Wild Goose.

For trial in entire district, Burbank and Abundance.

For District No. 4, we recommend Wyant, Hawkeye, Wild Goose, Forest Garden, and Burbank.

For District No. 5, we recommend Wild Goose, Miner, Forest Garden, Wolf, Wyant, De Soto, Hawkeye, and Lombard.

For District No. 6, we recommend Lombard, German Prune, Tagge, Burbank, Wickson, Wyant, Wolf, Weaver, De Soto, Forest Garden, Stoddard, Cheney, and Hawkeye.

For District No. 7, we recommend Wild Goose, Wyant, Wolf, Forest Garden, Lombard, Shippers Pride, and Green Gage, for general planting.

For trial in District 7, we recommend Stoddard, Burbank, and Abundance.

For District No. 8, we recommend Wyant and Wolf as first choice for entire district.

Second choice for entire District, De Soto, Forest Garden, and Stoddard.

First choice for south half of district, Wild Goose.

For trial in entire district, Burbank, Lombard, Shippers Pride, and Green Gage.

For District No. 9, we recommend Wyant, Wolf, Stoddard, De Soto, and Forest Garden.

For District No. 10, we recommend Burbank, Wickson, Wyant, Wolf, Weaver, De Soto, Forest Garden, Stoddard, Cheney, and Hawkeye.

For District No. 11, we recommend Lombard, German Prune, Burbank, Wickson, Wolf, Weaver, De Soto, Forest Garden, Stoddard, Cheney, and Hawkeye.

For District No. 12, we recommend Burbank, Wickson, Wyant, Wolf, Weaver, De Soto, Forest Garden, Stoddard, Cheney, Hawkeye, Wild Goose, Robinson, and Pottawattomie.

For District No. 13, we recommend Forest Garden, Burbank, Hawkeye, and Miner.

For District No. 14, we recommend Wyant, De Soto, Forest Garden, Hawkeye, and Lombard.

For District No. 15, we recommend Forest Garden, Hawkeye, Wolf, and De Soto.

For District No. 16, Stoddard, Sheney, De Soto, Forest Garden, Wolf, and Wyant.

For District No. 17, Wyant, Stoddard, Cheney, and Hammer.

For District No. 18, Wyant, Stoddard, Cheney, Hammer, Lombard, and Shippers Pride.

For District No. 19, Forest Garden, Wolf Pottawattomie, De Soto, Cheney, and Stoddard.

RASPBERRIES.

For District No. 1, we recommend Cumberland, Kansas, Gregg, Nemaha, Turner (Red), Cardinal (Purple).

For District No. 2, we recommend Nemaha, Kansas, Palmer, and Cumberland.

For District No. 3, Nemaha, Kansas, Palmer, and Columbia.

Cumberland for river counties and balance of district 3.

For District No. 4, Kansas, Palmer, Gregg, and Turner.

For Districts 5 and 9, we recommend Kansas, Palmer, and Nemaha.

For Districts 6 and 10, we recommend Cumberland, Kansas, Gregg, and Ohio.

For District No. 7, we recommend Nemaha, Kansas, and Palmer. Successful only in damp seasons or favored locations.

For district No. 8, first choice for river counties and for trial in balance of district we recommend Nemaha, Kansas, Palmer, Cumberland, and Columbia.

For trial in entire district, Cardinal.

For Districts 11, 12, 14, 18, and 19, we recommend Cumberland and Kansas.

RHUBARB.

For Districts 6, 10, and 11, we recommend the following varieties of rhubarb: Linnaeus and Victoria.

For District No. 15, Linnaeus.

STRAWBERRIES.

Aroma, August Luther, Bederwood, Brandywine, Clyde, Gandy, Senator Dunlap, and Splendid are Staminate or self-fertilizing varieties.

Crescent, Haverland, Sample, and Warfield are Pistillate varieties, and should be planted with Staminate varieties for fertilization.

For District No. 1, we recommend Senator Dunlap, Splendid, Bederwood, Crescent, Gandy, and August Luther.

For Districts 2, 3, and 9, we recommend Senator Dunlap, Splendid, Bederwood, Crescent, Sample, and Warfield.

For District No. 4, we recommend Senator Dunlap, Splendid, Bederwood, Crescent, and Gandy.

For District No. 5, Senator Dunlap, Clyde, Bederwood, Crescent, and Warfield.

For District No. 6, Senator Dunlap, Warfield, Sample, Aroma, and Haverland.

For District No. 7, Senator Dunlap, Warfield, Crescent, and Bederwood.

For trial in District 7, Sample and Splendid.

For Districts 8, 9, and 18, we recommend Senator Dunlap, Sample, Warfield, Bederwood, Splendid, and Crescent.

For Districts 10 and 12, we recommend Senator Dunlap, Sample, Warfield, Aroma, Haverland, and Crescent.

For District No. 11, Senator Dunlap, Sample, Warfield, Aroma, Haverland, and Bederwood.

For Districts 13 and 15, we recommend Bederwood, Warfield, Crescent, and Senator Dunlap.

For District No. 14, Senator Dunlap, August Luther, Splendid, Bederwood, and Crescent

For District No. 17, Crescent, Bederwood, and Warfield.

For District No. 19, Warfield, Senator Dunlap, Brandywine, Gandy, and Crescent.

LIST OF ORNAMENTALS.

INCLUDING TREES, SHRUBS, ROSES, VINES, BULBS, ETC., WHICH APPLIES TO THE ENTIRE STATE, EXCEPT WHERE OTHERWISE SPECIFIED.

Hardy Shrubs.

Snowball.
Hydrangea Paniculata, Grandiflora.
Prunifolia.
Golden Leaf (Aurea).
High Bush Cranberry.

Syringa, all kinds.
Weigelia, Variegated and Rosea.
Flowering Almond.
Lilac, all kinds.
Spireas as follows:
Van Houtii.
Arguta.
Thunbergii.
Collosa Alba and Ruberea.
Anthony Waterer.
Bumalda.
Billardii.
Altheas.
Caragana.
Moss Accacia.
Forsythia.
Yucca Filamentosa.
Purple Berberry.
Golden Leaf Alder.
Tamerix Amuerensis.
Dogwood.
Wahoo.
Rosa Rugosa.
Bechtel Flowering Crab.

Bulbs and Tubers.

Paeonias.
Tulips.
Lilies.
Dahlias.
Gladiolas.
Tuberoses.

Perennials.

Phlox.
Oriental Poppy.
Columbine.
Gaillardia.
Bleeding Heart.
Golden Glow.
Caladium.
Iris.
Larkspur.
Foxglove.
Cannas.

Climbers.

American Ivy (Ampelposis Quinquefolia).
Honeysuckles.
Wistaria.
Trumpet Vine.
Clematis.
Bitter Sweet.

Climbing Roses.

Crimson Rambler.
White Rambler.
Wichuriana-creeper.
Prairie Queen.
Baltimore Belle.

June Roses.

Harrison's Yellow.
Madam Plantier.
Persian Yellow.

Moss Roses.

Luxembourg.
Glory of Mosses.
Crested Moss.
White Moss.

Hybrid Perpetual Roses.

Alfred Colomb.
Anne De Diesbach.
Margaret Dickson.
Baron de Bonstetten.
Coquette Des Alps.
Mabel Morrison.
Prince Camille de Rohn.
Tom Wood.
Marshall P. Wilder.
General Jacqueminot.
John Hopper.
Ulrich Bruner.
Paul Neyron.
Magna Charta.
Madame Chas. Wood.
Fisher Holmes.
Jules Margotten.
Mrs. John Lang.

Weeping Trees.

Thurlow Weeping Willow.
Teas Weeping Mulberry.
Camperdown Weeping Elm.
Cut Leaf Weeping Birch.

Ornamental Shade Trees.

Hackberry.
Sycamore (S. E. part).
Carolina Poplar.
European Mt. Ash.
Black Walnut.
Butternut.
Ash.
Soft Maple.
Elm.
Russian Mulberry.
Catalpa Speciosa (S. E. part).
American Linden.
White Birch.
Horse Chestnut (S. E. part).
Sweet Chestnut (S. E. part).
Russian Olive.
Oaks.
Hard Maple (Extreme East).

Ornamental Hedge.

Berberry.
Japan Quince.
Spirea.
California Privet.
Tamerix.

Common Hedge.

Osage Orange.
Honey Locust.
Russian Mulberry.

Forest Trees.

Elm.
Ash.
Soft Maple.
Catalpa Speciosa.
Walnut.
Honey Locust.
Russian Mulberry.
Osage Orange.
Box Elder.

Evergreens.

Black Hills Spruce.
Pungens.
Englemon Spruce.
Douglas Spruce.
Concoler.
Ponderosa.
Austrian Pine.
Scotch Pine.
White Pine (Extreme East).
Balsam Fir.

Respectfully submitted,

G. A. MARSHALL, Chairman.
G. A. STRAND.
A. J. BROWN.
C. H. BARNARD.
W. G. SWAN.
G. N. TITUS.
E. F. STEPHENS.
H. S. HARRISON.
W. F. JENKINS.

Committee.

FOREST PLANTING IN EASTERN NEBRASKA.

By Frank G. Miller, Professor of Forestry in the University of Nebraska.

Nebraska is essentially a prairie state, only about 3 per cent of the total area being originally covered with timber. The early settler coming from a forested region, as he usually did, to one where timber was scarce and the climate often severe, very naturally turned his attention at once to the question of forest planting. Hardly a home was established that was not shielded with trees. The aim primarily was at protection against the storms and winds that so frequently visited Nebraska prairies. The commercial side was considered only incidentally. The tendency, therefore, was to select the quick growing species, especially such as were near at hand and could be had cheaply. In a word, the general character of the planting was temporary rather than permanent, and while there has been a comparatively large amount of tree planting done, as a matter of fact the major part of it is in poor condition today. Not only a rather inferior class of trees has been used too generally, but often the selection, though a good one, was illy adapted to the conditions in hand. Thus it frequently happens that a species adapted primarily to bottom soils, has been planted indiscriminately on the uplands. Or, it may be that a species has been planted on sandy land when it could hope to succeed only in a loam with a clay subsoil. This indiscriminate planting on the false supposition that a tree will grow anywhere has been an important source of failure in past planting.

Still another factor to be noted in accounting for failure in past planting and the present poor condition of so large a proportion of the plantations is the lack of care and management. There is hardly a planted grove in Nebraska that has been managed with the same care that the enterprising farmer gives to his field crops. Instead the vast majority of the plantations have had little or no care at all.

AREA PLANTED.

Taking the average of the figures as returned by the assessors for 1903 and 1904, Nebraska has nearly 300,000 acres of planted timber. Of this amount approximately 250,000 acres, or about 83 per cent of the total is in the territory east of the 99th Meridian. Since this terri-

tory contains approximately 21,000,000 acres, the planted area is slightly more than 1 per cent of the total. Nebraska is generally accredited with a vast amount of forest planting, and indeed she does lead all of the middle west in this regard, yet I believe the above figures will show that the state does not have as much planted timber as she is commonly thought to have. It is certain that there is need for vastly more, especially when it is remembered that for the best interests of agriculture at least one-fifth of the total area should be in timber; and the natural and planted timber together constitute less than one-half of this amount, even in eastern Nebraska.

PLANTED AREA DECREASING.

In general, the planted area in eastern Nebraska is decreasing. Not uniformly so, for some of the eastern counties, especially those in the northeastern part of the state, must be excepted. However, with the rapid appreciation in the price of land, together with an increased timber supply, due to the efforts of the early settlers, the activity in forest planting so characteristic of pioneer days, has gradually declined, till in the past few years the amount of planting done in most parts of the region under consideration had been very small, and this has been more than off-set by the large amount of the former planting that is being cut out and converted into fuel, posts and lumber. Nurserymen say that the demand for forest tree seedlings declined very rapidly from about 1894.

While it is a matter of regret that so much of the planted timberland is being cleared, yet much of the cutting can be justified, as the timber is mature and should be harvested. Cottonwood, for example,—and it constitutes nearly or quite one-half of all the planted timber in eastern Nebraska—attains its maturity here in from thirty-five to forty-five years, and if not cut then it begins to decline. Since it was so extensively planted by the pioneers, a large amount of it has come into maturity. Besides firewood, many of these old cottonwood plantations have yielded a large amount of lumber. The logs are sawed by means of small portable mills. The lumber is used principally in the construction of barns, sheds, houses and for bridge planking.

FUTURE PLANTING.

As stated, commercial considerations have been largely left out of account in past planting. But the tree planting of the future should

take on a different character. The time has come when the commercial side should be especially emphasized. The farmer should plant trees primarily with a view to raising wood as a crop, and to this end only the better and more profitable species should be used. The aim should be to make the tree crop a paying one, even when protection is the primary object of the planting. It is easily possible to secure all the advantages of shelter and ornament, and at the same time derive a revenue from the forest plantation.

PLANTING FOR PROTECTION.

In mentioning the purposes for which forest plantings should be made, their protective value must have an important place. The ability of windbreaks and forest belts to protect planted fields from the aridity of the wind, and thus increase crop production is a matter of common observation.

Mr. E. F. Stephens, Crete, Nebraska, writing under date of March 18, 1905, says: "Under the shelter of windbreaks, composed of blocks of nursery stock—shade trees which were too large to sell, in fact had outgrown their usefulness—on the high table lands between the Blue river and Salt creek, we once grew 105 bushels and forty pounds of corn per acre. We attributed part of this success and excellent crop to the protection given by these blocks of nursery stock already grown into trees of sufficient height to give shelter both from the north and south."

A notable example of the value of wind breaks about an orchard in preventing windfalls, is that mentioned by Mr. Benton Aldrich, Johnson, Nebraska, in his report of a heavy windstorm in September, 1895, as published in Bulletin No. 48, Nebraska Station: He says: "A neighbor had a few trees of Ben Davis apples, wholly exposed on nearly level land. They were fairly well loaded with fruit, probably a barrel per tree. After this storm he had less than two apples per tree by actual count. My son had 550 Ben Davis trees which were a little larger, and may have had more fruit per tree at the time. After the storm he had, by estimate, one and one-half bushels per tree left. His orchard is protected by mine, adjoining, which is on much higher land and has rows of maples on the sides and through it, and is eighty rods from east to west, and thirty-five rods in extent. There is, so far as I am informed, no doubt that his apples were saved by this natural protection, mounted by this growth of trees."

However, with the orchardist in Nebraska as with the grower of field crops, probably the chief benefit accruing from wind breaks is

the protection they afford from strong, southerly winds by checking evaporation. Not only common experience attests the effectiveness of forest belts in this regard, but the point has been demonstrated by experimentation.

In the first place, it has been shown by experiments that there is a close relation between wind velocity and the rate of evaporation. The United States Signal Service has made investigations on this part, and their observations prove conclusively that the rate of evaporation increases very rapidly with increase in the velocity of the wind. Taking the rate of evaporation in a perfect calm as unity, it was found that when the velocity of the wind was ten miles per hour, the rate of evaporation increased to 3.8; to 5.7, when the wind velocity per hour was twenty miles, and to 6.3 when the wind velocity was thirty miles per hour.

The importance of any agency therefore that will retard the velocity of the wind and thus check evaporation becomes apparent at once. That windbreaks will do this has been demonstrated. Card and Emerson, at the Nebraska Station, made quite an exhaustive study of this question in 1896, in which the ability of windbreaks to retard evaporation was clearly demonstrated. In one of their experiments, for example, conducted during the night of August 3, 1896, when there was a strong south wind, with a high temperature and a low humidtiy, the evaporation was 71 per cent less three rods north, and 33 per cent less twelve rods north of a forest belt than twenty rods south. The belt consisted of twenty-two rows of trees, running east and west.

Experiments by these investigators, as also by King of the Wisconsin Station, show that the relative humidity of the atmosphere and the per cent of water retained in the soil are greater to the leeward of windbreaks than elsewhere.

As to the width of the zone affected by forest belts, Newell, in speaking of the influence of windbreaks on the plains, in "Irrigation," says: "It is estimated that every foot of height of compact trees protects a rod; hense a Lombardy poplar windbreak of an average height of sixty feet, properly set out, has a beneficial influence extending practically 1,000 feet to the leeward."

It is interesting in this connection to note that the United States Weather Bureau and the United States Forest Service are planning a series of experiments on a comprehensive scale to determine the relation of windbreaks to crop production.

COMMERCIAL PLANTING.

From the data gathered in the field season of 1904, the United States Forest Service is in a position to give intelligent advice as to the

most promising trees to plant for commercial purposes. According to the uses to which they are best adapted these trees are about as follows:

For fuel, common cottonwood and white willow should be placed first. No other trees adapted to Nebraska conditions will produce as many heat units on a given area in a given time. On good bottom soils, cottonwood will produce three cords per acre annually for the first twenty-five or thirty years. Willow will not yield quite so well, but its fuel value is somewhat higher. These trees should be planted only sparingly on uplands, since in such situations they are very apt to kill out by drouth in dry seasons.

For fence posts, hardy catalpa, honey locust, green ash, Osage orange, European larch and red cedar may be recommended. Hardy catalpa very probably can be grown on good soil in any part of the state east of the 99th Meridian. The southwestern part may be a little too arid and the northeastern part a trifle cold. However, successful groves of catalpa are reported near Yankton, S. D. Wherever it will succeed it should have first place in commercial planting. Mr. John Heins at Ulysses, Nebraska, has just harvested ten acres of nineteen-year-old catalpa, realizing therefrom $218.00 per acre from the sale of fence posts. This plantation would have yielded equally well had it been cut four or five years ago, since the stand has been too heavy for a number of years, and many of the trees have been killed out by overcrowding. Mr. C. D. Robinson of Pawnee City is now harvesting a sixteen-year-old plantation, and while he has not sold any of the product, it is certain that he is realizing a greater yield of posts than Mr. Heins did.

Honey locust and green ash are not so profitable, but they are hardy throughout the territory in question, and are especially adapted to planting under dry upland conditions, such as obtain in the western and southwestern counties. Next to cottonwood, green ash has been the most widely planted tree in Nebraska, and should continue to have a prominent place in future planting. Honey locust has been planted very little in the past, but owing to its freedom from insect and fungus attacks, and its ability to withstand drouth, it should be more widely used in establishing plantations, especially in the drier portions. It is hardy throughout the state. Records on an average grove, twenty-nine years old, near Grand Island, show a value of $193.00 per acre.

Osage orange, though planted extensively for hedges in an early day, has never been used much in establishing plantations. However, recent studies prove it to be an exceedingly useful crop when grown on good soils. Measurements in the Benton Aldrich plantation near John-

son, Nebraska, give it a total valuation of $361.00 per acre. The grove was thirty-three years old when measured. The above figures include the material cut out in the past. This tree should be limited to the southeastern part of the state.

European larch has not been thoroughly tested in Nebraska, but judging from its success in the Dakotas and Minnesota as well as other parts of the middle west, I believe it to be a very promising tree for the eastern part of this state. It grows rapidly, the wood is heavy, hardy and durable, and is splendidly adapted for use as posts, ties and poles.

The place of red cedar posts as a fence post is well known. On account of its slow growth, however, it will hardly be planted on a large scale, for this purpose, especially in eastern Nebraska.

For lumber, cottonwood and black walnut are the most available. The former will make sawlogs in thirty years, but the latter will require seventy-five years to attain to a size suitable for lumber.

Two of the chief objections urged against forest planting are low returns and long time period required to produce the crop. But the work done by the United States Forest Service, not only in Nebraska, but in other states of the middle west, answers both objections. Such trees as hardy catalpa, Osage orange, honey locust and European larch will reach post size in from ten to fifteen years, according to the quality of the soil, and we have figures to show that such trees can be made to yield profitable returns.

As for the amount of planting in the future, the outlook seems very hopeful. Nursery men agree that there is a revival of interest in tree planting at the present time. This renewed activity has been in evidence particularly the past year, and the demand for forest tree seedlings has been greater than for some years past.

THE MIGRATION OF OUR FOREST TREES.

By Charles E. Bessey.

It is a familiar fact that new species appear from time to time among the native plants of a region. Such newcomers turn out on examination to be new only in the sense that they have not previously lived in the region, and in every instance these new plants are found to have come from other regions where they had existed for a longer or shorter period of time. In some cases the new species remain for a time and then disappear, or at least become inconspicuous, but more commonly they crowd in among the former plants and become permanent members of the plant community. Whenever such an addition is made to the flora of a region there is a readjustment of the former species, with a necessary change in the relative members of the individuals, and the particular habitat of each. In the case of annual plants these adjustments are made rapidly, so that in a short time the prominent features of the plant community may be entirely changed. On the other hand, in the case of perennial plants there is greater stability, new species finding greater difficulty in entering, and the old species giving away, if at all, only after the lapse of a much longer time. A vegetation which is well rooted in the ground is much less easily disturbed than one whose roots live for but a single season and then abandon the particular plot of ground where they grow. Forests are therefore conservative plant communities, into which new species gain entrance with difficulty, and which change very slowly after such entrance has been effected. There is only one other plant community whose stability approaches that of the forest, namely, the grassy vegetation of the prairies and plains, which is composed of perennial-rooted grasses, sedges and rushes. Where these form a close sod new species are almost wholly excluded, and but little change takes place in the character of the vegetation. It is only where the surface is not closely covered that the grassy vegetation is more easily modified by the incoming of new species. Where accident, or disease, or some other cause has destroyed the grassy covering new species promptly take possession. A fine example of this is to be seen in the growth of **Helianthus annuus** on the mounds made on the prairies by such burrowing animals as gophers and prairie dogs. Where the tough sod was broken by the freight wagons which crossed Nebraska by various

"trails" many years ago botanists find many newcomers, which could not have gained a foothold in the unbroken sod.

FACTORS IN MIGRATION.

The means of migration are physical and biological, the former including all the factors which are external to the plant, and which involve the mechanical movement of the plant or some of its parts, while the latter includes the devices on the part of the plant by means of which it takes advantage of physical agencies. In this paper only those means which have to do with the migration of forest trees will be considered, thus limiting the discussion by excluding a multitude of devices of all degrees of complexity which pertain to other plants.

The most general physical agent in the dissemination of plants is the movement of the air in the currents of wind. These sweep over the earth's surface with all degrees of rapidity, and with a carrying power which increases as the squares of the velocities. The fact that winds shift their direction at short intervals, rarely maintaining the same direction for more than a few hours, or at most a few days, makes them especially useful agents in the movement and transportation of such seeds and fruits as can be blown from place to place. It is probably true that to some extent the distribution of all of the species of trees which grow naturally in Nebraska is affected by the winds. The violent and long continued winds of high velocity transport seeds and fruits of all kinds, whether or not they show any special adaptations for wind carriage.

A second general agent in dissemination is moving water, upon which seeds and fruits may float from place to place. Every brook, every creek, every river carries thousands of seeds, many of which ultimately float to the banks, or are lodged upon sandbars and islands. In the aggregate the number of seeds carried in this manner is large, but the number of trees resulting from their growth is by no means as great, since many seeds are injured by prolonged soaking in water, and in addition many do not find favorable conditions for growth when cast ashore.

Animals of various kinds are active agents in the dissemination of seeds and fruits, especially of trees. Here the means of transportation are much more efficient, since they may result in the dispersal of seeds in all directions, and often for much greater distances. Squirrels, rats, mice and other rodents which carry and secrete stores of food, and many herbivorous mammals which feed more or less commonly upon

seeds and fruits, are efficient means for distributing the seeds of trees and other plants. To these must be added the birds of nearly all species, excepting those that subsist wholly upon animal food. Their power of swift flight enables them to transport seeds long distances in every direction, across barriers which are practically impassable for quadrupeds. The number of different species which take part in seed dissemination is not less than two hundred in the portion of the central plains included within the boundaries of Nebraska, and of these probaby one-third carry the seeds of trees.

Nebraska occupies a central position in the United States, and is somewhat south of the center of the North American continent. It lies between latitude 40 to 43 degrees north of the equator, and longitude 95 degrees 30 minutes to 104 degrees west of Greenwich. It lies almost wholly in the Great Plains region, or the "Prairie Province" as denominated by Pound and Clements in the "Phytogeography of Nebraska." In the valley of the Missouri river along its eastern border its elevation above sea-level is 880 feet at the southeast, and about 1,100 feet at the northeast, while westward and northwestward the elevation is much greater, reaching 4,900 feet in the northwest, and fully 5,300 feet toward its southwest boundary, near the Wyoming line.

The river system is a very simple one. Along the eastern border is the turbid Missouri river, which receives the Nemaha and Weeping Water (both short streams) south of the mouth of the Platte river. The Platte river flows from the Rocky mountains as two streams, which unite in western Nebraska, and is, like the Missouri river, a rapid and turbid stream. It receives one tributary, Lodgepole river, in the western part of the state, the much-branched Loup river (which drains the Sand Hills) in the center, and the Elkhorn river toward the northeasterly part. On the north is the Niobrara river which comes from the Wyoming foothills, and in the extreme northwest are branches of the White river, rising in the mountainous country of Pine Ridge. On the south the Republican river comes from the elevated plateau of eastern Colorado, traverses the southern counties, and then passes into Kansas, where it joins the Kansas river, and finally reaches the Missouri river. In the southeast, the Blue river drains a triangular area closely adjacent to the Platte river, and flowing south empties into the Kansas river.

The surface features of the state are considerably varied, including the wet and marshy "bottoms" of the Missouri river valley, the steep "bluffs" which limit them on the westerly side, the hilly and broken country still further inland, the rolling surface of the prairies of the

eastern portion of the state, the more pronounced hills adjacent to the bluffs of the Platte valley, the broad and nearly level valley of the Platte river, the steep and irregular hills of the Sand Hill country, the high plains, "bad lands," buttes, and mountainous ridges of the extreme west.

The soils of Nebraska show much of uniformity. Most of the eastern portion is overlaid with loess, which becomes more sandy westward toward the Sand Hills, while still further west it becomes more clayey. These three general types of soil are more or less modified locally, as by the increase of humus in the marshy borders of some streams, the increase of organic matter in the drainless valleys of the Sand Hills, and the alkali soils surrounding many ponds in regions still further west.

The climate of Nebraska is of the "continental" type. The rainfall which reaches thirty-five inches a year in the southeastern part gradually decreases westward to fourteen inches. It is very unequally distributed throughout the year. About 30 per cent falls in the spring, 39 per cent in the summer, 23 per cent in the autumn, and 8 per cent in the winter. The humidity of the air is generally low, and is especially so in the winter. The insolation is high, the days with sunshine being more than three times as many as those without. The temperatures ranges are from about 100 degrees F. as the maximum heat of the summer, to 30 degrees F. as the minimum of winter, the former for the southern counties, and the latter for the northern. The prevailing winds are from the southeast in spring and summer, and from the northwest in the autumn and winter. The average for ten years of the number of miles of wind for each season in eastern Nebraska (Lincoln) is, 28,111 in spring, 21,016 in summer, 23,586 in autumn, and 23,460 in winter.

The native trees of Nebraska have developed many devices, for the distribution of their seeds, adapted to the physical factors just described. These may be reduced to five general classes, viz.: Wings, hairs, fleshy fruits, rolling balls, edible nuts.

WINGS.

Rock Pine (**Pinus Scopulorum** (Engelm) Lemmon). Each seed is provided with a delicate membranous wing, a centimetre long and five to seven millimetres wide. When the seed drops from the cone it is given a whirling motion by a slight twist and bend in the plane of the wing, and if caught by the wind is carried a considerable distance from the parent tree. This tree occurs in the Rocky mountains from Montana to Wyoming and Colorado, and in Nebraska has pushed out upon

the foothills (Pine ridge, and Wild Cat mountains), and from these to the bluffs of the Niobrara, and North Platte rivers. From the latter it spread to scattered stations along the eastern edge of the Great Sand Hill region (Holt, Greeley, Valley, Custer, Lincoln and Franklin counties).

Basswood or Linden (**Tilia americana** L.). The wing is an extension and enlargement of the bract of the peruncle of the inflorescence. The several spherical, dry fruits at maturity are attached nearly at right angles to this wing, which is slightly bent and twisted. At maturity the bract carrying the fruits separates at its base from the tree, and when caught by the wind whirls horizontally, carrying its freight of seed-bearing fruits often to a distance of many metres from the parent tree. The linden occurs abundantly in the forests bordering the Missouri river southeast of Nebraska, and it now extends up that river along the eastern edge of the state and along the Niobrara river to Cherry county. It has also extended up the valley of the Blue and Republican rivers on the south to Jefferson county, and the Platte river in the central portion of the state, to Nance county.

The Elm (**Ulmus** spp.). The flat seed-pods are winged on their margins so that the surface is increased several times. When ripe they are very light, and are easily carried by the wind to a distance of ten to twenty or more metres from the parent tree. While great numbers fall to the ground under the tree, many are carried to a distance equal to or more than that of the height of the tree.

The White Elm (**Ulmus americana** L.) is very abundant in the valley of the Missouri river southeast of Nebraska, and thence eastward to the Atlantic ocean. From the southeastern forest body of this species it has extended up the several river valleys into all portions of the state to the western counties.

Rock Elm (**Ulmus racemosa** Thomas) occurs commonly in the forest belt bordering the Missouri river southeastward, and from this region it has moved upward along the eastern border of the state and up the Niobrara river near the northern boundary. While it has been recorded from but two stations (Cass and Keya Paha counties) it is highly probable that it occurs somewhat sparingly and perhaps intermittently along the eastern and northeastern border.

Red Elm (**Ulmus fulva** Michx.) is abundant in the Missouri river forest area, from which it has spread westward up the river valleys nearly or quite half way across the state. Beyond this area a single station is reported in Frontier county.

The Ashes (**Fraxinus** spp.). Each cylindrical seed pod is prolonged upward into a flat oar-shaped, slightly bent and twisted wing.

Where the fruit separates from its pedicel it drops with the heavier seed end down, and is given a whirling motion by the wing, and when caught by the wind is carried many metres before it reaches the ground.

White Ash (**Fraxinus americana** L.) is common in the Missouri forest area, from which it has extended up along the eastern border of the state to Sarpy county.

Green Ash (**Fraxinus lanceolata** Bork.) is common in the Missouri forest area, from which it has spread westward and northward along the river valleys, across the state to the western counties.

Red Ash (**Fraxinus pennsylvanica** Marsh.) is found with the preceding and apparently has been disseminated with it.

Red Bud (**Cercis canadensis** L.). The bean-like pods are very flat and thin, and are well adapted to be carried in the wind a few metres. It is common in the Missouri forests and has extended northwestward into Nebraska as far as Lancaster and Douglas counties.

The Maples (**Acer** spp.). The bicarpellary fruit develops two thin membranous curved and slightly twisted wings, one on the back of each carpel. At maturity the carpels split apart, and each falls slowly with a whirling motion, while the wind carries it to a greater or less distance from the parent tree. In a high wind this distance may be twenty to thirty metres, or even more.

Mountain Maple (**Acer glabrum** Torrey) is abundant in the Rocky mountains of Wyoming and southward, from which it has extended eastward into the extreme western part of the state at two stations (Sioux and Scott's Bluff counties.)

Silver Maple (**Acer saccharinum** L.) occurs abundantly in the Missouri forest area from which it has extended up the Missouri river nearly to the mouth of the Niobrara river and westward fifty to sixty miles, in the moist lands along the streams.

Box Elder or Ash-leaved Maple (**Acer negundo** L.) grows abundantly in the Missouri forests, from which it has extended across the state. As this species occurs in the Rocky mountains from New Mexico northward it is possible that some of the trees in western Nebraska have come down from the mountains and met those disseminated directly from the eastern forest areas.

Ironwood (**Ostrya virginica** (Miller) Wild.). The small nut is enclosed in a bladdery bag, which is so much larger that it serves the purpose of a wing. A dozen or more of these are aggregated into a loose strobilus. The obvious purpose of this structure is the easy

transportation of the seed by the wind either in the whole strobilus, or the separate seed-bearing bags. The tree is abundant in the Missouri forests, from which it has extended up through the eastern and northern counties to Brown, Cherry and Sioux counties.

Water Beech (**Carpinus caroliniana** Walter.). The small nut is attached to a foliaceous, somewhat three-lobed bract, which serves as a wing. These bracts are not crowded into a strobilus, but constitute a loose raceme. On falling from the tree the bracts serve to float the seed in the wind for some distance from the parent tree. This species occurs in the Missouri forests, and has been reported from eastern (Sarpy county) and northern stations (Brown county) in Nebraska to which it has apparently extended its range.

The Birches (**Betula** spp.). The little nut is winged on its margins. These grow in small cones, from which when mature they are shaken out by the wind, and carried away some distance before reaching the ground.

Canoe Birch (**Betula papyrifera** Marshall). This tree occurs in Minnesota and Montana, the Black Hills of North Dakota, and at a single station on the Iowa river in central Iowa (Hardin county). In Nebraska it is found only on the bluffs and in the ravines along the Niobrara river in Keya Paha, Brown and Cherry counties. The occurrence of this tree in Nebraska is a puzzle to the botanical geographers, for it is difficult to conceive of any means by which the seeds could be carried from the nearest known stations. Even should we consider the possibility of its dissemination from the Black Hills the difficulty is nearly as great, for the distance is fully 150 miles, a part of it across the very rough country known as the "Bad Lands."

Black Birch (**Betula occidentalis** Hook.) occurs abundantly in the Rocky mountains west of Nebraska and has extended from thence eastward into the state in Sioux county.

River Birch (**Betula nigra** L.) is found in the Missouri forests southeastward, and has extended its range northward along the eastern border of the state, being reported from Cass county.

HAIRS.

The Willows (**Salix** spp.). The bicarpellary seed-pods contain two rows of inverted seeds (anatropous), each of which develops a circular tuft of long straight ascending hairs on its funicle. Upon the dehiscence of the mature fruit the seeds are released, when the hairs

spread out almost spherically, and are caught by the winds and floated away for long distances, often a mile or more, or in high winds, many miles.

Black Willow (**Salix nigra** Marsh.) is common in the Missouri forests, from which it has spread up the streams, apparently across the state.

Almond Willow (**Salix amygdaloides** And.) is found abundantly in the Missouri forests, and has followed the river valleys across the plains to the Rocky mountains and even to Oregon.

Shining Willow (**Salix lucida** Muehl.) occurs in the Missouri forests and has moved up the river to Cass county.

Sand-bar Willow (**Salix fluviatilis** Nutt.) is abundant in the Missouri forests, from which it has extended up the river valleys, across the plains to the Rocky mountains, California and Oregon.

Bebb's Willow (**Salix bebbiana** Sarg.) is found in the Black Hills of South Dakota, and the Rocky mountains from Montana to Colorado, from which it has extended eastward so as to enter the northwest corner of the state (Dawes and Sioux counties).

Diamond Willow (**Salix missouriensis** Bebb.) is common along the Missouri river in western Missouri, from which region it has extended its range northward along the river, and westward in the Republican, Platte and Niobrara river valleys to the western border.

The Poplars (**Populus** spp.). The bi- and tricarpellary seed-pods develop two or three rows of seeds having the same general structure as those of the Willows. On the escape of the seeds they are buoyed up by the attached mass of fluffy hairs, carried away by the winds, sometimes for several miles.

Quaking Aspen (**Populus tremuloides** Michx.) is a Rocky mountain tree which has extended eastward into Nebraska but a few miles in the western counties from Banner to Sioux, Dawes and Sheridan counties.

Balsam Poplar (**Populus balsamifera** L.) occurs in the Rocky mountains of Wyoming, from which it has extended eastward into Nebraska in Sioux county.

Narrow-leaf Cottonwood (**Populus angustifolia** James) is also a member of the forests of the Rocky mountains, from which it has come eastward into Nebraska in Sioux and Scott's Bluff counties.

Rydberg's Cottonwood (**Populus acuminata** Ryd.) occurs here and there in the Rocky mountains of Colorado and Wyoming, from which it has invaded western Nebraska at one point (Scott's Bluff county).

Common Cottonwood (**Populus occidentalis** (Ryd.) Britt). is very abundant in the Missouri forests, from which it has passed up the rivers across the state to the western border and beyond.

It is now thought that our western Cottonwood is distinct from the species of the eastern states.

FLESHY FRUITS.

Red Cedar (**Juniperus** spp.). The small few-scaled cones increase their parenchymatous tissue and become fleshy, and berry-like. They are eaten by some birds and in this way the seeds are scattered.

Eastern Red Cedar (**Juniperus virginiana** L.) is found scattered over the eastern United States, and occurs in the various bodies of forests eastward of Nebraska. From these it has moved westward up the river valleys fully two-thirds of the distance across the state.

Western Red Cedar (**Juniperus scopulorum** Sarg.) occurs in the Rocky mountains, from which it appears to have moved eastward into the western third of the state.

Papaw (**Asimina triloba** (L.) Dunal). The large fleshy fruits which contain about eight large hard seeds are edible, and are picked up and carried off, or eaten directly by various quadrupeds. In either case it happens that some of the seeds are carried some distance from the parent trees. This species is very common in the Missouri forests, from which it has moved up the river valleys in southeastern Nebraska (Richardson to Pawnee, Nemaha, Otoe and Saunders counties).

Hackberry (**Celtis occidentalis** L.). The globose one-seeded fruits are fleshy, and are in fact small drupes, much like thin-fleshed cherries. They are freely eaten by birds, and thus the seeds may be carried to considerable distances (even to many miles) from the parent trees. This species occurs abundantly in the Missouri forests, from which it has extended its range up the Missouri, Republican, Platte and Niobrara river valleys, across the plains to the Rocky mountains.

Red Mulberry (**Morus rubra** L.). The compound fleshy fruit (sorosis) consists of an aggregation of small one-seeded drupes, each surrounded by the fleshy calyx-lobes. They are eaten by many birds,

and the hard seeds are voided uninjured, and thus carried far away from the parent trees. The Mulberry is found abundantly in the Missouri forests, from which it has extended northwestward along the eastern border of the state to Cedar county.

Prairie Apple or Western Crab Apple (**Malus iowensis** (Wood) Britt.). The fleshy fruit contains five two-sided carpels, and is eaten by swine, cattle, sheep, horses, and probably by deer, rabbits, woodchucks and a few other quadrupeds. Such fruits as are carried short distances and then dropped whole, or partially eaten, may supply seeds from which new trees may spring. This species is abundant in the Missouri forests, from which it has extended its range into Nebraska along the Missouri river and up the Niobrara river to Brown county. It has been distributed up the Nemaha river valey to Gage county, and the Platte river valley to Butler county.

The Hawthorns (**Crataegus** spp.). The fleshy fruits are in fact little apples with bony instead of papery carpels. The flesh is palatable and the fruits are eaten by many quadrupeds (as swine, cattle, sheep, horses, deer, rabbits, etc.) and by some birds which are attracted by the bright colors in most of the species.

Blackthorn (**Crataegus tomentosa** L.) occurs in the Missouri forests, from which it has moved up the river into the southeastern counties, from Richardson to Lancaster and Douglas.

Downy Haw (**Crataegus mollis** (T. & G.) Scheele) occurs in the Missouri forests, and has extended its range apparently with the preceding species to Lancaster and Douglas counties.

Red Haw (**Crataegus colorado** Ashe) is probably a western species which has moved down into the Sand Hill region, where it occurs along the banks of the Dismal and Middle Loup rivers in Thomas county.

Thorny Haw (**Crataegus occidentalis** Britt.) is a native of Colorado, Wyoming and Montana, from which it has moved down the Niobrara river to Cherry, Brown, Rock, Holt, Keya Paha, Boyd and Knox couties. It occurs also on the Middle Loup river in Thomas county.

Juneberry (**Amelanchier canadensis** (L.) Med.). The little hard-seeded apples have a soft edible flesh which is greedily eaten by birds. Many of the seeds pass through the ailmentary canal uninjured and are thus distributed over considerable distances. This species occurs in the Missouri forests, from which it has moved up the valley of the Missouri river as far as Sarpy county.

Cherries and Plums (**Prunus** spp.). The monocarpellary, two-ovuled ovary becomes a fleshy one-seeded drupe. The hard shell of the stone protects the seed from crushing when the fruit is eaten by birds or quadrupeds, and preserves many of the embryos while the seeds are passing through the ailmentary canal. The smaller fruits (cherries) are greedily eaten by many birds, while the larger (plums) are eaten by quadrupeds, and occasionally carried away by birds.

Choke Cherry (**Prunus virginiana** L.) is found in the Missouri forests, from which it has been carried northward along the Missouri river as far as Sarpy county, and westward in the Nemaha, Blue and Republican river valleys to Franklin county.

Wild Black Cherry (**Prunus serotina** Ehrh.) occurs in the forests of Missouri, from which it has spread into southern and eastern Nebraska, to Sarpy county along the Missouri river, and Franklin county in the valley of the Republican river.

Wild Plum (**Prunus americana** Marsh.) is common in the country east of the plains, into and across which it appears to have been carried, so that it is now found in the Rocky mountain region. It is found in all parts of Nebraska, even in the "pockets" in the Sand Hills into which it must have been carried by birds.

Kentucky Coffee Tree (**Gymnocladus dioica** (L.) Koch.). The large monocarpellary fruits (15-18 centimetres long, 4-5 wide, and nearly 2 centimetres thick) contain about half a dozen large, spherical, very hard seeds, imbedded in a sweet pulp. The ripened pods hang on the trees for a part of the winter, and when they fall are picked up by quadrupeds which are attracted by their sweet odor. The hardness of the seeds prevents their being crushed. The tree occurs in the Missouri forests, and has followed the Missouri and Niobrara rivers northwestward to Rock county. In the southeastern part of the state it has followed the smaller streams westward fifty to sixty miles from the Missouri river.

Honey Locust (**Gleditsia triacanthos** L.). The large twisted and bent monocarpellary fruits (20-30 centimetres long, 2-2.5 wide, and 0.5 thick), contain ten or more very hard, flat seeds, bedded in a sweet pulp. The pods fall from the tree during the winter and are picked up and partly eaten by the larger quadrupeds, as swine, cattle, etc., and doubtless were also by deer, buffaloes, and other wild animals before the advent of white men. The hardness of the seeds preserves them from injury. The tree is common in the forests of Missouri, and has been carried up the Missouri river and its tributaries so that now it

occurs as far west as Franklin county in the Republican valley, and Holt county along the Niobrara river. It has also passed up the Nemaha and the Blue rivers to Gage and Lancaster counties.

Buckthorns (**Rhamnus** spp.). The small drupe contains two to four very hard one-seeded stones, surrounded by a thin flesh. When these drupes are eaten by birds the seeds are preserved from injury by their hard covering.

Buckthorn (**Rhamnus lanceolata** Pursh) is common in the Missouri forests, from which it has moved up along the eastern border of the state to Cherry county on the Niobrara river. It has followed the tributaries of the Missouri river (Nemaha and Blue rivers) to Gage, and (Platte river) Saunders counties.

Indian Cherry (**Rhamnus caroliniana** Walt.) occurs somewhat sparingly in the Missouri forests, from which it has advanced into eastern Nebraska, having been noticed at two stations (Cass and Saunders counties).

Buffalo Berry (**Lepargyraea argentea** (Pursh) Greene.) The small red or amber one-seeded drupes are edible, and are eaten by birds and thus carried away. The seed is protected from injury in the alimentary canal by its hard covering. This small tree is a native of the Rocky mountain region and westward, from which it has been carried eastward across the state to the banks of the Missouri river (Nemaha county).

Sumach (**Rhus copallina** L.). The small one-seeded drupes are crimson in color and have an acid flavor. They are eaten by birds, and their seeds are protected from injury by the bony seed coat. This species occurs in the Missouri forests, and has been carried northward to the extreme southeastern corner of the state (Richardson county).

ROLLING BALLS.

Sycamore (**Platanus occidentalis** L.). The flowers grow in spherical heads, and produce compact, spherical clusters of oblong nutlets, which hang from long peduncles. When they fall from the tree (in the winter) they roll over the ground in the wind, carrying their seeds with them. These trees are common in the forests of Missouri, from which they have moved up along the eastern edge of the state to Douglas county.

EDIBLE SEEDS AND NUTS.

Buckeye (**Aesculus glabra** Willd.). The large, brown, shiny seeds drop to the ground as soon as mature, where they are quite con-

spicuous. Here they are picked up by large animals and sometimes swallowed. They are too hard to be easily masticated, and many must be rejected after trial. In the meantime they have usually been carried some distance from the parent tree. This species occurs in the Missouri forests, from which it has moved into Nebraska as far as Richardson, Pawnee, and Nemaha counties.

Walnuts (**Juglans** spp.). The large drupaceous fruits contain a bony shell (the nut) enclosing a four-lobed, edible seed. At maturity the bitter flesh rots away, leaving the nut, which is picked up by squirrels and related rodents, and carried away to be eaten at once, or hidden for future eating. Many of these are dropped on the way, or those hidden are forgotten or overlooked, so that much effective distribution of seeds has taken place.

Butternut (**Juglans cinerea** L.) is common in the Missouri forests, from which it has been carried into the southeastern part of Nebraska, as far as Gage, Johnson, Otoe and Cass counties.

Walnut (**Juglans nigra** L.) is found in abundance in the forests in the Missouri river valley southeast of Nebraska, and from here it has moved up that river and up the Niobrara valley to Cherry county. It has occupied the southeastern corner of the state, and the Republican valley to Harlan county.

The Hickories (**Cicoria** spp.). The fruits are drupes, with a hard flesh which splits at maturity into four segments and separates from the hard, smooth, but usually angled nuts, each enclosing a two- to four-lobed, edible seed. These nuts constitute the favorite food of squirrels, and are carried away and secreted in great quantities. Many of these eventually germinate and spring up into young trees.

Shellbark Hickory (**Hicoria ovata** (Mill.) Britt.) is common in the Missouri forests, from which it has been carried into the southeastern counties of Nebraska, from Gage to Cass.

Big Hickory Nut (**Hicoria laciniosa** (Michx.) Sarg.) occurs in the Missouri forests, from which it has been carried northward along the Missouri river from Richardson to Sarpy counties.

Mocker-Nut (**Hicoria alba** (L.) Britt.) occurs in the Missouri forests, from which it is reported to have moved northward into eastern Nebraska (**Sargent**).

Pig-Nut (Hicoria glabra (Mill) Britt.) is common in the Missouri forests, from which it has been carried along the Missouri river into eastern Nebraska from Richardson to Cass counties.

Bitter Hickory (**Hicoria minima** (Marsh.) Britt.) is common in the forests of the Missouri river valley, from which it has been carried northward into the southeastern counties of Nebraska from Richardson to Pawnee, Lancaster and Cass.

Oaks (**Quercus** spp.). The fruits (known as "acorns") are thin- and tough-shelled nuts, each containing a single, large, edible seed. They are relished by squirrels and other rodents, as well as by swine, cattle and sheep, and also by deer and buffaloes. All of these no doubt have contributed in some degree to their dissemination, but the squirrels have been the most active agents in this work, gathering and hiding them in many places, usually at some distance from the parent tree.

White Oak (**Quercus alba** L.) is common in the Missouri forests, from which it has been carried into southeastern Nebraska as far north as Cass county.

Post Oak (**Quercus minor** (Marsh) Sarg.) is found in the Missouri forests, from which it is reported to have moved northward into southeastern Nebraska (**Sargent**).

Bur Oak (**Quercus macrocarpa** Michx.) is abundant in the Missouri river valley forests, from which it has migrated along the river valleys fully half way across the state, reaching Harlan county on the south, Custer county in the centre and Cherry county on the north. It occurs, also, in the Black Hills of South Dakota, to which it was probably brought from the same Missouri forest area.

Yellow Oak (**Quercus acuminata** (Michx.) Sarg.), found in the Missouri forests, has reached the Platte river in eastern Nebraska.

Low Yellow Oak (**Quercus prinoides** Willd.) of the Missouri forests has barely reached southeastern Nebraska in Richardson county.

Red Oak (**Quercus rubra** L). is common in the Missouri forests, from which it has been carried northward along the Missouri river to Dixon county and westward fifty or sixty miles.

Scarlet Oak (**Quercus coccinea** Muench.) occurs in the Missouri forests, and has entered the southeastern counties of Nebraska from Richardson to Cass.

Black Oak (**Quercus velutina** Lam.) is found in the Missouri forests, from which it has moved northward along the eastern border of Nebraska to the Platte river.

Black Jack Oak (**Quercus marilandica** Muench.) of the Missouri forests, has moved into the southeastern counties of Nebraska, Richardson to Pawnee and Nemaha.

Laurel Oak (**Quercus imbricaria** Michx.) is found in the Missouri forests, from which it has moved northwestward nearly or quite to the southeastern corner of Nebraska. Although this species has repeatedly been reported from this part of the state, I have seen no specimens which were collected within our borders. I have specimens collected in Missouri but a short distance from the southeastern extremity of Nebraska.

DISCUSSION.

From the foregoing statistics it appears that of the seventeen trees whose fruits or seeds are winged, thirteen came into Nebraska from the southeast and four from the west. Of the eleven species with hairy seeds six came from the southeast and five from the west. Of the twenty species with fleshy fruits sixteen came from the southeast, and four from the west. The single species whose seeds are in rolling balls came from the southeast, and all of the species with edible nuts (eighteen) came from the southeast. The significance of these facts is not at once very obvious. They do not directly indicate the relative value of the several devices for dissemination, nor do they plainly decide the question of the efficiency of winds, waters, birds, and quadrupeds as carrying agents. Thus the fact that thirteen trees with winged fruits or seeds came from the southeast, and only four from the west, does not indicate the greater efficiency of the southeast winds over those from the west. The fact that there is a much more compact forest area, containing a greater number of species of trees of this kind a short distance southeast of the state, is of far greater importance. The nearness of a vigorous vegetation representing many species makes that vegetation more efficient in invading a territory. The Missouri forests dominate the forests of Nebraska, because they are near by, and contain many species. This is shown more emphatically in the case of the species with edible nuts, all of which have come from the Missouri forests, where they are abundant. In Wyoming and northern Colorado there are no species of this kind in the sparse forests within a hundred miles of the western border of Nebraska. There are no oaks, hickories, walnuts, or buckeyes in this portion of the Rocky mountain foothills to move eastward. On the other hand, there are species of trees having hairy seeds not only in the Missouri forests,

but also in the canyons of Wyoming, and here we find that almost one-half of our trees of this kind came from the west. It is to be remarked, however, that while five of the six southeastern species have crossed the state, the five western species have moved eastward only a few miles from the Wyoming line.

Of the thirteen southeastern species with winged seeds or fruits three barely enter the state, one has advanced one-fourth of the way across the state; three, one-half; one, two-thirds, and five to or beyond the western border. Of the four western species, two have barely entered; one has advanced half way, and one, two-thirds of the way across the state.

Of the sixteen species with fleshy fruits, seven have barely entered the state; six have advanced half way across the state; one, three-fourths, and two to the western border and beyond. Of the four western species, two have advanced about one-fourth of the way across the state; one,three-fourths, and one has reached the Missouri river.

Lastly, if we examine the eighteen species with edible nuts, all of which have entered from the southeast, we find that fifteen have barely entered the state; one has advanced nearly one-fourth of the way across the state, one, two-thirds, and one, three-fourths.

Summarizing what we have found, by assigning a definite value to the distance covered by each species and taking the aggregate of these for all the species, we find that the average of those with winged seeds and fruit is 53 per cent of the whole distance; for those with hairy seeds, 52 per cent; with fleshy fruits, 45 per cent; with edible nuts, 16 per cent; and with rolling balls, 10 per cent. We can thus express the efficiency of each device in these per cents, as follows:

Wings on seeds or fruits	53 per cent
Hairs on seeds	52 " "
Fleshy fruits	45 " "
Edible nuts	16 " "
Rolling balls	10 " "

That the migrating movement of the trees in Nebraska is still going on is attested by many observers, especially in the southeastern part of the state. The conditions under which such movement occurs are usually the following: (1) Cessation of prairie fires, (2) protection from domestic animals, (3) a forest border in a moist valley. Under such conditions the forest border becomes margined with tall-growing weeds which kill the tenacious prairie grasses, at the same time affording a lodgment for seeds of shrubs and trees. These grow, and gradually the shrubs and trees retain possession of the belt of

ground, at first to the partial exclusion of the weeds, and later to their total suppression. Still later the trees overtop the shrubs, and eventually the latter may be suppressed also. While this is happening, a new weed belt is forming in advance of the best of shrubs and young trees, thus the forest margin is continually advanced.

There are many such advancing forets borders in Nebraska. In fact, wherever the fires and domestic animals are kept out such an advance is commonly taking place. The rate of advance varies from a few feet a year to a hundred feet under favorable conditions, and in exceptional cases to several hundred feet. When it is remembered that an advance of but ten feet a year along a forest border a mile long adds a little more than an acre of woodland, even such a slow advance is seen to accomplish much. In this way in the course of a century the actual forest area may be greatly enlarged. While such a steady advance of the forest margins is now actually going on, there is another mode of distribution which is even more rapid. A seed is carried by a bird or other means to a considerable distance from the body of trees of its kind. It springs up in its new station and eventually produces seeds, and becomes a centre from which further distribution takes place. A case of this kind has been brought to my attention in recent appearance of the Linden tree (**Tilia american**) in the vicinity of Lincoln.

In the western part of Nebraska the present spreading of the Rock Pine (**Pinus scopulorum**) is quite noticeable. It is not uncommon to find young trees considerably in advance of the older trees of the sparse forests, around which are many small trees which have sprung up from the young parent trees.

PARK PLANTING.

It is an interesting sign of better times to see the advancing tide of interest that is now showing in the way of improving our cities and school grounds by the planting of trees.

Our cities are coming to see the need more and more of providing a breathing place and pleasure grounds for their citizens, and to that end are doing a good work in the way of park making.

The ideal city should have one of these parks in every portion of the city where residences abound. To secure such park sites it is very essential that our city councils act promptly and early in securing them before the advancing price of real estate makes their purchase well nigh impossible.

A state park is a laudable enterprise toward which our legislatures should direct their ambitions and votes. The State Park and Forestry Association of Nebraska has been advocating a state park to be located at the capitol city (Lincoln) and it is only a question of a few years probably, at most, when this ideal of our enterprising citizens shall be realized.

Here ground should be provided in large enough tracts to justify the name of a state park and the plans for trees and shrubs should be designed by a competent landscape gardener.

PUBLIC SCHOOL PARKS.

Where interest is lacking in a city to secure the needed money or land to build a park upon our public schools will furnish a ready starting place for such an enterprise. Our school children may often serve as levers to lift up or direct the energies of the older people toward better things.

They take kindly and easily to modern ideas of improving their school grounds, and should be encouraged in every way to go forward in their work.

In the city of Joliet, Ill., the high school grounds have been planted to trees and shrubs in a park plan by the children under the care and aid of the school board and janitor. The grounds comprise about fifteen acres and are thus ample to afford a park in which the entire city should be interested.

This school park was started by accident, as it were, through the incident of the planting of some peach pits by the janitor. These pits were planted in the back ground near the border of the grounds and were allowed to grow to bearing age. The children were interested of course in the picking of the fruit from these trees and from this beginning they were led to the planting of a school nursery, where flowers and tree seeds were planted and cared for. From this nursery in a few more years trees were taken to be planted in the school grounds and also at the home of many of the children. Through this youthful influence the parents were interested in tree planting and many homes were made brighter and better thereby.

Th children were zealous for the care of the grounds and if a stranger or rude boy was seen to harm a tree or pluck a flower he was quickly reported to those in authority.

This city is but an example of what any of our western cities may do through their school children under a little wise direction on the part of the teachers or school board.

A SCHOOL PATRONS' MEETING.

In the city where I reside, with a popuation of about 2,500, we organized a school patrons' association last winter that has proved to be an interesting and profitabe means for aiding and encouraging the work and management of our public school.

We meet every month in our high school room and listen to an address by some leading school worker, or a paper prepared by one of the patrons, which is made the subject for general discussion. Our program is spiced also with song and an occasional reading or recitation by the young people. At our last meeting we listened to an address by Professor Miller of the forestry department of the state university. He told us of the example of the city of Joliet, Ill., which I have already described. With this address as an incentive we will plan to perfect an organization next month to take up the work of school parks and street tree planting.

These organizations are being perfected in many of our cities under the name of Civic Improvement societies.

Prof. Miller told us of one of these societies in the east that was composed entirely of women, but had done a very large work in the way of park and tree planting throughout their city.

CO-OPERATION IN SPRAYING.

A citizen of our capital city inquired of me recently as to the cost of spraying an orchard.

I gave him the figures that our commercial orchardists usually estimate of 3 or 4 cents per tree for each spraying. "Where could I get some one to do this spraying for me?" said he. "I would be willing to pay 50 cents per tree for the season and have my orchard sprayed thoroughly and at the right time." I replied that I would be glad to do the work for him at those figures could I spare the time at the right season to do the work. I referred him to one of our orchardists who uses a sprayer and suggested he might make terms with him for doing the work.

This business man's dilema is but a sampe case of the difficulty experienced by hundreds of our fruit growers who have not the experience or the time needed to perform this important function to successful orcharding. This same trouble is affecting the general farmer who has a small orchard that is ony made a side issue to his regular farm work. If such persons would combine together and hire either one of their own number or a man of the right ability outside of their circle to perform this spraying for them under a specific contract it would afford a relief to this one great trouble of the fruit grower. The fruit grower has other troubles, it is true, but there is no one that concerns him half as much or should so concern him, as the destruction of the noxious insects that are ever ready to prey upon his orchards and vineyards; and also the prevention of the fungus diseases that are so menacing to the health and even the very life of his orchard. Our commercial orchardists who make this their mainstay for a living are very much alive to the need for these two lines of spraying. They can and will afford, if they are up-to-date, a good machine to do their own spraying. But for the smaller orchards of from one to five or even ten acres it will be a wise and practical plan to co-operate in their spraying work.

COVERING STRAWBERRIES.

The season is at hand when the strawberry bed is ready for its winter covering. Such weather as we are having at the time of this writing, however, does not make one feel or think of going into winter

quarters, for I am sitting very comfortably in my shirt sleeves in a room without a fire, and have been at work all day without a coat. These are exceptional days, however, for the middle of November. Frosty nights are the rule for this season, and we must remember that it is the alternate freezing and thawing of the ground about the strawberry crowns, that works the injury to the plants.

If our weather was such as to insure a constant freezing temperature from this time forward until the first of April, we would have no need for protecting the strawberry bed.

With plenty of moisture in the ground such as we have at the present time our plants should go through the winter in good condition with a very slight covering of straw or hay. It is the dry, open winter that is most damaging to all forms of small fruits and nursery stock.

What shall we cover our beds with, is a question to be determined largely by the material that is available for this use. Clean wheat straw is usually the best and cheapest, and has the additional advantage of being easily and quickly spread. Oat straw would do equally as well were it well threshed, so as to be free of grain. It has a higher value than wheat straw for feeding and so can not be considered as cheap for covering. Wild hay is good if it can be found free of noxious weeds, though it does not spread as nicely as straw. Some strawberry growers cut a waste field of grass early enough to avoid the ripening weeds and let it lie on the ground until ready for use in the fall. Again, many commercial growers use coarse stable manure as a covering, and thus secure the benefit of it as a fertilizer as well as a protection in winter. I have used it for many years exclusively, and like it specially for its manuring qualities. As a covering it has its faults because of the danger of getting it too thick in places and so smother the crowns. I have often had the plants weakened in the crown by the use of fresh, fine manure. Weeds are also very apt to creep into our beds through the use of manure, especially where timothy and clover have been used for feeding. For my use this fall I have bought a stack of wheat straw at 50 cents a load and have it hauled and placed at margin of my bed ready for spreading at the first needy and convenient time.

As a general rule I do not begin covering my beds until the ground is frozen enough to bear up a loaded wagon. So, as soon as we have a good freezing night I am ready to go to work and spread rapidly the straw now ready at hand. Barely enough straw to hide the foliage is all that is needed.

BULLETIN NO. 2, OF THE NEBRASKA STATE HORTICULTURAL SOCIETY, WITH VOL. 37, 1906.

It is the intention of the Nebraska State Horticultural Society, now that we have established an open office in the Capitol building, at Lincoln, to issue monthly bulletins of current interest on general horticultural matters. The bulletins of each month will deal with work appropriate for that month.

Bulletin No. 1 contains a list of the different fruit districts of the state, with a list of fruits and ornamentals recommended for planting in each district. Extra copies of these bulletins may be secured by addressing the secretary.

Membership in the society is open to all who are interested in horticulture. The fee for annual membership is $1.00, for life membership, $5.00. For further information, address the secretary.

L. M. RUSSELL,
Lincoln, Neb.

PICKING, PACKING AND SHIPPING FRUIT FOR EXHIBITION PURPOSES.

By J. H. Hadkinson, Benson.

Picking and preparing fruit for exhibition purposes is an art that can be mastered only with practice and careful observation.

An exhibitor looks at his fruit on the tree or bush and says to himself, "Well, I have got some good apples," pears, plums or peaches, as the case may be, and feels that if he exhibits his fruit, he is sure of a premium. He goes to work and picks, generally packing the fruit loosely in a box or basket, as comes handiest to him, never thinking that shipping fruit loosely will bruise it, and the judge of the exhibit will not take into consideration the cause of these bruises when comparing this with the other exhibition fruit, which the judge himself will admit is smaller or slightly inferior in some other way, but not so much so as to be equal to the bruises, therefore, winning out and the exhibitor with the bruised fruit feels hurt.

The following recommendations for picking, collecting, etc., may be applied to single as well as collective exhibits. When one has made up his mind to exhibit (which ought to be at an early date, for we are

all interested in showing what Nebraska can do in horticulture,) he ought to study thoroughly the rules for judging single and collective exhibits, scale of points attached to Summer, Fall and Winter varieties, then make a list of what he wishes to exhibit.

The rules for judging and scale of points for varieties will be found at the end of this bulletin.

Pick your specimens, one by one, placing carefully in a shallow basket, one layer thick. If fruits are soft and liable to bruise, place some soft material in the bottom of the basket to prevent bruising. Then take the fruit to the house or cellar and place it carefully on a table covered with soft material to prevent bruising. Then compare list previously prepared, and pick out varieties for single entries first, then varieties for collections. When they are made up, pack the fruit in box or boxes,—bushel apple boxes are good for pomaceous fruits. The lumber in the sides of these ought never to be less than three-eighths of an inch thin, and if thicker, it is too heavy. If bushel apple boxes are not handy, empty cracker boxes are good substitutes. Never use berry crates, as they bruise a row all around in handling, and you have only about one-third left in the center fit for exhibition.

Peach baskets or boxes are recommended for peaches, and plum baskets for grapes. Always pick more fruit than you need for the exhibition, and always pack a few more than the collections or single entries call for, in order to guard against any mishap between leaving home and exhibition table.

Pack collections by themselves and mark same on the box either by a number, which number and list ought to be taken in memorandum book or paper.. This method facilitates matters when the friut arrives at the exhibition space, and if exhibit is shipped in care of the superintendent of the exhibit, this list ought to accompany the letter sent to notify the person in charge of the exhibit when it is shipped. If single entries are packed together, place ripe kinds of fruit in boxes by themselves,—not hard and soft varieties together. Take a list of them as recommended for collections.

It is a good plan to wrap all soft fruits and specimens commencing to ripen, first with tissue paper, then with oiled paper if it is to remain packed for any length of time. If it is for a short shipment, and the fruit is medium hard, newspaper will take the place of oiled paper. Newspaper and excelsior are fine materials for filling in between fruits, which should always be packed tightly. If barrels are used, place a layer of excelsior or crumpled newspapers in the bottom and one on top also, and when filling the barrel, place excelsior or crumpled newspaper around the inside of the barrel. Newspaper is no good if placed either

in the bottom, or top, or around the sides, if it is put in sheets, as it does not save any bruising.

If grapes are to be kept in storage before being exhibited, they should be wrapped in tissue paper first, then oiled paper, and packed in baskets with either cheap cotton batten or fine excelsior between the bunches.

Mark plainly all packages with name of shipper, and number or name of varieties, either on outside or on memorandum in the top of the package. Ship early fruits, by express, prepaid, to the

LINCOLN ICE & COLD STORAGE CO.,
Lincoln, Neb.

Be sure to mark on outside, "For State Fair." If fruit is shipped direct to the Fair Grounds, the name of the exhibitor should be on the outside, and it should be marked, Care of

L. M. RUSSELL,
Horticultural Hall, State Fair Grounds,
Lincoln, Neb.

If these suggestions are followed, I can truthfully say that few exhibitors will be disappointed. We earnestly request you to become an exhibitor, also a member of this society.

STATE FAIR PREMIUM LIST

RULES AND REGULATIONS FOR FRUIT AND FLORAL EXHIBITS

REGULATIONS:

1. All entries for exhibition at the Horticultural meeting shall be in place on or before 8:00 o'clock a. m. of Monday, the opening day of the meeting to the public.

2. All fruits and flowers (except cut flowers and cold storage fruits) not in place by 8:00 a. m. Monday, will be barred from competition. Cold storage fruit to be in place by 6 p. m. Monday.

3. Fruits must be grown in the state, and must be correctly named and labeled.

4. Fruits and flowers competing for the same premiums must be arranged, as near as may be, together.

5. Collections of fruit must embrace at least five different varieties, and not less than five specimens of each variety, and arranged in a body or group.

6. The collection of fruits, Lots 1 and 2, shall be separate and distinct from each other and minor exhibits, but must be exhibited by the party growing or in the name of the county horticultural or pomological society of the county in which grown.

7. Seedlings must be characterized for excellence equal at least with those of established varieties of same grade and season before being entitled to recognition by the Society.

8. Articles on exhibition or occupying space in hall can not be removed during meeting except by special permit of the President. This rule is intended to prevent mere sale stands in the hall, or sale of articles on exhibition.

9. All fruits obtaining premiums becomes the property of the Society, to be sent elsewhere for exhibition, or to be disposed of as the Board of Directors may determine.

10. All fruits or other articles in competition for the same premium must be arranged together in groups. This can not be varied

from. When not otherwise specified, there must be five perfect specimens of fruit on each plate, no more and no less. No duplicates of any kind will be tolerated.

11. When there is but one exhibitor competing for a premium, judges may at their option, recommend one premium, second, or first, as merit may warrant.

12. All exhibits must remain on exhibition until 4:30 p. m. of the last day of the meeting, or premiums are forfeited.

RULES FOR JUDGING FRUITS, WITH A SCALE OF POINTS.

General Rules.

1. In all cases the judges are to be governed by the letter and spirit of the schedule under which exhibitors have made their entries. The general appearance of the fruit, care in its selection, and taste displayed in its arrangement or grouping, each entry being distinctly separated from the rest; these are all elements of the highest importance, and should receive appropriate consideration by the committee.

2. In every group, whether the single plates, the threes, fives, tens, or larger collections of fruits, there should never be more than one plate of any variety in any one group. Lists of names of varieties exhibited shall accompany each group and must be attached to the entry card, and have a corresponding number and designation—with or without exhibitor's name, according to rule.

3. The same plate of fruits can not compete for different prizes, though the several entries for the best ten, five, or other numbers, and the best plate, may embrace the same varieties, but not the same plates of specimens. In each case they must be duplicates, and in sweepstakes they will count for a single variety.

4. When the schedule prescribes the number of each kind, usually three to five, to be placed on exhibition, the exact number must be presented.

5. In general collections of fruit by individuals, counties, or otherwise, when the several species of fruits are specified in the schedule, they must be presented, or the collection may be passed by the committee.

6. In all cases, but more especially in the display, or greatest and best collections, number of varieties is the **prima facie** test of superiority, other things being equal; but quality, relative value, their perfect con-

dition and tasteful appearance will be considered, and should rank thus, respectively: **First,** number; **second,** quality or value; **third,** condition, approaching perfection; **fourth,** taste in display. To illustrate on a scale of ten:

No. 1 may have 100 plates, the largest collection.....10
Quality; some inferior varieties..... 5
Condition of fruit; rather poor..... 5
Taste in display..... 5

Total 25

No. 2 may have 90 plates ranking..... 8
Quality; superior in most, ranking..... 8
Condition of fruit; perfect, ranking..... 10
Taste in the arrangement; good, ranking..... 9

Total 34
No. 2 would in this case take the premium.

In the case of single plates of the several kinds named, or in a competition for the best plate or basket of any kind of fruit, we may consider condition, form, size, color, and texture, with flavor.

On the same scale we may have two entries to decide, thus:

No. 1; condition perfect.....10
Form; abnormal 8
Size; overgrown 10
Color; perfect 10
Texture and flavor; superior.....10

Total 46

No. 2; condition, stem lost..... 8
Form; perfect 10
Size; uneven 6
Color; too pale 6
Texture and flavor; insipid..... 5

Total 35

This scaling might be used in deciding between any number of single plates of designated varieties competing with one another for

the best plate of any kind, or for the basket premium with assortment of single variety, according to the words of the schedule.

Special Rules.

The judges shall have an ideal standard of perfection in all cases, made up of the following particulars:

1. The condition and general appearance of the fruit, which must be in its natural state, not rubbed or polished, nor speckled, bruised, wormy, or corded; with all its parts, stem and calyx segments, well preserved, not wilted or shriveled, clean.

2. The size, in apples and pears, particularly, should be average, neither overgrown or small. The specimens should be even in size.

3. The form should be regular, or normal to the variety, and the lot even.

4. The color and markings, or the surface, to be in charcter, not blotched nor scabby.

5. When comparing different varieties, and even in the same kind grown on different soils, the texture and flavor are important elements in coming to a decision. Five points.

6. It shall be the duty of the superintendent to appoint two assistants, and they, acting in the capacity of a committee, shall remove all fruit not in a fit condition for exhibition at any time during the progress of the exhibition.

7. No more than one plate of seedlings of any variety of fruit shall be recognized by the judges in any individual or county display when awarding premiums.

In the class peaches and plums, etc., the important elements are size, form, color, flavor and condition. Five points.

In grapes we must consider and compare the form and size of the bunches, the size of the berries, their color, ripeness, flavor and condition. Five points.

In currants we shall have to examine the perfection and size of the bunches, and of the berries, their flavor and condition. Three points.

In gooseberries we shall have to look at the size, color, flavor and condition of the fruits. Four points.

In judging cherries we have as our guide the size and form, color, flavor, and condition. Four points.

In judging strawberries we shall compare the size and form, color, flavor, firmness and condition. Five points. They shall be shown with stem and calyx.

Raspberries may be shown with or without the calyx. In this fruit we shall have to judge of the size, color, flavor and condition. Four points.

Blackcaps must have size, color, flavor and condition. Four points.

Blackberries must be tested according as they present size, color and form, flavor and texture and condition. Four points.

In all cases it is well to have a convenient scale of comparison, for which the number ten is found to be easily managed. The highest figure denotes perfection of the variety, and five is mediocre; below that is condematory. The total of the marks should exceed fifty per cent of the possible number, or the entry must be passed as unworthy of award.

Seedlings having once been presented, and failing of recognition under the rules of the society, shall not again be presented.

Any one having fruit which they wish to keep in cold storage for the State Fair may do so by expressing it, prepaid, to Lincoln Ice & Cold Storage Co., Lincoln, Nebraska.

Be sure to mark this fruit "For State Fair."

The Horticultural Society will pay storage on same and have it delivered to the fair grounds at the proper time.

SCALE OF POINTS FOR VARIETIES OF APPLES.

In cases where premiums are offered on collections of variety of apples, no variety shall be credited at more than the number of points given in the following list:

Alexander, F	
Arkansas Black, W	3
American Russett, W	2
Autumn Strawberry, F	6
Autumn Swaar, F	8
American Summer Pearmain, S	4
Baldwin, W	5
Bailey Sweet, F	4
Brittle Sweet, F	2
Ben Davis, W	10
Benoni, S	5
Back Twig, W	5
Bottle Greening, W	4

Cayuga, F 4
Chenango, S 6
Coles Quince, S 5
Colvert, F 4
Cooper, S 2
Day, F 4
Domine, W 6
Duchess, S 10
Dyer, F 6
Early Harvest, S 5
Early Pennock, S 5
English Golden Russet, W 4
Fallawater, W 4
Fall Orange, F 4
Fall Wine, F 3
Fall Winesap, F 5
Fameuse, F .....
Flora Bell, F 5
Fulton, F 8
Fulton Strawberry, F 6
Gabriel, F 3
Gano, W 10
Genet, W 8
Glori Mundi, F 3
Grimes' Golden, W 10
Haas, F 5
H. Nonesuch, W 5
Ingram, W 5
Iowa Blush, F 5
Isham Sweet, F .....
Jonathan, W 10
Keswick, F 4
King of Tompkins County, W 4
Lansingburg, W 3
Lawver, W 2
Little Romanite, W 5
Lowell, F 5
Maiden Blush, F 8
Mann, W 4
Milam, W 5
Minkler, W. 8
Missouri Pippin, W 8
McIntosh, F 5

McMahon White, F 5
New Town Pippin, W 4
Northern Spy, W 6
N. W. Greening, W 5
Ortley, W 3
Otoe, W 4
Patten's Greening, W 4
Peck's Pleasant, F 2
Penn, Rew Streak, F 3
Perry Russet, W 3
Pewaukee, W 4
Plums' Cider, F 5
Porter, F 8
Pound Sweet, F 4
Price's Sweet, F 5
Ramsdell's Sweet, F 6
Rambo, F 5
Red Astrachan, S 4
Red June, S 2
Rome Beauty, W 6
Roman Stem, W 8
Roxbury Russet, W 4
R. I. Greening, W 2
Salome, W 8
Saxton, F 3
Scott's Winter, W 3
Sheriff, W 3
Sops of Wine, S 3
Spitzenburg, W 3
Smith's Cider, W 5
L. Romanite, W 3
St. Lawrence, F 3
Stark, W 5
Summer Hagloe, S 4
Striped Gilliflower, F 3
Summer Queen, S 2
Sweet June, S 5
Trenton Early, S 5
Tetofsky, S 4
Talman Sweet, W 3
Utter, F 10
Virginia Beauty, W 5
Winesap, W 10

Willow Twig, W 2
W. W. Pearmain, W 3
Walbridge, W 5
Winter Swaar, W 4
Wagner, W 3
Windsor, W 5
Wyeth, F 4
Wealthy, F 10
Warfield, F 5
Wolf River, F 4
York Imperial, W 5
Yellow Bellflower, W 3
Yellow Transparent, S 8

CLASS I.—Green Fruits.

Lot 1.

For the best and largest collection display of fruits by one individual, in quantities as provided by rules of the Society, not less than 30 varieties $25
For second best display 20
For third best display 15
For fourth best display 10
For fifth best display 5

Lot 2.

For the best and largest collection and display of fruits by a county society in quantities as provided by the rules of the Society, to be not less than 50 varieties $30
For the second best display 25
For the third best display 20
For the fourth best display 15
For the fifth best display 10

Lot 3.

(To be distinct from above lots.)

	1st Pre	2d Pre	3d Pre	4th Pre
Best 50 plates summer and fall apples, any variety or varieties. Display and condition to rule	$10	$7	$5	$3

50 plates summer and fall apples, any variety or varieties, to be rated and judged by score card..	10	7	5	3

	1st Pre	2d Pre	3d Pre	4th Pre
Best collection Nebraska grown summer apples, 5 varieties	$ 5	$3	$2	..
Collection autumn apples, 10 varieties	8	5	3	..
Collection Nebraska grown autumn apples, 5 varieties	5	3	2	..
Collection Nebraska grown winter apples, 20 varieties	10	7	5	3
Collection Nebraska grown winter apples, 10 varieties	8	5	3	..
Collection Nebraska grown winter apples, 5 varieties.	5	3	2	..
5 specimens Autumn Swaar	2	1	..	..

	1st Pre	2d Pre	3d Pre
5 specimens Benoni	$2	$1	..
5 specimens Bailey Sweet	2	1	..
5 specimens Ben Davis	2	1	..
5 specimens Chenango	2	1	..
5 specimens Cole's Quince	2	1	..
5 specimens Cooper	2	1	..
5 specimens Dyer	2	1	..
5 specimens Early Pennock	2	1	..
5 specimens Fallawater	2	1	..
5 specimens Fall Winesap	2	1	..
5 specimens Fameuse	2	1	..
5 specimens Fall Orange	2	1	..
5 specimens Flora Bell	2	1	..
5 specimens Fulton	2	1	..
5 specimens Fulton Strawberry	2	1	..
5 specimens Gano	2	1	..
5 specimens Genet	2	1	..
5 specimens Grimes	2	1	..
5 specimens Haas	2	1	..
5 specimens Hubbard's Nonesuch	2	1	..
5 specimens Isham's Sweet	2	1	..
5 specimens Iowa Blush	2	1	..
5 specimens Jonathan	2	1	..

5 specimens Lawyer	2	1	..
5 specimens Lowell	2	1	..
5 specimens Little Romanite	2	1	..
5 specimens Mann	2	1	..
5 specimens Maiden's Blush	2	1	..
5 specimens Mammoth Black Twig	2	1	..
5 specimens McIntosh Red	2	1	..
5 specimens McMahon White	2	1	..
5 specimens Minkler	2	1	..
5 specimens Missouri Pippin	2	1	..
5 specimens Northern Spy	2	1	..
5 specimens N. W. Greening	2	1	..
5 specimens Oldenburg	2	1	..
5 specimens Ortley	2	1	..
5 specimens Otoe Red Streak	2	1	..
5 specimens Pewaukee	2	1	..
5 specimens Plum's Cider	2	1	..
5 specimens Porter	2	1	..
5 specimens Pound Sweet	2	1	..
5 specimens Rambo	2	1	..
5 specimens Rome Beauty	2	1	..
5 specimens Roman Stem	2	1	..
5 specimens Salome	2	1	..
5 specimens Sheriff	2	1	..
5 specimens Stark	2	1	..
5 specimens Striped Gilliflower	2	1	..
5 specimens St. Lawrence	2	1	..
5 specimens Summer Hagloe	2	1	..
5 specimens Summer Queen	2	1	..
5 specimens Tetofsky	2	1	..
5 specimens Trenton Early	2	1	..
5 specimens Utter	2	1	..
5 specimens Warfield	2	1	..
5 specimens Wealthy	2	1	..
5 specimens Willow Twig	2	1	..
5 specimens Winesap	2	1	..
5 specimens Winsor	2	1	..
5 specimens Wolf River	2	1	..
5 specimens Wyeth	2	1	..
5 specimens Yellow Bellflower	2	1	..
5 specimens Yellow Transparent	2	1	..
5 specimens York Imperial	2	1	..

Lot 4—Pears.

	1st Pre	2d Pre	3d Pre
Best collection Nebraska grown pears 3 varieties	$6	$3	$2
Plate 5 specimens Flemish Beauty	2	1	..
Plate 5 specimens Bartlett	2	1	..
Plate 5 specimens Clapp's Favorite	2	1	..
Plate 5 specimens Seckel	2	1	..
Plate 5 specimens Duchess d'Angouleme	2	1	..
Plate 5 specimens Kieffer	2	1	..
Plate 5 specimens Louise B. De Jersey	2	1	..
Plate 5 specimens Beaurre Hardy	2	1	..
Plate 5 specimens Sheldon	2	1	..
Plate 5 specimens Tyson	2	1	..

Lot 5—Peaches.

	1st Pre	2d Pre	3d Pre	4th Pre
Best collection Nebraska grown peaches	$15	$10	$5	$3

	1st Pre	2d Pre
Best plate 5 specimens seedling peaches	$2	$1
Plate 5 specimens Alexander	2	1
Plate 5 specimens Champion	2	1
Palte 5 specimens Bokara No. 3	2	1
Plate 5 specimens Coolridge's Favorite	2	1
Plate 5 specimens Elberta	2	1
Plate 5 specimens Early Rivers	2	1
Plate 5 specimens Hale's Early	2	1
Plate 5 specimens Heath's Cling	2	1
Plate 5 specimens Hill's Chili	2	1
Plate 5 specimens Russell	2	1
Plate 5 specimens Salway	2	1
Plate 5 specimens Triumph	2	1
Plate 5 specimens Wager	2	1
Plate 5 specimens Wright's Seedling	2	1

Lot 6—Plums.

(12 specimens to each plate.)

	1st Pre	2d Pre	3d Pre
Best collection Nebraska grown plums	$5	$3	$2
Plate German Prune	2	1	..
Plate Imperial Gage	2	1	..
Plate Lombard	2	1	..
Plate Wild Goose	2	1	..
Plate Miner	2	1	..
Plate Forest Garden	2	1	..
Plate Wolf	2	1	..
Plate Wyant	2	1	..
Plate Hawkeye	2	1	..

New seedlings must have superior merit equal to any named varieties in cultivation.

Lot 7—Apricots.

	1st Pre	2d Pre	3d Pre
Best plate of Apricots, Nebraska grown	$3	$2	..

Class 1—Discretionary. In Class 1 the sum of $25 shall be set aside to pay premiums on meritorious fruit. The sum of $25 for same purpose in Class 2.

CLASS 2—Grapes.

Lot 1.

	1st Pre	2d Pre	3d Pre
Best collection of grapes, not less than ten varieties, 5 clusters each	$15	$10	$ 5
5 varieties for market profit to rule	3	2	1
5 varieties for table, quality to rule	3	2	1
5 bunches Agawam	2	1	..

5 bunches Brighton	2	1	..
5 bunches Concord	2	1	..
5 bunches Cottage	2	1	..
5 bunches Delaware	2	1	..
5 bunches Duchess	2	1	..
5 bunches Elvira	2	1	..
5 bunches Empire State	2	1	..
5 bunches Herbert	2	1	..
5 bunches Jefferson	2	1	..
5 bunches Lady	2	1	..
5 bunches Lindley	2	1	..
5 bunches Moore's Early	2	1	..
5 bunches Niagara	2	1	..
5 bunches Perkins	2	1	..
5 bunches Pocklington	2	1	..
5 bunches Telegraph	2	1	..
5 bunches Wilder	2	1	..
5 bunches Woodruff Red	2	1	..
5 bunches Worden	2	1	..
5 bunches Wyoming Red	2	1	..

CLASS 3—Floral.

SPECIAL RULES GOVERNING PLANT EXHIBIT.

1. All plants in this class must have been owned by the exhibitor at least three months before exhibition.

2. In competition for premiums on best collection and display of plants grown in pots, it shall be discretionary with the exhibitor as to the number used in varieties or species.

3. In collections of plants grown in pots, exhibitor must use but one variety, or species, except in general collections.

4. Collections to be grouped separately, except in the general collections and display.

5 All exhibits, except cut flowers, must be in the hall by 8:00 a. m. Monday, and arranged in place, and awarding committees will go over them the next day.

Cut flowers to be in place by 2:00 p. m. Tuesday, and awarding committee will go over them at 2:30 p. m. of the same day.

6. The awarding of the premiums on plants and cut flowers shall be made by one disinterested expert, to be selected by the Board of Directors.

SPECIAL RULE.

No plants shall be sold or taken from the exhibit until Friday of the Fair under penalty of forfeiture of all premiums to the exhibitor.

7. Where the word "variety" is used, it shall be understood to mean any one-named sort.

8. Interference with awarding committee when at work is forbidden, and all premiums previously awarded shall be forfeited and exhibitor barred from further competition.

9. All plants must be correctly named.

10. The awarding committee shall have power to withhold premiums from anything not worthy.

All the above rules must be strictly adhered to or exhibitor will be disbarred.

All florists desiring space in Floral Department in Horticultural Hall shall be required to file written application for space. Said application must reach Secretary's office seven days previous to first entrance day of Fair. No space to be allotted unless this rule is complied with.

Immediately upon receipt of applications the Superintendent will divide space equally into as many divisions as there are exhibitors, and shall number said divisions 1, 2, 3, etc. These divisions shall be allotted in the following manner:

The Secretary and Superintendent shall prepare two boxes. Into one will be placed the names of exhibitors and into the other the numbers 1, 2, 3, etc. They will then draw one name from box of names and one number from box of numbers, and such number shall be the division that exhibitor whose name has been drawn shall occupy, and they shall continue to draw in like manner until all spaces have been assigned.

Boxes must be well shaken and raised high in air before drawing.

All space in cut-flower department must also be applied for and distributed in manner as above designated.

After drawing has been completed, the Secretary will immediately notify all exhibitors what space they are to occupy and as near as possible state number of surface feet.

Secretary is instructed to send copy of above rules to all florists in the state three weeks prior to first day of Fair.

Recommended by H. S. Harrison, Superintendent, and approved by the Executive Board of the Nebraska State Horticultural Society.

L. M. RUSSELL, Secretary.

Scale of points to govern awards on collections and specimens on blooming plants in Class 3, Lot 1:

Condition	20
Bloom	20
Variety	20
Arrangement, display and effect	15
Value	20
Size, as regards specimens	10
	100

Scale of points to govern Class 3, Lot 2:

Condition	20
Quality	20
Arrangement	20
Value	20
Number of named varieties	20
	100

Scale of points to apply to all collections and specimens other than blooming plants in Class 3, Lot 1:

Condition	20
Variety	20
Arrangement	20
Value	20
Size, as regards specimens	20
	100

Scale of points to govern Class 3, Lot 3:

Taste in arrangement	30
Quality	30

Value	20
Condition	20
	100

Precedence must be given to scale in order named.

	1st Pre	2d Pre	3d Pre	4th Pre
Best grown collection and display green house plants in pots	$45	$35	$25	$20
Grown 5 specimens palms	10	5	3	2
Grown display of tuberoses	3	2	..	..
Grown collection of ferns and selaginellas	10	5	3	2
Grown collection largest rex begonia	3	2	1	..
Grown collection flowering begonias	3	2	1	..
Collection carnations in bloom	8	5	3	1
New and rare plants	3	2	1	..
Roses in pots	8	5	3	..
Pair hanging baskets	3	2	1	..
Bed of geraniums planted outside, equal to eight feet in diameter	8	5	3	..

Lot 2—Cut Flowers.

	1st Pre	2d Pre	3d Pre	4th Pre
Best collection of cut flowers, to be judged where displayed, and a space of twenty square feet to be allowed to each exhibitor	$ 8	$ 5	$ 3	..
Collection of roses, 12 of a kind, not less than 5 varieties	8	5	3	..
Collection carnations, not less than 6 varieties, 12 of each	5	3	2	..

Lot 1.

Lot 3—Floral Designs.

	1st Pre	2d Pre	3d Pre	4th Pre
Best floral design	$20	$15	$10	$ 5
Basket of cut flowers	5	3	2	..

Floral wreath	5	3	2	..
Bouquet	5	3	2	..
Best grown 5 specimens variegated foliage plants.	8	5	3	..
Grown collection of palms	25	15	10	5

PREMIUM LIST FOR WINTER MEETING.

WINTER OF 1905-1906.

CLASS 1—Green Fruits.

Lot 1.

	1st Pre	2d Pre	3d Pre	4th Pre
Best 50 plates Nebraska grown winter apples, 3 or more varieties, to be judged by scale, of points	$10	$7	$5	$3
Best collection 5 varieties Nebraska grown winter apples, to be judged by scale of points	5	3	2	..

Lot 2.

	1st	2d	3d
	1st	2d	3d
Best 5 specimens Baldwin	$2	$1	..
5 specimens Ben Davis	2	1	..
5 specimens Domine	2	1	..
5 specimens Gano	2	1	..
5 specimens Genet	2	1	..
5 specimens Grimes Golden	2	1	..
5 specimens Jonathan	2	1	..
5 specimens Mann	2	1	..
5 specimens M. B. Twig	2	1	..
5 specimens Minkler	2	1	..
5 specimens Mo. Pippin	2	1	..
5 specimens Northern Spy	2	1	..
5 specimens N. W. Greening	2	1	..
5 specimens Rome Beauty	2	1	..
5 specimens Roman Stem	2	1	..
5 specimens Salome	2	1	..
5 specimens Stark	2	1	..

5 specimens Virginia Beauty	2	1	..
5 specimens Willow Twig	2	1	..
5 specimens Winesap	2	1	..
5 specimens Winsor	2	1	..
5 specimens Yellow Bellflower	2	1	..
5 specimens York Imperial	2	1	..

Class 2—Cut Flowers.

	1st Pre	2d Pre	3d Pre
Best vase American Beauties	$8	$5	$3
Vase roses	8	5	3
Vase carnations	5	3	2
Vase violets	4	3	1

TWO DISEASES OF PINES.

By G. W. Pearson.

This paper will discuss only two pine diseases, namely, the "damping off" disease, and a new leaf disease which has, as yet, no recognized name. Both of these diseases attack pines in their seedling stage, and both are causing more or less trouble in growing pine seedlings in this state.

THE "DAMPING OFF" DISEASE.

The disease commonly known as "damping off" is very destructive to young pines from the time they first come up until they are three or four weeks old, there being comparatively little damage after they are one or two months of age. On the forest reserve at Halsey, the Jack Pine has proven to be the most susceptible, as high as 75 per cent of the seedlings in Jack Pine beds being lost in some cases, while, of the Bull Pine, only about 10 per cent are lost.

The disease manifests itself by the sudden wilting of the young plants. After examination it is found that the trouble is caused by a fungus which attacks the stem just above the surface of the soil, destroying the fundamental tissue, and thus cutting off the water supply from the upper portion of the plant. The work of the fungus is very rapid, an entire bed often being destroyed in a few days. In the nurseries at Halsey 75 per cent of the seedlings in a Jack Pine bed have been destroyed in a single day.

Several fungi are known to cause "damping off," but the most common one is **Pythium debaryanum.** This is normally a saprophyte, living upon decaying organic matter in the soil, but when the mycelium comes in contact with the tender tissues of certain young plants, it becomes a facultative parasite. The fungus reproduces both sexually and asexually. Most of the conidia germinate immediately after they are formed, but sexual spores, and, even some of the conidia, undergo a resting stage, and may lie in the soil for several months before germinating. Most soils contain either the mycelium or resting spores, and therefore seedlings are liable to attack whenever conditions are favorable for the growth of the fungus.

One condition, which is absolutely necessary for the growth of the "damping off" fungus, is an abundance of water. Warm, sultry days, such as we frequently have right after a rain, are especially favorable, and it under these conditions that we have the greatest loss of seedlings from "damping off." Anything which tends to dry the surface soil retards the progress of the disease; therefore frequent stirring of the soil, accompanied by the admittance of air and sunshine has a good effect. Good results are also obtained by covering the surface of the soil with a thin layer of sand or gravel. This prevents the soil from coming into contact with the stem at the place where it is most liable to attack. Spraying with Bordeaux mixture has been tried at Halsey, but with poor results.

After a plant is once attacked, there is no remedy; therefore the only means of combating the disease is by preventative means. In the first place, the site selected for a seed bed should afford good drainage. The best soil is a light, sandy loam; heavy soils containing a great deal of organic matter, and which retain a great amount of water should be avoided. A heavy soil may be improved, however, by mixing to the depth of five or six inches with sand. After the seedlings come up, the soil should be kept well stirred to the depth of about one inch, unless a surface mulch of sand or gravel is used, in which case cultivation will be unnecessary. On the forest reserve at Halsey, the beds are raked immediately after every rain during the early part of the summer. This is possible only in a light, sandy soil, such as is found at Halsey, since it will not bake when worked wet. A sand or gravel mulch is to be recommended for a soil which can not be readily worked when wet. If low shade frames are used, they should be raised after a rain, so as to allow a free circulation of air.

THE "LEAF" DISEASE.

What seems to be a comparatively new disease has caused a considerable amount of damage to the one- and two-year-old pines at Halsey during the past two years. The presence of the disease is first indicated by the dying back of the leaf tips during the early part of summer. As the season progresses, the disease passes down toward the base of the needle, often killing all of the needles and even the upper portion of the stem. While the disease is doing a great deal of damage, the present indications are that some of the attacked seedlings will recover. A large number of the two-year-old seedlings at Halsey, which died back almost to the ground last season, have sent out strong lateral shoots this year. Whether they will recover, or whether the new shoots will also be killed back, remains to be seen.

No one has yet made an exhaustive investigation of the disease, although Dr. Heald examined a number of the diseases pines, sent from the reserve, last year, and found a fungus of the germs **Cladosporium** to be present. He thinks that this fungus is the cause of the disease, but has made no inoculation, and therefore can not say positively that **Cladosporium** is the cause.

An examination of a number of specimens sent from Halsey this spring shows that **Cladosporium** and also a species of **Pestalozzia** is present. The surface of the dead portions of the needles is marked by numerous dark patches, which upon close examination, prove to be masses of fungus threads bursting through the epidermis. A cross section of the mycelium reveals the presence of a dark brown mycelium lying right beneath the epidermis. This mycelium has a close resemblance to that of **Cladosporium** in its advanced stage, but since no spores could be found, the fungus could not be positively determined to be **Cladosporium.** In a plate culture, made by placing bits of the above mycelium into a medium of aqua with 155 per cent glucose, colonies of **Cladosporium** were obtained, together with several other fungi. 'In this case spores were produced, so that **Cladosporium** was identified beyond any doubt. Spores of **Pestalozzia** were obtained by placing dead needles in a moist chamber, but no **Pestalozzia** was found in the plate culture.

From present indications **Cladosporium** seems to be the cause of the disease, but since at lesat two fungi which are known to attack pine seedlings are found to be present, namely, **Cladosporium** and **Pestalozzia,** the only way of determining positively which one is causing the trouble is to secure spores from pure cultures of both fungi, and make inoculations of healthy young pines.

A number of normal one-year-old Bull Pines and Jack Pines were recently secured from the reserve at Halsey, and planted out of doors under a shade frame. Several Bull Pines were inoculated with **Pestalozzia** by placing the spores in ordinary hydrant water and applying to the seedlings with an atomizer. A number of the needles on several seedlings were injured in order to expose fresh tissues, while the other seedlings were left in their natural state. All of the inoculated seedlings were covered with bell jars in order to secure favorable conditions for the germination of the spores. Since these inoculations were made on June 2, or only five days ago, sufficient time has not yet elapsed to secure any results.

Pure cultures of **Cladosporiums** have not yet been obtained, and therefore no inoculations have yet been made with this fungus.

DISEASES OF PLUM, PEACH AND CHERRY.

By Carl P. Hartley.

These stone fruits are closely related and subject to the attacks of very much the same fungi. I shall consider only those diseases which have been or are likely to be commercially important in the vicinity.

LEAF-CURL (**Exoascus deformans**).

This disease is very destructive in some parts of the United States, and is present in considerable, though not in very alarming, quantities near Lincoln. The portions of the leaves which are attacked are hypertrophied and curled, and a tree may be entirely defoliated. The mycelium may live thru the winter in the twigs and infect the leaves of the next year; or the spores contained in the dead leaves from the year before may infect the young leaves just at the commencement of growth. It is quite well established that the fungus can prosper only in young leaves whose growth has by unfavorable weather conditions been temporarily arrested.

TREATMENT.

It was for a while supposed that because of the perennial mycelium in the twigs the diseases could not be controlled by spraying. But experiments conducted by the Department of Agriculture in California and elsewhere during the period from 1894 to 1900 seem to have pretty thoroughly exploded this idea. In one extensive experiment from 95 to 98 per cent of the foliage was saved by spraying. The recommendation of the book on leaf-curl, published by the Department in 1900, was for spraying once or twice during March with strong Bordeaux mixture, using five pounds of copper sulphate and five pounds of lime to the barrel; the object is to have the trees heavily covered with fungicide at the beginning of growth. Pruning off affected leaves are also commonly recommended.

SCAB OR BLACK SPOT.

(Cladosporium carpophilum).

This disease does the most damage to peaches, tho plums are also attacked. The fungus may cause a shot-hole effect of the leaves, tho its chief injury is to the fruit. Black spots are formed on the surface of the fruit, and growth of the skin is retarded so that the fruit often cracks open.

TREATMENT.

Raking up the dead leaves, destroying the infested fruit, and spraying at the same time as for leaf-curl, are recommended.

BROWN ROT (**Monilia fructigena**).

The dark brown, mummified fruits, covered with light gray spore-tufts, which are the work of this fungus, are well known to all growers of stone fruits. Blossoms, and in the case of the plum and peach, stems and leaves, are also killed by it. The fungus is primarily a saprophyte, and unless conditions are very favorable it does not cause serious injury to strong, vigorously growing tissue. The fruit is seldom attacked until it is nearly ripe, and are destroyed much more readily after removal from the tree than before; when blossoms are attacked infection is most likely to take place on the calyx at the time the petals fall, and the rapidly growing pistil of the flower which has successfully "set" often defies infection until the stem below it is rotted, so that its growth has to cease. Infection of peach and plum twigs results from the mycelium in the blossom growing on into the stem; it there attacks the tissues, and after the rest of the stem is weakened because of the impaired transport the fungus invades the whole stem and leaves beyond the point of infection. The most harm is done in this vicinity by the destruction of plum blossoms and the rotting of peaches and plums on the tree; the difficulty in keeping stone fruits any length of time after picking is also largely due to this fungus. Even apples are seriously bothered in some localities.

The fungus lives over the winter by means of perennial mycelium in the unripened fruits which remain hanging on the tree or lying on the ground. Fresh spores are produced by this mycelium during the spring and summer which infect the blossoms, and later, the fruit. Conidia are produced in great numbers on rotted parts of the plant very soon after infection, and these also spread the disease. Rotted blossoms, falling and lodging against some other portion of the plant, infect that portion with remarkable rapidity.

Spores easily break thru healthy epidermis, altho punctures are somewhat more favorable to infection.

TREATMENT.

The destruction of all mummies is a universal recommendation. In a small orchard hogs or chickens might help by eating fallen fruit before it rots. Raking up mummies can not be done unless previous clean cultivation has been practiced. It is suggested that as easy a way as any to get rid of the mummies would be to run a furrow down the center of a row, rake the mummies in from each side, and bury them. Because of the continuous production of summer spores and the rapidity with which the disease progresses, control by spraying is difficult. The spraying recommended against leaf-curl and black spot is also recommended for brown rot, and later sprayings are also recommended; spraying near the ripening of the fruit must be with copper acetate or ammoniacal carbonate of copper. The blighting of the blossoms might be prevented by spraying while the petals are falling.

PLUM POCKET (**Exoascus pruni**).

This disease shows itself in hypertrophied, bladdery plums without any seeds. Infection takes place during or immediately after blossoming. The fungus lives thru the winter in the twigs, and spreads by means of spores produced at the surface of the plum-pocket at maturity, which comes at about the middle of the summer.

TREATMENT.

Prune off affected branches, and destroy them before the summer spores mature.

SHOT-HOLE FUNGUS.

(Cercospora circumscissa).

This disease produces spots on the leaves of plum and cherry, and to a less extent of peach; it attacks especially the Miner plum and the English Morello cherry, most plums being free from attack. The diseased spots may or may not drop out, but the leaves drop very early in the season, injuring the tree seriously. The disease may spread rapidly by means of conidia, and has been very prevalent in this vicinity since 1903, killing great numbers of Miner plums and Morello cherries, and weakening other trees.

TREATMENT.

Spray with ammoniacal copper carbonate after petals fall, and repeat at intervals if necessary. In the case of plums, and probably in the first spraying of cherries, Bordeaux may be used instead of the carbonate.

It is an open question as to whether fungi causing heart and root rot did not have a part in the recent general destruction of English Morello cherries, attacking them after they had been weakened by the loss of their leaves. But when, as in this recent case, trees are completely defoliaged for several years in succession, it is of no practical importance whether the bracket fungi were present or not; the trees would have been killed by such treatment as they received from the shot-hole even if there were no such thing as heart rot.

THE TREE AGENT'S GRAFT.

By L. O. Williams.

Professor Emerson's letter in a recent issue of the Farmer reminds us that the tree agent is again abroad in the land.

This particular agent to which he refers with his new form of "graft" reminds me of a style of graft very similar in its purpose that occurred in my boyhood days. The grafter of my story was a stranger who found his way into town and his efforts to gull the people was worked under the guise of a horticultural grafter. His scheme was a bold one. He would take the common forest trees with which my home town then abounded and by the use of an apple twig and a bottle of a secret "medicine" that his father had "spent a lifetime in discovering," would propose to change the said forest tree into a fruit-bearing tree. His scion and medicine was inserted in the roots of the large trees and the owner of the said tree was to look for apple blossoms the next spring.

Well, he succeeded in working his "graft" on several of our prominent business men. He put in a week or ten days there, boarding meanwhile at the best hotel. He didn't ask any pay for his work until his "graft" was ready to fruit. He got away, however, without paying his hotel or livery bill, and left one of his merchant victims with a bill against him for a nice fur overcoat. There were some of our people, however, who had the faith to look up in their walnut trees the next spring for apple blossoms.

But from that day to this, covering a period of thirty-five years, I have not seen the first forest tree to bear anything but its natural friut. Both the walnut and the hickory, the maple and the willow, have failed to respond to the tree agent's graft. "Neither do men gather grapes off thorns nor figs off thistles."

SOME PRINCIPLES OF GRAFTING.

The first thing to be considered by the friut grower or nurseryman who wishes to propagate new stock or change old ones by the grafting process is: Will such and such trees or shrubs unite their wood cells closely and strongly so as to make a new and perfect tree?

Never to my knowledge have trees or different families been made to unite their woods sufficiently to make a lasting union. Many attempts

have succeeded far enough only to form an unstable graft that would break apart sooner or later and generally before the end of a year.

Again, it is often quite impracticable to obtain a good union between members of the same family. The rose family, to which most of our central western fruits belong, is divided into sub-families or tribes, and it is found unnatural for the members of one tribe to graft with another tribe or sub-family. For instance, the apple and pear, which belong to one tribe of the rose family, will not unite with the plum, peach or cherry, which belong to another tribe or tribes of the rose family. In other words, you cannot graft successfully the stone fruits with the pome fruits. It is still more impracticable to graft any of these fruits upon the most of our common forest trees, which belong to widely different families. The successful propagator goes still further than this, in that he finds it to his interests to study the common likes and dislikes for each other among the various members of the same family. For instance, the peach and plum are very commonly grafted or budded back and forth upon each other. There are certain varieties of these fruits, however, that are found to be better adapted to each other than another, and it is for the nurseryman or horticulturist to discover these varieties that "work" best together.

The peach is a desirable and appropriate stock for certain varieties of the plum, but there are certain varieties that do not form a perfect and lasting union with the peach. I remember at the time the Hawkeye plum was first introduced, of buying about ten of the trees at $1 each. They were budded on the peach and were fine, thrifty trees as come from the hands of the nurseryman. I set them out in the orchard expecting quick and desirable returns from them. They had stood hardly two years in the orchard before they began to show signs of weakness—they began to look runty. I dug them out one by one and found a lack of congeniality between the top and the root. They were like some people we hear so often about—perhaps know some of them—who get married on sight, and after a few months or at most a few years, they find a remedy for their uncongenial alliance in the divorce courts.

The practice that prevails to quite an extent among our nurserymen of propagating these uncongenial varieties upon each other is done fore the mere sake of gain, or in other words the trees, Hodges' razors, "are made to sell." And this reminds me, too, that the man or woman who marries for the sake or sordid gain or position meets with a fate similar to these same razors.

THE PECAN TREE.

There has been considerable interest aroused among our tree men in Nebraska regarding this nut-bearing tree. It has been advertised in

our fruit journals by our southern nurserymen for the past year or two, but it is finding its way north quite slowly. The reason for this is that it is a native of Texas and other southern states and has not become acclimated to our interior and changeable weather. It is found growing along the Missouri near Brownville, or at least Mr. S. W. Christy of that place has a "Pecan Lodge." His trees, I believe, are too young yet to test their bearing qualities. The pecan is also found growing on an island of the Mississippi river north of Davenport, Ia., and as that locality is a degree and a half north of Brownville, Neb., we might reasonably expect a hardy tree from nuts obtained in the former locality. I have been writing to a party at Davenport for two seasons past, to have some nuts sent me for planting, but thus far without success. A third trial this fall may result more favorably. Would be glad to hear from any growers of the pecan in southeastern Nebraska.

WINTER PROTECTION FOR SHRUBS AND ROSES.

We have many half-hardy shrubs and roses that are better for a protection over winter. Often a simple mulching of leaves or manure about the roots is all that is needed; and their needs will be determined very largely by the location and condition of the soil at time of winter coming.

Shrubs and roses against the north side of the house will usually winter more safely than those found on the sunny side. The same principles apply here as in the strawberry bed, viz., the alternate freezing and thawing is what we need to guard against. To this end a protection about the roots of the bush is all that is needed. There are certain shrubs like the Althea that are tender in wood and bud—similar to the peach—and it is these, along with our half-hardy roses, that we need to give more perfect protection by covering the top. An old gunny sack with the bottom cut open may be placed over the tops and then filled with straw or leaves. Several thicknesses of burlap when wrapped snugly about the tops may be easily placed and will answer the purpose equally as well. It is well also to add the mulching of leaves or other litter about the roots. Where shrubs are too tender to be wintered safely in this way they may be salefly dug up and with the dirt clinging to roots, placed in a cellar. I have wintered good sized Altheas or "Rose of Sharons" in this way and they do not seem to suffer any diminution in their blooming habits by this treatment. They should be kept in a cool and dark corner of the cellar if possible, and if cellar is dry, water the roots as needed. Last winter was a hard one on rose bushes generally. Even the Crimson Rambler, which usually stands out without protection, was badly hurt in most instances.

This rose is such a strong, rampant grower as to make it difficult to cover, but a mulching about roots is easily applied and may be found to give all the protection necessary. Where grown against the south side of the house the ground is more apt to become dry, causing the roots to suffer. To obviate this danger, give a free watering to the roots before the ground freezes up for winter.

COMMERCIAL CHERRY ORCHARDING.

By E. F. Stephens.

The ready demand for cherries again this year, and that in face of the outlook for a general bountiful crop of all fruits, but adds emphasis to the opinion long held by the writer of the value of a commercial cherry orchard.

Next to the strawberry as a popular fruit for home consumption and preserving the cherry will take its place. Its popularity is on the increase, and that despite the failure of last year's crop.

More trees were planted last spring in the village and city lots than ever before, and the man or woman who does not want a cherry tree or two, if not a dozen of them, in his yard is rarely found. They are even found as an ornamental and fruit tree combined in many of our front yards. This popular planting of the tree in the small lots should give the commercial orchardist a cue to his plans for orcharding.

As a business enterprise it is safe to estimate the returns from the cherry orchard as follows: The average life of the cherry tree, of the Early Richmond type, may be placed safely at fifteen years. It begins bearing at three and four years after planting, and for the latter ten years of its life (of fifteen years) it will readily yield one bushel per year on an average. Many trees, under favorable care and soil, will double this average, for I have known a yield of three or four bushels per tree to have occurred in favored years. At one bushel per tree for ten years, as a very conservative estimate, we have ten bushels for the life of the tree, valued safely at $1 per bushel on the tree. An acre will contain, at one rod apart each way, 160 trees. These should produce an annual average income then of $160 each for ten years. Sixteen hundred dollars then would be the total net income from an acre in fifteen years, or an average of $106.66 per acre for each year. The first cost of the orchard, including trees and planting, may be estimated at 40 cents per tree, or a total of $64 per acre. The expense of cultivation and care for the first five years may be offset by the use of the ground between the tree for garden or small fruit growing. Five or six dollars per acre for the following ten years will cover the cost of pruning and care for that period. This would make the total cost per acre foot up around $125 for the entire period of ten years. This will average about $8 per annum, and deducting this expense from the in-

come per acre, we have very close to $100 as the average net income per acre for the cherry orchard during the entire lifetime of fifteen years. If it can be made to live and bear ten years longer, as I have known them to do, so much the better for the average income. These figures will be found conservative and should encourage the owners of small orchard tracts near our growing towns and cities to engage in the growing of this very desirable and popular fruit. In the spring of 1899 the writer planted for one of our large western ranches in this state a cherry orchard of 5,000 trees, covering thirty acres. The idea of the proprietor at the time of planting was to establish a canning factory in connection with it for taking care of the surplus fruit, but so far the demand for the fruit has been such as to find a ready sale at fair prices for immediate use. Though this orchard has met with some severe losses on account of the killing of the late varieties, and from severe hail storms, yet my faith in the enterprise is good for a fifteen or twenty-acre orchard, well located anywhere in the eastern half of the state.

THE COTTONY MAPLE SCALE.

(Pulvinaria innumerabilis Rathvon.)

By Harry Scott Smith.

Owing to the prevalence of injury by this insect the following paper is presented for publication:

During the two years covered by this report, frequent complaints have been received at the Entomologist's office concerning isolated outbreaks of this extremely injurious and here in Nebraska our most conspicuous pest of shade trees. Considering the usual abundance of this insect in restricted localities throughout the state, it is thought advisable to devote a few pages to a discussion of its character and the best means of checking its ravages.

The cottony maple scale is a pest native to the United States, and one with which most persons are familiar by reason of its habit of suddenly appearing in a locality where it was supposed to be entirely absent, and the unsightly condition in which it leaves the trees after infestation. It was first described in 1854 by Dr. S. S. Rathvon, of Lancaster, Pa., and has since then been placed costantly before the public eye in numerous bulletins and newspaper articles on account of the damage it occasions in certain localities where conditions are especially favorable to its propagation. The most elaborate treatises on this insect are those worked out by J. Duncan Putnam,* and more recently by Dr. L. O. Howard.**

This insect is of very general distribution, having been found in greater or lesser numbers in almost every state in the Union. However, it rarely becomes injurious south of the fortieth parallel on account of the great number of parasites which attack it in that region.***

Here in Nebraska it occurs throughout the state, but, in accordance with one of its chief characteristics, become injurious only occasionally and usually in widely separated districts. The region of the greatest

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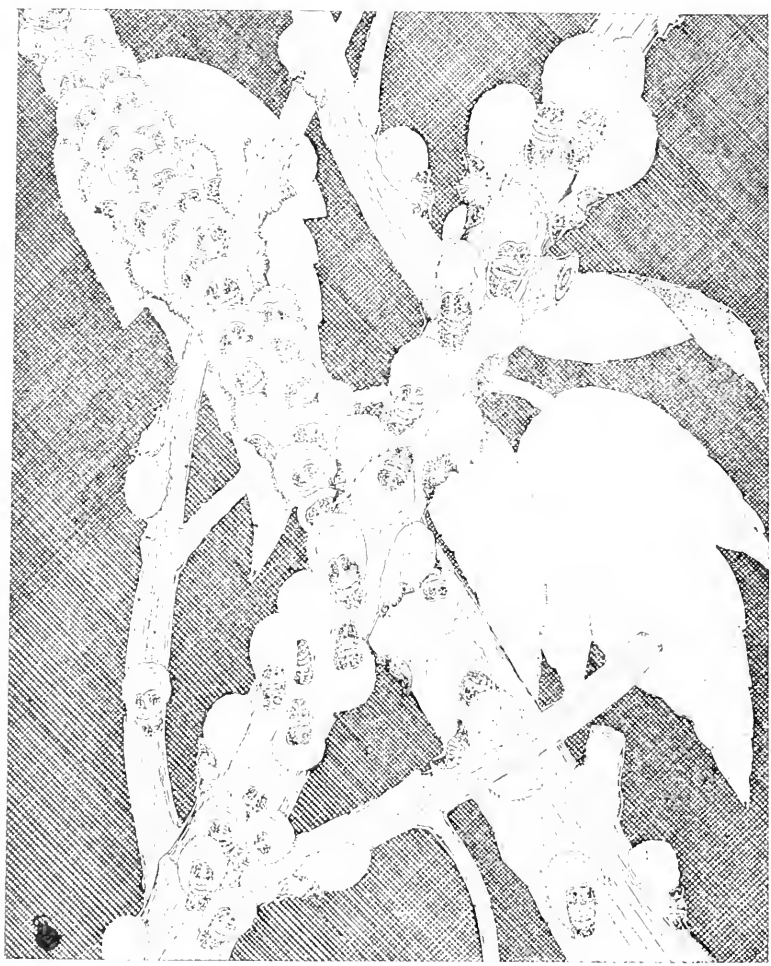
*Proceedings of the Davenport Academy of Natural Sciences, Vol. II, 1879, pp., 293-347.

**Bulletin No. 22, New Series, U. S. Dept. Agr. Div. Ent. pp. 7-16.

***J. G. Sanders, Circular No. 64, Dept. Agr., Bureau of Ent. p. 2.

present infestation lies in the central portion of the state, bounded on the west by the sandhill tract and on the south by the Platte river. Those towns in which the atack of the scale became extraordinarily severe, threatening the life of, and actually killing many of the shade trees, are Long Pine, Albion, Broken Bow, Kearney, Ainsley and Neligh. In most of the above named localities the entire growth of the previous year was killed and the vitality of all the infested trees greatly reduced. During the first week in April, 1905, when the



The Cottony Maple Scale.

writer was sent out for the purpose of fighting the scale at Broken Bow, he found the trees to be literally alive with the pest, not one being free from their attack, excepting only those which were so nearly killed the preceding summer as to be unable to furnish sustenance for them.

These insects, like the other members of the scale family, obtain their nourishment by sucking the juices from their host plant, through a beak-like mouth, with which they pierce the tender twigs and under sides of leaves. It is in thus appropriating to their own use the sap which was intended for the development of the tree, that they are capable of such destruction. The favorite food plants of this scale, as its popular name indicates, are the various species of maple, including the box-elder, which seems to be preferred to anything else here in Nebraska. Mr. J. G. Sanders, of the U. S. Bureau of Entomology, reports having found it on "47 different species of trees, shrubs and vines, including various species of maple, oak, linden, elm, willow, poplar, beech, hawthorn, sycamore, locust, hackberry, osage-orange, mulberry, grape, poison-ivy, apple, pear, plum, peach, currant, gooseberry, rose and Virginia creeper." In any single locality, however, its food habits are not so varied, it usually confining its attack to a single kind of tree, only a few scattering ones being found on dissimilar plants. Thus at Broken Bow, although there were a great many soft maples, elms and hackberries among the box-elders, the former were not injured in the least, and only rarely were the scales found infesting them at all. At Albion the elm seemed to be the favored host, and at Neligh also the insect seemed to confine its attention to the above named tree, while at Kearney it found to be the most injurious on the soft maple.

The life history of this, as of other scale insects, is most interesting, and one of the most unique in the whole insect group, owing to the great diversity of development in the two sexes. The great white cottony masses which seem to spring suddenly into existence in the month of May, and which give the insect its common name, are the egg-sacs of the female, consisting of a mass of tangled waxy threads which are secreted by a pair of spinnerets. Into this tangled mass the eggs are placed in enormous numbers, from one thousand to two thousand being deposited by a single female. These eggs hatch during the months of June and July, and soon the infested plant is swarming with the minute lice, which settle usually upon the under surface of the leaves along the veins, and begin their destructive pumping of the sap. In a short time they undergo a moult and begin to secrete the wax on their dorsal surface, which forms the scale covering. The difference in the two sexes now becomes apparent, the males remain-

ing more slender and convex. As soon as the eggs are deposited by the female she has performed her mission and dies, the dead insect with its cottony mass still clinging in place, until some wind or rain storm washes it away. Often they remain on the tree for a long time, making it appear infested, when in point of fact the generation had perpetrated all the damage of which it was capable when the egg laying ceased.

When the male larva has attained its full growth the propupa forms within the larval skin, which in a few days is cast off and the true pupal form assumed, which changes from a pale green to a dark flesh color. The insect remains in this stage only a few days when the posterior end of the scale is raised by a pair of waxy filaments which are secreted from near the end of the body, and the perfect winged male emerges. In this stage the male insect takes no food whatever, having no mouth parts and no mouth opening. It is equipped, however, with a pair of eyes which are absent in the mature female.

While this complex metamorphosis has been taking place in the male insect, the females have undergone two moults and are of a pale green color with a dark dorsal stripe extending the whole length of the body marking the slight longitudinal ridge. In form they are flatter than the males and somewhat broader, especially across the posterior end. In the later part of August and early September the two sexes mate and the males die. The females now gradually lose their brighter colors, changing to a dark brown and becoming more wrinkled. Before the leaves fall they migrate to the new growth of twigs where they pierce the bark and feed as long as the sap flows, become dormant at the approach of cold weather, and hibernate in this position throughout the winter.

As soon as spring opens, however, and the sap starts to flow through the trees, the females which have not been subjected to the attacks of parasites and have managed to withstand the vicissitudes of winter begin to grow rapidly in accordance with the great development of eggs within their body, and soon the cottony egg-sac referred to above begins to form. This is gradually filled with the light colored orange-yellow eggs, which, as stated before, hatch out in June and July. By this time the scale has assumed a position at a steep angle with the twig to which it is attached, due to the enormous growth of eggs beneath the body.

By the above general description of the life history of this insect it will be seen that thre is but one generation each year, which, to summarize briefly, occurs as follows: The young hatch from the eggs in the early summer, the winged males emerge in the fall, mate with the females and then die. The females migrate to the twigs where they

become dormant as cold weather sets in, pass the winter in this state, start growth again as spring opens, and produce their eggs when mature.

NATURAL ENEMIES AND REMEDIES.

Fortunately the cottony maple scale is beseiged by a great number of natural enemies, both paracitic and predaceous, which commonly keep it from increasing sufficiently to become harmful. Among the former the most efficient ones in the destruction of the pest are the four-winged chalcid flies. The importance of this group in forestalling the ravages of the scale is best shown by quoting what Dr. L. O. Howard,* U. S. Entomologist, has to say in regard to Coccophagus lecanii (Fitch), a parasite belonging to the above named group.

"This species, which has been reared from a number of different scale insects of the Lecaine group, is very widespread and appears frequently in astonishing numbers. It was due to this parasite that it was found almost impossible to carry the scale insects through the season at Washington in 1898; of the many thousands of scale insect larvae which settled upon the trees under observation it is safe to say that much less than one per cent reached full growth. During the months of July, August and September they were stung by this little parasite, which laid its eggs in their bodies; soon afterwards they turned black, the adult parasites issuing from holes cut through the backs of their bodies. The development of the parasite was plainly seen to be very rapid, occuping certainly not more than two or three weeks, and there was therefore a succession of generations, with an increase in numbers in geometrical progression, until really the wonder is that a single scale insect escaped.

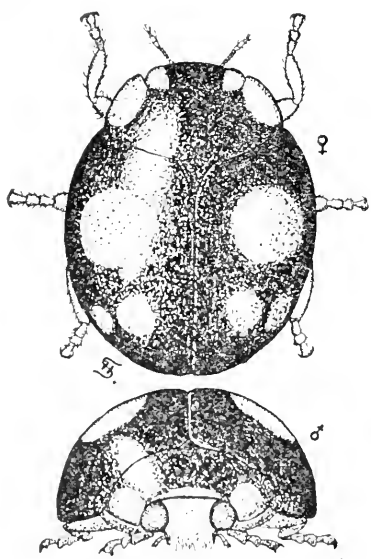
"The writer had under close observation a branch of a large Norway maple tree growing in the Smithsonian grounds, which in June was fairly plastered with the egg-sacs of the Pulvinaria, while in July its leaves were thickly spotted with newly settled young; in August he spent an entire morning trying to find a living scale insect, but without exception all which were found had been killed by this important parasite. The little Coccophagus even gained access to the Insectary. Potted maple trees stocked with the scale insects were discovered by them, and the scale was exterminated, although the little trees had been swarming with these scales, and although daily an assistant had picked off and crushed those which through a change

*Bulletin No. 22, New Series, U. S. Dept. Agr., Div. Ent., pp. 13.

in color, indicated the presence of the parasitic egg or larva. It is this species probably more than any other which is responsible for the fluctuations in numbers of the cottony scale."

Dr. Howard also further says that it is probably only through the influence of a damp and rainy season, which prevents these active little parasites from flying about to any extent, that the scale is able to overcome the effects of its attacks, enormously prolific as the Pulvanaria is. Other parasites of somewhat less importance but which aid very materially in the destruction of the scale are **Coccophagus flavoscutellum**, a more southern species than the one referred to above, **Atropates collinsi**, **Eunotus lividus**, **Aphycus pulvinariae** and **Comys fusca.**

The pretty little insects known as the lady birds play an extremely important role in checking the advance of the scale by preying upon them in their early stages, including the egg. Perhaps the most important of these is the twice-stabbed lady bird, **Chilocorus bivulnerus**, a small black insect with two red dots. Another one of similar appearance is **Hyperaspis binotata**. **H. Signata** has also been found to prey on the scale, and here at Lincoln, **H. proba** has been reared from that insect. Mr. J. G. Sanders found in the severely infested parks and cemeteries of Chicago that the egg-contents of 80 to 85 per cent of the cottony ovisacs had been destroyed by the larvae of **Hyperaspis.**



Hyperaspis proba; an Important Enemy of the Cottony Maple Scale.

Still another enemy of this insect, and a very effective one at times, is the predaceous caterpillar of **Lucilia coccidivora** Coq. It is said to have been instrumental in keeping the cottony cushion scale within bounds at Washington for a period of nineteen years.

The statement is commonly made by entomologists that this pest is not injurious for two consecutive years, the natural enemies of the scale playing their part in keeping the forces of nature balanced. But when, as often happens, nature introduces certain factors which prevent the increase of parasites from surpassing that of the scale, the equilibrium is lost, the scale gains the ascendency, and an abnormal state of affairs exists. It is in just such an overbalanced condition of things that recourse must be had to artificial remedies.

There are two stages in the life history of the scale during which spraying is practicable; summer spraying, when the insects have just hatched and are actively moving about, and **winter spraying**, after they have become dormant and the trees have shed their leaves.

In applying insecticides to infested trees the greatest precautions should be taken not to destroy the natural enemies of the scale. To quote again from Mr. J. G. Sanders,* "Hundreds of larvae **Hyperaspis Binotata** were found to have been destroyed by a summer treatment with kerosene emulsion for the cottony maple scale in parks of Chicago, and no doubt thousands of the minute chalcids were killed, as they were found quite plentifully on unsprayed trees." For this reason, as well as that of economy, rapidity, ease, and most of all, effectiveness, the writer would advocate the winter treatment with kerosene emulsion.

In response to frequent complaints from Broken Bow during the winter of 1905-6, in regard to this pest, the writer was detailed by Prof. Bruner to take charge of some spraying at that place. Unfortunately, however, it was not until April that he was enabled to begin operations, the annoying delay being caused by the failure of the equipment to arrive at the proper time, and by the inclement weather. At this late date the box-elders had begun to put out buds, so that it was feared that injury might result to the trees by the use of very strong emulsion, thus making the remedy worse than the disease. Consequently they were treated with solutions containing 18 and 20 per cent kerosene. As soon as the leaf buds opened the spraying operations were stopped, an emulsion weak enough to be harmless to the trees having no effect whatever upon the wax-covered scales. Although this treatment was not as effectual as it might have

*Bulletin 22, New Series, U. S. Dept. Agric., Div. Ent., p. 13.

been had the operations begun earlier, making it possible to have used a stronger emulsion, still the benefit derived was considerable in proportion to the time and money spent. On examining some specimens of twigs collected at the above named place in June, it was found that 90 per cent of the scales were dead, although just how much of this mortality was due to the effects of the kerosene emulsion and how much to the moderately cold winter, was not determinable. On the lot sent, three twigs six inches long, eight larvae of the predaceous lady-bird were found. However, unless the natural enemies of the pest are very abundant this year, the scales from unsprayed trees will no doubt completely reinfest those sprayed, so that next year they may again become abundant. If such is the case precautions should be taken to go over all the trees during the coming winter, as the pest can be exterminated in this way; only temporary relief can be had by spraying a portion of the trees.

The treatment may take place any time after the trees have shed their leaves in the fall up to just before the buds appear in the spring, preferably in December, January and February. This method has many points of advantage over summer treatment; in the first place, as shown by Mr. S. Arthur Johnson* in some experiments performed at Denver, Colo., it is the most effectual; secondly, the factor of economy is a favorable argument, it requiring only one-fourth as much material as is commonly used in spraying where the tree is in full foliage, and then, too, in summer spraying, owing to the fact that the young hatch out during a period extending over two months, at least two applications would be imperative; lastly, it is a much less difficult and disagreeable task to properly apply the insecticide, all parts of the infested tree being visible. In a plant the leaves of which are somewhat sensitive, as in the case of the box-elder, it is almost impossible to use a strong solution without defoliating the tree. Mr. Johnson in the exepriments cited above, found that the most satisfactory remedies were a winter application of kerosene emulsion, of a strength of 25 per cent or more, or whale oil soap at the rate of one pound per gallon; the lime-sulphur-salt solution was ineffectual.

Numerous other methods have been used in fighting this pernicious insect, such as spraying with a concoction made from boiling tobacco stems, fumigating with hydrocyanic gas, washing the scales off by the use of a stream of water under pressure, etc., but all have been practically abandoned in favor of the kerosene emulsion or mechanical kerosene and water mixture.

*Bulletin 52, U. S. Dept. Agric., Div. Ent., pp. 85-88.

As the scales usually locate for the winter on the younger twigs, it will greatly facilitate spraying to prune the trees back rather severely.

THE PLUM AND APPLE CURCULIOS.

(**Conotrachelus nenuphar** Herbst and **Anthonomus quadrigibbus** Say.)

By Myron H. Swenk.

About fifteen years ago these two curculios appeared in the orchards of southeastern Nebraska in injurious numbers and have continued their depredations from year to year ever since, the damage varying according to locality and season from a mere trace of "stung" fruit to a complete loss of the crop. During the last few years both species have been apparently on the increase, and it was deemed advisable to carefully look into the matter. Accordingly, at Professor Bruner's request, the writer spent some little time from early May, 1905, through the summer investigating the problem, and a condensed report upon the conditions as found is herewith presented.* As a preliminary source of investigation, a circular was sent to the leading horticulturalists of the state inquiring as to the presence and comparative abundance of these insects, the damage perpetrated and the remedies used in combating them. Very few replies were received to this circular, but yet enough to clearly indicate that the curculios were responsible for considerable damage to the apples and plums in 1904 and 1905, varying from 10 per cent to 100 per cent of the crop in different orchards, that the horticulturalists were very undecided as to which one was the chief depredator, and that they were also quite at sea as to what methods should be employed to reduce the injury. The answers proved valuable, however, in helping to determine the region in which the curculios have done most damage during the last two years; a region approximately embracing the territory south of the Platte river and east of the ninety-seventh

*Those who would care for a more detailed knowledge of these insects are referred to a very excellent and complete account recently published as Bulletin No. 98 of the Illinois Agricultural Experiment Station, entitled "The Curculio and the Apple," by C. S. Crandall. The writer has drawn largely upon this work for some of the data presented in this paper.

meridian, and isolated orchards in the country north of the river. Eastward these insects occur throughout the United States to the

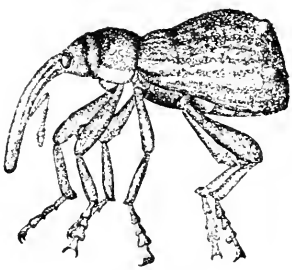
HISTORY OF THE CURCULIOS.

Both are native insects, and before the planting of orchards found sustenance upon various wild fruits, the plum curculio originally feeding principally upon the common wild plum (**Prunus americana**) and to a lesser extent also upon the wild crab apple (**Malus ioensis**) and several species of wild haws (**Crataegus**), while the apple curculio confined its attention to the crab-apple and the haws. With the advent of congeneric or related cultivated fruits, it was not surprising that they should take these on as a source of food supply, and in many localities practically abandon the wild for the cultivated varieties.

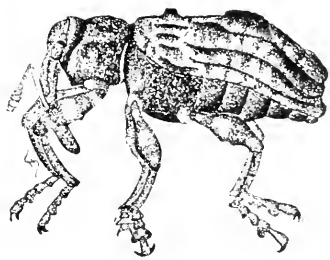
Accordingly, we find that while the plum curculio greatly prefers the fruit from which it derives its name, it will on necessity take up readily apples and cherries, and even pears, peaches, apricots and quinces. The apple curculio, however, confines its work to that fruit. The plum curculio was recognized as a fruit grower's enemy long before its naming in 1797, but the apple curculio, though described and named in 1831, was not recognized as inimical until thirty years or more later.

APPEARANCE OF ADULT BEETLE.

Both of these insects are small, dark colored, "snout-beetles," one-fifth of an inch long or less. But on comparison they are seen to be very different. The plum curculio has a short, stout beak which is pointed downward from the head, its body narrows from the bases of the elytra or "wing-cases" toward their tips, and each elytron



Apple Curculio.



Plum Curculio.

bears a long, high, sharply edged, black hump. The apple curculio has a long, slender, almost forwardly directed beak, in the female as long as the body but in the male only one-half as long, broadens from the elytral bases towards the tips and each elytron bears a pair of conspicuous tubercles. These differences are very evident upon comparing the accompanying cuts of the two species. As the two differ fully as much in life history and methods of attack as in appearance, it is best to consider them separately in this respect. The plum curculio, being evidently the commoner of the two, will be considered first.

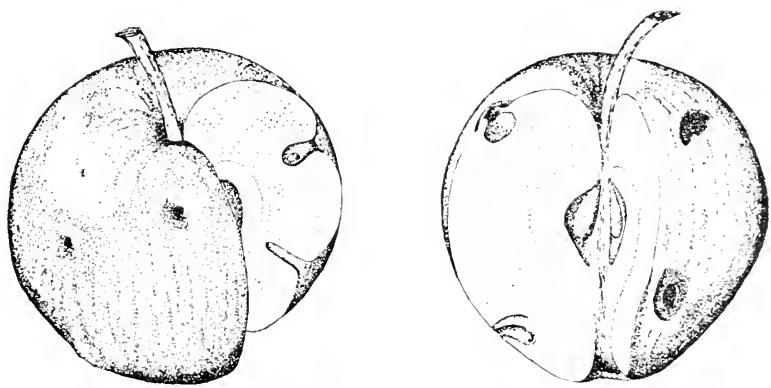
LIFE HISTORY OF THE PLUM CURCULIO.

The insect passes the winter in the adult beetle state, hiding under fallen leaves, loose bark, rubbish piles or any other similar retreat, and, after spring has developed until the first buds are well formed, begins to appear upon the trees. In Nebraska during 1905 and 1906 this appearance took place about the middle of May. The sexes mate and the female beetles immediately begins to deposit eggs within the very young growing fruit. Puncturing the skin with the small jaws at the end of her beak she inserts the latter and begins an excavation just beneath the skin, devouring the pulp as removed. When the cavity has been completed she withdraws her beak and turning about deposits an egg therein. Then the characteristic deep crescent-shaped cut is made in the fruit in front of the egg. Oviposition continues from the appearance of the curculios in May through June, when it is at its maximum, July and August, and during her life each female deposits from fifty to two or three hundred eggs. Of course, not all of the beetles survive for this long period, but they begin to die off rapidly in July and only a very few live until the end of August. The egg of the plum curculio is white, oval, in size about one-thirtieth of an inch long by one-third as wide. In four to six days they hatch, giving forth small, yellowish white footless larvae which begin to eat their way through the fruit and about the stone or core, forming irregular and tortuous burrows, and ultimately, except often in the case of cherries, causing the fruit to fall. When full grown the larva is about one-third of an inch long, yellowish white with a brownish head, and with a double row of bristles down each side. They remain in the fruit altogether three or four weeks, the maximum of emergence occuring about the third week in July, although the total period begins in latter June and continues throughout August. On leaving the fallen fruit the larva immediately buries itself in the earth, usually to a depth of an inch or less up to two inches, rarely more,

where they form a rounded burrow and pupate therein. In about four weeks the adult beetles emerge and immediately fly to the fruit, continuing to feed thereon as long as there is any upon the trees and doing much harm. These feeding punctures or "stings" are also made by the old beetles during the spring and summer along with the egg punctures, and are large, cylindrical holes surrounded by a ring of discolored skin, which leaves permanent blemishes upon the fruit. As winter approaches the adult curculios of the new generation seek hibernating quarters, where they remain until the following spring. The entire period from the egg to the adult of this curculio covers about seven weeks.

LIFE HISTORY OF THE APPLE CURCULIO.

Like the plum curculio this species hibernates in protected nooks as adult beetles and appears upon the trees in the spring at about the same time, i. e., the middle of May. Mating takes place and oviposition immediately begins, the process being essentially similar to that of the preceding species except that no crescent-shaped cut is made, but the egg cavity is larger and deeper with a bulb-shaped bottom, and the egg is sealed therein by a deposit of excrement over the opening. The apple curculio consumes much more time in the operation



Punctures by Apple and Plum Curculios.

of oviposition than does the plum curculio, requiring about an hour and a half while the plum curculio completes the process in fifteen or twenty minutes. This work of egg laying continues through June and July, and each female deposits about fifty to one hundred eggs during this period. The eggs are oval, whitish, one-twenty-fifth of

in inch long by one-half as wide. Immediately after hatching which requires four days, the larva burrows toward the core of the apple, producing much reddish excrement, and after about three weeks becomes fully grown. It is then a soft, whitish, legless grub about one-half an inch long, with a curved and humpbacked, much wrinkled, bristleless body, very different from the larva of the plum curculio. The larva of the apple curculio does not cause the apple to fall, but all the metamorphoses are carried on within the fruit, and after a final moult the pupa state is assumed. A week spent in this condition brings on the adult beetle which cuts a large hole and makes its way out, so that the entire period from egg to adult beetle averages about thirty-two days. The adults begin to appear early in July and continue coming out throughout August. Unlike the plum curculio the adults of the new brood in this species after emergence do not prove injurious to the fruit by making numerous feeding punctures, but rather tend to immediately seek out hibernating quarters, and remain hidden until the next May.

REMEDIES FOR CURCULIO INJURY.

The first thing the horticulturalist who would fight the curculio must do is to place his orchard in a state of thorough cultivation, for without such a condition it is practically useless for him to proceed. In all of the several badly infested orchards examined by the writer while investigating this pest, there was a heavy undergrowth of grass and weeds, and, in some, even stacks of dead brush and piles of leaves and other rubbish. Such conditions form ideal hibernating quarters for the curculios, enable them to hide from birds and other predaceous insects which prey upon them, protect the fallen apples from the sun and other influences which might destroy the developing larvae, and render quite impossible the application of the various cultural remedies to be suggested directly. All superfluous undergrowth should be removed, the soil disked and pulverized, and all limbs which would hinder the passage of machinery or prevent the sunlight from reaching the ground between the trees should be pruned. All this is but merely putting the orchard into the condition it should be in anyway for the best health of the trees. This accomplished, the application of our most efficacious remedy is made possible, namely the

1. Cultivation of the Surface Soil. We have just seen that in the life circle of the plum curculio a considerable portion of its life is spent underground after the falling of the fruit. The average

period spent by each individual in its subterranean burrow is about four weeks, although some complete their transformations in three weeks and others require as much as five weeks. But since at no one time are all the curculios in the ground, some of them being in the egg or larval state while earlier ones have long since emerged as adult beetles, it follows that the entire period in which curculios are to be found underground is of no considerable length. Approximately it extends from the middle of June to November, but there is a period during July and August when the great bulk are in the ground together, either as newly arrived larvae, pupae or adults ready to emerge. As we have seen, these pupae are only a short distance below the surface, over one-half of them buried less than one inch and practically all of them under two inches, so it follows that light cultivation of the surface soil with a disk or harrow would disarrange the burrows and bring the delicate pupae to the surface where they would be exposed to the elements and perish in a short time. It has been shown that direct sunlight will kill them very quickly, while on a warm day they cannot survive long even in the shade. The exact time when the greatest number of pupae could be thus exposed varies greatly with the season; three applications of the disk at least, and more if possible should be made, one probably a little before the middle of July, another during the latter part of that month or early in August, and a third in middle August. These diskings would disturb nine-tenths of the pupae and result in the death of a very large proportion of them. The remedy next in importance is the

2. Destruction of Fallen Fruit. The object in destroying this fruit is to kill the larvae developing therein. We have seen that the curculio attacks the fruit quite extensively even when it is very young, so the earlier fallen, very small fruit should be destroyed even more carefully than that which falls later. It is often a matter of difficulty in orchards of considerable extent to devise a practicable means of gathering up this fallen fruit, a process which should be repeated every few days. In open cultivated orchards much of it will be exposed to direct sunlight which in itself is quite sufficient to kill the larvae; in other cases the fruit might be raked together in a spot where the sun could reach it. Much good will be accomplished during cultivation, for many of the larvae will be crushed when the fruit is cut up by the disk. This remedy also applies primarily to the plum curculio, since we have seen that apples attacked by the apple curculio do not usually fall, but it is also of considerable avail against the codling moth. An old remedy for the plum curculio which is very helpful in small orchards is the

3. Jarring of the Trees. When this method is practiced a sheet of suitable size, i. e., one just as large as can be conveniently used, say twelve feet square, is spread beneath the tree and the latter given several sharp blows with a padded stick, or a quick shaking. One of the characteristic instincts of the adult plum curculio is to draw up its legs and drop when disturbed, and this will cause many of them to fall upon the sheet, from which they may be taken and killed. This jarring should be started as soon as the fruit is "set" and repeated as often as possible while the curculios are abundant. They drop easiest when they are numbed by the coolness of early morning. The apple curculio, on the other hand, does not often drop when disturbed but rather clings the tighter. In orchards of considerable size, however, this remedy is, as a rule, too slow and laborious for practical application.* Sometimes help is gained by

4. Spraying. This method also aims at the destruction of the adult beetle by the eating of arsenical poisons. One great difficulty in the way of success by spraying is that only occasionally does the insect eat enough of the poisoned skin of the fruit to cause its death, in the majority of cases passing its beak through to the pulp beneath without partaking of any of the arsenite. Especially is this true of the apple curculio. The result is that spraying for the curculio is hardly to be considered a primarily successful method of combating it. It is undoubtedly true, however, that the fruit of the trees which have had frequent application of Paris green, London purple or arsenate of lead are generally less liable to feeding punctures and egg deposition than untreated ones, due probably to the repellant effect of the sprayings. While spraying does not seem to have enough value that the writer would at present care to recommend its being employed especially as a curculio remedy, the necessity of such applications in fighting the codling moth will doubtless prove also of considerable help against curculios.** Care should be taken not to use the arsenites so strong that the foliage is burned, and the

*A more practicable curculio catcher for larger orchards is described and figured in Mr. A. L. Quintance's recent paper on "The Principal Insect Enemies of the Peach" to be found in the Yearbook of the U. S. Department of Agriculture for 1905, p. 328, to which the reader is referred.

**For an extensive account of very successful results by spraying with arsenate of lead consult Bulletin No. 108 of the Illinois Agricultural Experiment Station.

addition of lime to the poison is strongly recommended. As a last preventative may be mentioned

5. Avoidance of Extraneous Sources of Infestation. If a well kept orchard is near to a badly infested one, or to extensive patches of wild plum, crab-apple or wild haw, the former is liable to injury by curculios flying in from the infested trees. The only way of avoiding this evil is to apply cultural methods to the neglected orchard or to remove the patches of native trees, and it is conceivable that in most instances both of these alternatives would prove all but impossible. Fortunately only a single instance of such difficulty has come under the observation of the writer, and the indications are that this state of affairs in Nebraska is rare.

SOME FOREST PROBLEMS.

By Frank G. Miller, University of Nebraska.

For a third of a century now, a campaign has been carried on in this country for a more rational treatment of our forests. As a result, a general interest in this matter has been awakened, and the importance of our native woods as a source of national wealth, and the practical necessity for their preservationn seems at length to have come home to our people. The old conception was that forests were an encumbrance to the land, and were, therefore, to be gotten rid of in the easiest possible manner. Now with Baron Von Miller, the great German, we are coming to "regard the forest as a heritage given us by nature, not for spoil, or to devastate, but to be wisely used and carefully maintained."

The attitude of the American people toward the forests hitherto finds a ready explanation in the conditions that obtained on the continet when it was first settled. Then the entire eastern portion was an almost unbroken forest, extending to the western slope of the Alleghanies in the north, and swinging in the south as far west as the Indian Territory. This area included seven-tenths of our natural woodlands. The Pacafic coast forests, about which so much has been written comprised but one-tenth; one tenth was to be found in the Rocky mountain country, while the remaining one-tenth occured in scattered areas throughout the prairie states.

So vast was the timber area, particularly in the east, that to the early settlers the continent appeared an unbroken wilderness, and "a wilderness and civilization," they said, "are incompatible." The new comer must have lands for agriculture, fields must be cleared, and so this hardy pioneer armed himself with his axe and firebrand, and the battle against the forest began. From that time on, the seal of Indiana, bearing the figure of a wood chopper with uplifted axe, has been emblematical of the attitude of the whole country toward the forests. The war for their extermination has been a long and desperate fight, it being more than two centuries before they had retreated more than a few miles from the Atlantic shore.

So far as clearings have been made on lands that are better adapted for agriculture than for timber the fight to subdue the forest

has been a perfectly legitimate one. The best interest of agriculture required the clearing of a large part of the forest lands. To illustrate what I mean I may refer to Ohio and Indiana, both once heavily wooded, bearing magnificent hardwood forests. Today these states import 82 per cent of their lumber supplies, yet no one questions the wisdom of clearing these lands; for rich as they were in timber, they are even more valuable for agricultural purposes. But the work of destruction has gone too far. Great stretches of land in different parts of the country that never were agricultural in character have been denuded of their timber till but a beggarly portion remains, with the result that not only these lands have become wholly unproductive, but the damage to neighboring lands from snows and floods have greatly increased. In northern Michigan, for example, millions of acres which originally bore valuable timber, are now scarcely more than desolate sand barrens. These Michigan forests have served the purpose of one generation, while they could have been made to yield a continuous harvest and handed down to posterity unimpaired. (The situation in Michigan is typical of conditions prevailing throughout the Lake states, as well as in many others.) In Mississippi 10 per cent of the forest areas are now converted into badlands and the sands washing up to the valleys below have turned them into sandy wastes.

Besides the vast clearings that have been made for agricultural purposes, the demands of trade yearly make vast inroads on the timber supply. Still many of the industries depending on the forests have only begun to develop. Even the lumber trade has sprung up in comparatively recent years. The population of the country when the federal government was organized was all in a heavily wooded area, and here the land required for other purposes supplied the demands for lumber. With the building of railroads came the development of the west. The lumber trade increased. Distributing centers were established, and the lumber industry in the past fifty years has grown into a business of marvelous magnitude. With the development have come various factories, converting the raw material into the innumerable articles of commerce which are inseparably associated with the comforts and necessities of life.

Our annual consumption of wood per capita is nine times that of Germany, and twenty-five times that of great Britain. A few statistisc showing the amount of wood used in some of the industries may be of interest. Fifty thousand acres are consumed every year in the manufacture of crates and boxes. The railroads of the country use annually about one hundred and fifty million ties. Seven hundred

and fifty thousand telegraph poles must be renewed yearly, not to mention the telephone poles used and the telegraph poles required in the construction of new lines, making a total annual consumption for poles and ties two hundred and thirty-five thousand acres. The match industry clears up yearly four hundred acres of pine. The Diamond Match company has recently purchased forty-thousand acres of Oregon timber, the whole to be manufactured into matches. Three thousand five hundred acres are needed yearly in the manufacture of shoe pegs. Shoe lasts and boot-trees take six thousand four hundred acres more. One mill converts yearly ten thousand cords of wood into toothpicks. Another manufactures seventy-five thousand clothespins every day. Each of our several largest newspapers uses daily from one hundred to one hundred and fifty tons of paper pulp, or ten to fifteen thousand acres of timber per year. These figures have not yet included the amount of timber converted into lumber, lath, shingles, fence posts, farm implements, etc., etc. Seventy-five million dollars worth of lumber is annually manufactured into wagons and carriages. The lumber and paper trade consumes every year a total of four million acres of forest, while the amount used for fuel alone is greater than that required for all other purposes combined. Many of the minor products are quite as important. The woodlands yield over 17 per cent of the granulated sugar made in the United States, not to mention the many other indirect products, such as tanning materials and naval stores.

Thus it will be seen that the purposes for which wood is used require an enormous amount of it, and with the development of the arts and industries the amount will still increase. To the enormous clearings made in a single year to supply the demands for the forest products must be added the losses accumulating from fires. Every year vast areas are swept over and the timber is either more or less damaged or destroyed altogether.

But the woodlands are of immense value to the country in other ways than in the commercial products which they yield. It is proven over and over again that forests conserve the ground water and control its distribution. Unfortunately we have no scientific data to show whether the presence or absence of forests has anything whatever to do with the amount of precipitation. Contrary to popular belief on this question, the extreme probability is that forests increase precipitation, if at all, only very slightly, and that little appears as local summer showers. But when it comes to using the rainfall you have a different proposition. There can be no doubt that forests conserve the moisture content of the ground. Their influence in regu-

lating the moisture supply even in regions of ample rainfall, as in the east and south, is known to be sufficiently great to demand attention. They hinder the drying up of streams by checking evaporation, and prevent floods by retarding the melting of snows, and by storing the rainfall. The grove with its numerous leaves and branches, its floor of litter, and its tangle of underbrush, breaks the force of falling rain, conducts it to the ground gradually, and there it is put in storage for future demands instead of causing swollen streams and damaging floods incident to rapid surface drainage.

If the water conserving influence of forests is of so marked advantage to regions of ample rainfall, how much more important then are forests to localities of sparse rainfall as is the case in so large a part of the country west of the Missouri river. Here the interests of agriculture, grazing, mining and transportation all demand the conservation of the water supply.

The forest policy is a part of the land policy, and these two questions are inseparably linked with the whole matter of irrigation, which is going to have so vital a bearing on the development of the arid lands. It is claimed that by despoiling the watershed of its forest cover, the summer flow available for irrigation in the Rocky Mountain country has been diminished by more than 40 per cent.

There yet remain in round numbers about six hundred million acres of public domain. According to the best authority that can be brought to bear upon the question there is water enough available to irrigate about one hundred million acres. The most of these lands are very rich. All the plant foods with which nature has endowed them are yet stored in the soil, and need only the presence of water to unlock them and make them available for plant growth. This land is practically worthless for agriculture as it is, yet if under irrigation it could be made to support a population of many millions. Private capital has done much for irrigation in the west, and has demonstrated over and over again the feasibility of irrigation. But private capital has gone to its limit, and the national government should now come to its aid, build large reservoirs and flumes, reforest the watersheds and thus store up and conserve the waters which now go to waste. The irrigation law, therefore, enacted in 1902, is a most opportune measure, and means the gradual reclamation of one-sixth of the public lands, as also the promotion of the cause of foresty.

Besides being so vitally connected with the question of irrigation forestry will play a large part in settling the problem of grazing on the public lands. Large areas, as in Arizona, for example, formerly affording good pasturage, watered by streams rising in the timber-

covered mountains, now that the forests have been cleared off, are abandoned because of a lack of water supply at certain seasons of the year. Again in many instances the government forest reserves are the summer ranges without which much winter range could not be used.

Mining operations, too, in many parts of the west, have suffered from the depreciating supply of timber. The exploitation of the mines requires large quantities of timber, and, in many cases, successful mining is impossible without it. Thus irrigation, grazing, mining, and forestry are large questions now confronting the west, and they are so interlinked that they must be settled in combination.

The sanitary influence of trees is coming more and more to be recognized and appreciated. The woods were anciently regarded as the abode of spirits, fit only for the habitation of ugly beasts. Edmund Spencer refers to the forest as "a gloomy shade." How different the modern conception when the woodlands are everywhere converted into health and pleasure resorts.

Even more vital is the relation which forests sustain to the water supply of the large cities. The water suply, to be pure, should have its source in uninhabitated woodlands. Recognizing this fact, some of the large cities, notably Boston and New Haven in the east and Los Angeles in the west, are now planting up their watersheds to forest trees. This is an important move, and one that no doubt will be widely extended, involving as it does the health of many millions.

It is but natural that there is general concern to know what is the present status of forestry in this country—whether there is enough timber to supply the present and future demands at reasonable prices, and what is actually being done for the preservation and extension of the forest lands.

Statistics to show the amount of available timber are wanting. A few estimates have been made, but these can hardly be said to be more than mere guesses. One authority says, "Our annual wood consumption which is increasing exceeds our annual production which is decreasing." In general, prices have appreciated in the past thirty years. Not uniformly so, for some classes of lumber are cheaper now than then. The supply cannot be judged by the prices altogether, for through the development of railroads, as the timber becomes scarce in one region additional timber from new centers is brought into competition with the former supply. The lumber industry first centered in the northeastern states, then it moved to the Lake states, and now the center of lumber operations is in the south and on the Pacific coast. As the supply diminishes new kinds of timber

are brought into use, thus large forest areas are now being worked which were formerly thought to be worthless. The more conservative students of the problem believe that there is no immediate danger of a timber famine. Still the situation is a serious one and the scientific management of our forests is necessary if the timber supply is to be maintained. To quote from President Roosevelt's first message he says, "The fundamental idea of forestry is the perpetuation of the forests by use. Forest protection is not an end in itself; it is a means to increase and sustain the resources of our country and the industries which depend upon them. The preservation of our forests is an imperative business necessity."

The difference between lumbering and forestry is that lumbering destroys the forest; forestry destroys only the trees. Forestry is not opposed to cutting down the tree. It should be harvested when ripe, but with a view always to securing a tree in its place. Forestry does not harvest in any period of time more than has been produced in that same time.

Europe has practiced a well defined forest policy for a century, but like ourselves, began such practice only when compelled to do so by the centuries of mismanagement. There in the best managed forests only that which is produced in a given year is removed in the annual cutting. Not a branch leaves the forest unaccounted for. Every part of the crop is gathered in with as much care as the thrifty farmer uses in garnering his wheat or corn. Even the stump and its roots are utilized. Thus far in this country we have used the roots in but one instance. Formerly in some places walnut trees were cut into fence rails, and now the stumps of these same trees are dug up and manufactured into furniture. Many of these trees as they stood in the forest would be worth today from five to six hundred dollars per tree. A complete system of forestry such as is practiced in so large a part of the old world is a number of years in the future with us; but toward this end we are making good progress at the present time.

On the whole, however, our forest policy has been one of slow progress. Almost from the earliest settlement of the country laws were enacted looking to the conservation of our timber resources. They were laws in name only and not in fact. But many of the ideas started then have been very vital and persistent, and while futile enacted are bearing results now. For example, New York passed a tree planting law in 1791. This was 100 years ahead of the times, but a movement that is now quite on time. The early laws erred on the side of over protection. They were too strict, hence never were enforced.

With the act of 1850, making "free grants of public lands to aid in the construction of railroads" came a period of wide open exploitation. A little later a curious movement sprang up—a movement to plant new forests and let the old ones go. This idea was given expression in the law of 1873, known as the Timber Culture Act. It gave a citizen a chance to acquire 160 acres of land, if he in turn should plant a certain per cent of it to forest trees. Here then was an offer on the part of the government to give away millions of acres of public land in order to create new forests, while scarcely a dollar was spent to protect the natural forests which we already had. So far, however, as the law had for its object the bringing about of tree culture in the treeless region it was in theory highly commendable, but in practice it proved to be very bad. Under this act thirty-seven million acres were entered, however, but eight and one-half millions were finally proved up. Had the law been strictly complied with even on this amount, it would have meant that one million acres had been added to our forest area. But it is very probable that nine-tenths of these filings were fraudulent, hence were accompanied by no attempt at tree planting. With the remaining one-tenth an honest attempt was made to comply with the law. Yet this effort was largely a failure, owing to the lack of knowledge as to the best trees to plant and how to plant them. On the whole there is little in the way of additional forest land left to the credit of the Timber Culture Act. So futile had it been and so flagrantly had it been violated that in 1891 it was finally repealed.

Section 24 of the bill passed by congress, repealing the timber claim law, gave the President of the United States power to "set apart and reserve in any state or territory having public lands, wholly or in part covered with timber or undergrowth, whether of commercial value of not, public reservations." Reserves followed but no provision was made for their protection. Indeed the idea of taking care of the forest reserves was a matter of very slow growth. At length, however, due in large measure to the able work of Hon. Hoke Smith, a law was enacted in 1897, giving the Secretary of Interior power to establish a first class forest service, which was put into execution so far as the means at hand would permit.

Up to the present time more than one hundred million acres have been set aside as national forest reserves. These reserves are all in the west and are selected mainly with a view to protecting the head waters of streams. The United States government should add to these holdings in the west wherever it is feasible. Besides this the government should acquire large forest areas in the east, including some in

every state and territory in the Union. The states and territories themselves should have large holdings under their own control. Some of the eastern states have made good advancement in this respect. New York now has reserves amounting to nearly a million and a half acres. Pennsylvania holds a half million acres. Other states and many cities now own extensive reserves and parks. Owing to the long time investments involved, and the large and comprehensive measures necessary to the handling of such lands, the large forest areas should be held by federal or state ownership.

There are about eleven hundred thousand square miles of forest lands in the United States. The annual increment on this area is something enormous, and if it were properly managed, it would supply the demand for all time to come.

Of this forest area the federal and state governments combined own less than one-third, and this comprising the poorer land, and very little virgin forests.

Less than one-half of the private holdings are in tracts ranging from five to five hundred acres—tracts which are too small for the most profitable lumbering. The remaining forest lands are in large holdings, owned in the main by lumber companies, and these lands comprise the richest and best forests that are left. Hence it is to this source that the lumber trade must look for the major part of its supplies for some years to come. Here is the most difficult problem that forestry has to meet, yet these are the forests which above all others should be under scientific management.

No class of forest lands lend themselves quite so readily to forest management as the small private holdings. The investments are permanent. The labor necessary to the care and culture of woodlots can be done at odd times. The outlay is slight. And finally there is a growing interest in forestry among the small holders, because they can see at once that forestry practice will pay.

But with the large holdings the situation is very different. As a rule the lumberman has bought the land for the timber upon it as a speculation. The land itself is of no interest to him, and he usually means to abandon it as soon as the timber has been removed. With him the application of the forest principles would not pay; for he should have to harvest his crop with a view to reproducing the forest either by natural regeneration, or by planting, either of which would involve an expense which he as a mere speculator cannot afford to assume. However, conservative forestry is invading the ranks of the large lumber concerns; for there is a growing tendency on the part of such companies, particularly those whose interests demand a

sustained yield of timber, to make their holdings permanent, to make large expenditures to operate their business, and they cannot, therefore afford to practice any other than forestry methods.

The government seeks to co-operate with private owners, and gives the aid of the Forestry Service in devising plans for managing their timber holdings. To this end a circular was issued in 1898, offering "practical assistance to farmers, lumbermen, and others in handling forest lands." In response to this announcement applications for such assistance have been received from nearly eveery state in the Union. So fast as the resources of the Service will permit preliminary examinations of these lands are made, and a plan of managing the forest is devised which will insure its continuous productiveness with satisfactory returns to the owner. The favor with which this offer of assistance has been received evinces a growing tendency on the part of corporations and large lumber companies to adopt forestry principles in the management of their lands.

Great advances have been made in the mechanism of lumbering. Here, as in every other line where tools and machines are used, invention has followed invention till now with the aid of improved machinery great trees are felled and converted into lumber with almost incredible rapidity. The next step forward must be in the direction of lumbering according to forest principles, which would not only conserve and improve the forests, but would in the end subserve the highest interests of the lumber industry.

I submit that this whole forest problem is not one of sentiment, but a practical question of dollars and cents, and one that must be worked out on economic lines. The widespread popular interest in forestry at the present time is the result of an industrial demand for the protection and conservation of our forests, growing out of the decreasing supply of timber, close competition and appreciating prices.

RESULTS FROM WORK IN BREEDING HARDY FRUITS.

By C. G. Patten, Charles City, Iowa.

The results as presented in this paper will be the better understood if a brief outline be given of the conditions that surrounded the work at the beginning.

Thirty-seven years ago the writer began planting the seeds of the apple on the wind swept prairies of the 43d parallel in northern Iowa; where the mercury fell in its extremes from thirty to forty below zero.

No one whose experience has been confined to the East or South, or to the humid atmosphere of the Lake Regions, or to the balmy atmosphere of the Pacific Slope can comprehend the powers of a Northwest blizzard to suck the moisture from trees and plants, killing by complete exhaustion of moisture and bursting tissues those trees and plants that had their origin in more equable winter climates.

In the far away sixties in this northern latitude one would hardly dare question the prevalent opinion that it was useless to plant anything but a Siberian crab and a few Duchess trees that were just being introduced.

The most courageous planters adhered closely to the recommended list of eastern Wisconsin—Fameuse, Tolman Sweet, Golden and Perry Russets, Oldenberg and Tetofsky. And even now these sorts with the exception of the last two, are planted with extreme caution.

The winters of 1863 and 1864 had been very destructive; and those of 1872 and 1873 even more so; while the winters of 1883, 1884, and 1885 were of such extreme severity that they left the orchards of the Nortwest in ruin.

In the meantime a deluge of Russian apples, plums, pears, and cherries, had come upon the scene; these were to give to the "cold North" fruitful and enduring orchards.

Time has passed, and nearly all of these fruits have passed with it. And so also the most of the seedling apples of northeastern Wisconsin, which were sent out about that time.

During all this period some of the leading pomologists of the West believed that the hopes of the country lay in the breeding to fruits which would be adapted to the distinctive climate of the prairie regions.

My first effort consisted in planting the seeds of a whole barrel of Yellow Belleflower apples, grown in a small orchard in Green Lake County, Wisconsin; but ignorance of the prairie conditions west of the Mississippi, caused a loss the first year of the whole 1,000 seedlings.

My next planting thirty-six years ago was of a few seeds of the Duchess of Oldenburg, a few of Baldwin and Lowell grown nine miles north of Portage, Wisconsin; and some Pewaukee, Tolman Sweet and Siberian seed grown at Fox Lake in the same state. This planting of American, Siberian, and Oldenburg apples was very instructive along breeding lines.

Out of this planting of the Oldenburg seed, came the Patten Greening, which suffered less than any tree of the mother parent variety of any age on my grounds.

The pollinating variety which without doubt was the Rhode Island Greening, left its impress in form and tree, and leaves, and form and color of fruit, far more than did the hardy Oldenburg.

The Patten Greening today stands second in value to no apple for the whole state of Minnesota.

Its superior hardiness, freedom from blight, and scab, and rust of foliage, its early and remarkable bearing, its commercial and uniform size, and excellent culinary qualities, place it in the front rank of all hardy varieties, and furnish a base for the scientific breeding of the apple in the Northwest which exists in no other within my knowledge.

During all these years of experiments the conviction had been deepening with me that out of our hardiest and best American apples and Siberian crosses and the hardiest Russians would be bred the future successful orchards of the Northwest.

Acting upon this conviction I planted almost exclusively seeds from know varieties and surroundings, keeping a record of their parentage, and thus eliminating chance to the fullest extent possible, so that, if anything of value appeared, its parentage would be surely known on one side, and often could almost as surely be traced on the other.

Seeds were taken from a large number of varieties, and out of all this work some surprising results have come. A noticeable feature in seedling apples has generally been their smallness of size. But with me, small size has been the exception. So much so that in a collection of 50 varieties, for size, color, and general appearance I could nearly or quite duplicate any selection of that number from our old lists.

Some fifteen years ago an experiment was made in crossing the Briar Sweet Crab with pollen of the Pound Sweet apple. The Briar Sweet is a seedling of the old Large Red Siberian, and an undoubted cross with the Bailey Sweet; the limbs of these trees interlocking with those from which the seed was taken. In this cross the Bailey Sweet predominated largely, both in size and quality of fruit over the Siberian, while the latter transmitted its hadiness, and mildly its crab-like quality. Eleven seedlings were grown from this cross, three were destroyed, seven of them have fruited and all are sweet apples, an achievement in breeding true to type, which I believe has never been surpassed in so short a period, and especially when we consider the hereditary low breeding of the Siberian. Five of them are of good to excellent quality, and range in size from the parent hybrid to the Fameuse apple.

In these crosses there is the foundation for breeding a family of sweet apples for the North that will produce sweet apples in variety, about as surely as Short Horns will produce Short Horns. Wolf River crossed on Briar Sweet has produced some curious specimens but only one good summer apple. In all crosses with the Siberian its long inbreeding in nature leaves its impress on leaf and bark, or size, or quality, or seed and capsule; and many times on a number of these characters combined. One of the results noted in this cross pollenizing work is that close up in the breeding of the Jonathan is a sweet apple.

Another, by far the more important in this breeding problem, is that the male parent dominates in giving color to the new fruit. Exceptions to this general law may be numerous, but color is one of the most persistent characters in nature. This fact is most clearly demonstrated in Bulletin No. 22, U. S. Department of Agriculture, Division of Vegetable Physiology and Pathology, entitled "Immediate Effects of Pollen in Maize," prepared by Herbert J. Webber. Therein it is shown that all varieties and colors of corn experimented with transmitted, with but few exceptions, the distinct colors of the male parent, to the kernels of corn with which it was crossed, and not color alone but form as well. Prof. Hugo de Vries' paper on "Atavism" published in the first volume of the International Conference on Plant Breeding, strongly confirms, incidentally, the theory of the color influence of the male flower. Prof. S. A. Beach's experiments at the New York Agricultural Experiment Station, in crossing a white grape with another white variety, produced from a large number of seedlings only white grapes; notwithstanding one of these crossed grapes was the product of two colored sorts. Color is one of the most persistent

characters in plant and animal breeding, and when it is intensified by conscious or unconscious selection as in Fameuse, McIntosh, Wine Sap, and like apples, and these are used as the pollinating variety, it is nearly impossible to get away from their impress. Distinct and beautiful colors will hereafter be a marked feature in our efforts in breeding the apple.

Twnty-nine years ago it was my fortune to secure a cross between the Native Soulard Crab and a Pippin apple; as nearly as I am able to learn, I believe it to have been the Vermont Pippin; this cross is without doubt the first one ever originated between **Pyrus Corronari** and our cultivated apple. In form and color it is much like the parent Pippin, the best specimens being from 2½ to 3¼ inches in diameter. While considerable of the quality of the wild crab remains, it has a persistent sweet after taste. This hybrid has again been crossed, and the result is an apple of much finer texture and quality. Much interest was added to this experiment at that time by the fact that, after repeated trials by Mr. George P. Peffer of Wisconsin, he concluded that such crosses could not be made. From a letter now in my possession, Prof J. L. Budd had a like experience, not having been able to secure a perfect seed in numerous crosses with the Soulard, many specimens of which showed a marked resemblance in outward size and appearance to the Roman Stem apple with which it was crossed.

Doubtless reverses and disappointments are the common heritage of the experimenter, and perhaps one ought to be satisfied with having produced one fruit which is adding untold thousands to the wealth of the region in which he lives; but when he sees several others of his productions, which by their superior merits are displacing the older sorts he should be doubly happy.

Of the Grimes Golden and Patten Greening, crosses which have been exhibited during the last season and of which I have a few specimens here, I con only say that it is yet too early to say more than that some of them present features of marked value.

In conclusion I wish to present for your consideration some photographic views of sections of four-year-old cross-fertilized trees of apple and pear. These views seem to show a marked segregating power of the male parent, in fixing the form and size of the seedlings. The first is the Collins or Champion, crossed on Malenka, a small Russian, very upright grower. Those of you who are acquainted with the Collins will readily see the force of the comparison. Seven of the nine seedlings are more than twice as large as a four-year Malenka, with three times as many limbs, and a distinctly different

form, and a uniformity in size and appearance that suggests a grafted variety.

The second is a Patten Greening tree, and crosses of Black Annett on it. The Black Annett has small or fine branches similar to the Jonathan; the Patten Greening is a strong, rugged, angular grower. Not having four-year trees of these varieties, full-sized typical three-year trees were selected.

The third is the Black Annett, as the mother parent, crossed with Oliver or Senator. The influence of the male parent in this cross is very striking; the small limbs of the mother tree and the form, have practically disappeared; while the strong, long-branched, upright habit of the male parent is conspicuous in every seedling.

Fourth and lastly, is a section of four-year pear tree; the mother parent being the only non-blighting sort introduced by Prof. J. L. Budd, nearly twenty-five years ago. It is as upright in habit as a Lombard Poplar. This tree was crossed with the Anjou. Not one of a goodly number of trees has the form of the mother parent, all are in form as you see it in the view, but several of them closely resemble the Anjou in bark and general appearance.

While the thoughts herein presented will not seriously conflict with the well established laws of breeding, they may serve to awaken thought, and throw some side light onto this most intricate problem of inheritance, which caused Darwin to exclaim, "that the whole subject is most wonderful." But in its unfolding as witnessed in the last half century, it requires no prophetic vision to see in it, and through it, one of the great uplifting forces for the human race.

METHODS IN BREEDING HARDY FRUITS.

By N. E. Hansen, South Dakota Experiment Station, Brookings, S. D.

My purpose in this brief paper is simply to emphisze some points brought out in Bull. 87 and 88 of the S. Dakota station. In crossing various fruits I have found it of decided advantage over the old outdoor method to do the work under glass. The trees, shrubs and plants are raised in pots, boxes or tubs for a year or two before blossoming time. In winter they are stored in two specially constructed tree cellars—one 16 by 50 feet and another 26 by 80 feet—with enough windows to afford some light, where they are kept dormant and even allowed to freeze somewhat. In late winter or early spring they are brought into the greenhouse and the crossing is done when the flowers are ready. Only a small part of the blossoms are emasculated; the remainder are removed while still in the bud. No sacks are necessary as a rule. When there is no room in the greenhouse the tubs are taken direct from the cellar to their permanent summer position late enough to escape frosts.

As a whole, the method demands close attention and careful manipulation. While visiting orchard houses in Europe in 1894 and again in 1897, the thought came to me that this method of raising fancy fruit could be utilized in experiments in the prairie Northwest. The applicability of this method elsewhere remains to be determined. The use of dwarf stock is necessary, as the Paradise for the apple, quince for pear, and the western sand cherry for the stone fruits.

The South Dakota legislature of 1901 granted means for erecting the first fruit-breeding greenhouse ever constructed. Since then experiments have been limited only by the space available. Much more could have been done with a larger greenhouse. Since South Dakota always intends to be at the head, we trust that future legislatures will provide additional facilities. As a result of this appropriation, and the liberality of the Regents of Education in affording needed storage cellars and other facilities, we are able to announce the production of many interesting and hybrid fruits, many of them combinations made

for the first time. Some of them are hybrids of the South Dakota sand cherry with the peach, nectarine, Japanese plums, a Chinese apricot, and a purple-leaved plum from Persia. Progress is also being made in originating hardy cherries, strawberries, and raspberries. By far the most extended experiment on record in the making of graft-hybrids of the apple has been undertaken and we await the fruiting of the resulting plants with interest. In ornamentals the main work done has been crossing the wild Dakota and Siberian roses with choice double roses. If sufficient greenhouse facilities are afforded, the propagation of such new seedlings as give promise of permanent value will be pushed, so that they may be distributed for trial elsewhere as rapidly as possible. The advancing northward at least 500 miles of the successful cultivation of the cherry, peach and apricot and that of winter apples, we trust will be some of the results of erecting this novel workshop for the invention of new hardy fruits.

Considerable success has been secured in hastening the fruiting of cross-bred seedlings. For instance, strawberries originated one winter by crossing the wild with the tame have been raised up to fruiting size the same year outdoors and fruited in pots under glass the following winter. This saves much time in selecting varieties for propagation and also hastens the work of propagation by our being able to pot many layers before transplanting to the field.

In handling a quarter of a million fruit seedlings I find many interesting side lines of investigation presenting themselves, but just now the main effort must be to originate a few varieties of the various orchard and small fruits worthy of a permanent place on the present limited fruit list. Some of the seedling variations which present themselves make me feel confident that Dr. Hugo De Vries in his theory of mutuation hit the nail on the head. It is certainly a very helpful thought that new forms worthy of specific rank can originate as sports, that evolution is by saltation, that is, by leaps or steps, instead of being a long and very gradual upward slope. Memebers of the legislature who have the dispensing of funds will certainly find more comfort in the theory of De Vries than in that of Darwin. My experience at first hand with many thousand seedlings of native and cultivated fruits and plants, certainly compels me to believe that the evolution of new species as the result of man's effort intelligently directed is more like the labor of an inventor of machinery in his workshop than that of an observer of an ever changing panorama. In brief, plant-breeding is the inventing or new plants, using material as furnished by nature; and the time necessary for the work with modern scientific

methods, is very much shorter than that usually considered necessary. The modern plant-breeder rides in his automoblie on the highway of evolution. And perhaps Mendel's law and De Vries mutuation theory are two of the wheels.

LABORATORY WORK IN PLANT BREEDING.

By R. A. Emerson, Lincoln, Neb.

Importance of Laboratory Work.

It is perhaps unnecessary to say that at least a part of the instruction in any systematic course in plant breeding should be given by the laboratory method. True, the average student of plant breeding can learn much about practical methods and about principles upon which these methods are based from lectures and systematic reading, but he will certainly become more expert in practical methods and obtain a clearer insight into the underlying principles if his library and class-room work is supplemented by regular laboratory exercises.

As regards instruction in practical methods the truth of the above statement is obvious. No one for instance would attempt to give instruction in the selection of seed corn by lectures alone no matter how well they might be illustrated by charts and photographs, provided he could arrange for actual practice work. It is largely on account of this fact that work in corn judging is provided for in our agricultural schools. When we come to the other phase of instruction, however, when we attempt to teach the principles of plant breeding, too many of us depend almost wholly upon work in the lecture room and library. An opportunity to work with the plants themselves is just as important to the student who is studying principles as to the one studying practical methods. For instance, the student who has a chance to hybridize a few plants and grow the hybrids for two or three generations will be benefitted more by this work than he could possibly be by an equal amount of time spent in reading about hybrids. His reading afterward will mean more to him for he has some experience of his own with which to compare the results reported by others. Moreover, work along this line with the plants themselves is decidedly ahead of lectures and books in creating enthusiasm on the part of the student. I doubt if there is anything the student will watch with more interest than a hybrid which he himself has made. If the beginner is not tempted to poke in to the first flower bud on his new hybrid in-

stead of waiting for it to open the next day, it is a question whether he will ever take any great interest in plant breeding.

Lines of Work Suited to Laboratory Presentation.

Just what phase of the subject of plant breeding shall be brought to the student's attention in the laboratory will doubtless depend somewhat on the instructor's viewpoint. Naturally his own hobbies will receive ample illustration. Nevertheless it is to be assumed of course that the instructor will try to present all phases of his subject with due consideration for their relative importance. Manifestly, however, some things are better adapted to presentation in the laboratory than others. Personally I have not attempted to introduce into my laboratory work any thing to illustrate the effect of environment on the production of improved varieties of plants. Doubtless something of the sort could be done, but the lines of work which to my mind seem best suited to laboratory study are the methods and results of hybridization and of straight selection.

As between teaching practical methods on the one hand and fundamental principles on the other, it is my belief that the latter should receive the greater attention in a general course. While some part of any work in plant breeding will naturally be devoted to practical methods, such work is special for the most part and belongs therefore, with a study of particular crops rather than in a general course.

Practical Work In Hybridization.

The practical work in hybridization will usually consist of practice in cross-pollinating the flowers of a number of common plants. The particular plants used will of course depend on the locality where the course is given, and upon the season of the year in which it is offered. Some of the plants selected should have perfect flowers and others imperfect ones. Some plants should be included that must not be pollinated until the pistils mature and some that permit of premature pollination. The plants chosen for the first work should have flowers that are easy to operate upon, while later more difficult subjects should be included. On the whole, comparatively little time should be spent on this work. If the student gets an insight into general methods it is enough. When he comes to take up the breeding of a particular crop he will adopt his own method anyway.

Difficulties Encountered in a Laboratory Study of Hybrids.

When it comes to studying results of hybridization in the laboratory many difficulties arise. In the first place at least three generations of the hybrid in addition to the parent generation must be grown in order that the student get an adequate notion of the behavior of hybrids. This is not a difficult matter for the special student who will spend some years in the work; but in the one or two semesters which the average student can devote to the subject there is not time to grow four genrations one after the other of any plant with which I am acquainted. The early dwarf beans require comparatively little time for development, usually not much over three months from the time the seed is planted until the crop is ripe, and yet, if no time is lost during the nine months of the school year, the student can barely grow the parent races, cross them and grow the first and second generations of the hybrid. One way around this difficulty is to have on hand from a previous year's work crossed seeds and seeds of the first and second generation of the same hybrid. The student can then at the very beginning of his course plant seeds of the pure parents races and seeds that will produce the first, second and third generations of a particular hybrid. Or the difficulty may be overcome by choosing a plant that can be propagated by cuttage or some similar means as petunia or tomato for instance. Individuals of several generations of a hybrid, once they have been obtained, can then be carried along from year to year without great trouble. The advantages of these methods are that they enable the student to compare the several generations of the hybrid directly with each other and to complete the work in a single semester. The main disadvantage of the methods is the fact that the student will take less interest in the study of "ready made" hybrids than in following his own crosses from one year to another.

A method not very different from those already suggested is to use preserved materials. Of all these, specimens on herbarium sheets or in glass jars are of least value. The choice should be for plants, some product which will keep well in its natural state. Ears of corn are ideal in this respect. The same specimens can be kept for a long time if carefully handled. Seeds of beans, peas, etc., are also good. Gourds, I suppose would furnish excellent material. But hybrid specimens need not be limited to products that keep for years. Even pumpkins and squashes, excellent subjects for crossing, can be kept well through the winter. Some of the ornamental gourds can be kept

considerably longer. The use of squashes and pumpkins would of course necessitate the growing of a new supply each year.

There is a second difficulty that is hard to get around, particularly where the student is to grow the plants rather than to depend upon preserved specimens. This is that large numbers of individuals are required in order that any adequate idea can be had of the possibilities of hybridization. Where only a few individuals of any hybrid are grown it is improbable that all or anything like all the possible combinations of parent characters will be secured; but even admitting the probability of the presence of most of the possible forms, certainly no accurate idea can be had from a few individuals of any numerical relation which might exist between the various forms. Large numbers of plants cannot be grown during the winter when school is in session without the use of considerable room in greenhouses. The choice of comparatively small plants will of course reduce the difficulty materially. If preserved specimens are used they also should not be too bulky. This is the greatest drawback to the use of such plants as squashes and pumpkins.

How to Study Hybrids in the Laboratory.

In case only one or two exercises are to be devoted to the study of hybrids in a general laboratory course in horticulture, it will doubtless be sufficient for the student, first, to note in a general way the relative amount of variation in the first and succeeding generations in comparison with the variations shown by the parents; whether they resemble one parent more than the other, or whether they are like one parents in some respects and like the other in other respects; third, to learn whether certain types seem to breed more nearly true than others. When more time is at the disposal of the student, as would be the case in a regular course of plant breeding, the work might be started much as outlined above, but a more careful study should follow at once. The student should be impressed at the start wtih the importance of studying unit characters. He should take up a single character at a time as, for instance, wartiness in squashes, stringiness in bean pods, hairiness in popples and the like, and study this one character in all generations of the hybrid as well as in the parent races. He should not only observe the variation in the development of this character in the various individual plants, but he should note in case of alternate inheritance the number of individuals that have the character and the number in which it is wanting. In case of certain characters he should make accurate measurements of all individuals as, for instance,

in studying shape of squashes, bean seeds and the like. In no other way can he get so clear an idea of the variation that the particular character exhibits in the various generations under observation. Later he should study the relation of one character to another. He will run across numerous correlations, especially in color. The student will soon find that it is often difficult to tell beforehand just what characters behave as units in heredity. He might assume at the beginning, for instance, that all the fibers present in a bean pod would behave as a unit character, but this notion will be corrected when he studies the second generation of a cross between a tough stringy-podded bean and a tender stringless-podded one. He will at once come upon plants with pods that have fibers along the sutures but no fibers in the walls or perhaps pods that have the wall fibers without the suture fibers.

Laboratory Work in Selection.

Practical work in selection is not well adapted to laboratory exercises in a general course in plant breeding. There are a number of plants or plant products that might be employed in such work. Practice might be had for instance in the selection of corn of a particular type or some variety of table beet might be used instead. But such work simply teaches the student what the desirable or standard characteristics of a particular variety or crop are and affords him practice in sorting out individuals of the approved type from those of that are not so desirable. While this is most excellent and practical work it manifestly belongs with the study of the particular crop in question and should not be introduced to any great extent in a general plant-breeding course.

When we undertake a laboratory study of the principles upon which proper selection is based, much the same difficulties are encountered as we have to overcome in laboratory work with hybrids, namely that large numbers of individuals must be used, requiring considerable room and that several generations must be grown and studied, requiring more time than the average student can afford. These difficulties are to be met in the ways pointed out in discussing laboratory work with hybrids: Small plants may be chosen; seed of several generations produced from a particular selection may be provided for the student or, other individual plants of the various generations may in some cases at least be propagated from cuttings; finally, preserved materials may be employed.

In a study of the results of a certain selection it is not enough that the student see the type originally selected and note the progress made

by examining the best individuals produced in each of the several generations, in order to get an adequate idea of what to expect from selection he must see numerous individuals of the stock from which the selection was first made and all the individuals produced in each generation or at least enough of them to indicate the percentage of individuals like the selected type.

As many distinct types as possible should be under observation since certain types may breed more nearly true than others from the first, or certain individuals may transmit their characters with more certainty than others.

BREEDING HARDY RASPBERRIES FOR THE NORTHWEST.

By N. E. Hansen, South Dakota Agricultural College, Brookings, S. D.

1. That hardier varieties of the raspberry are needed is evident from the fact that all of the present standard sorts are not hardy over a large area of the prairie Northwest.

2. Some of these old varieties are grown under winter protection, the canes being laid down in the fall and covered with earth. This method is expensive and the work is distasteful to the busy prairie farmer, who likes fruit but cannot find time for such extra work as laying down raspberry canes.

3. These tender varieties were developed in large measure from the native raspberris of the eastern States (1) by selection from large numbers of seedlings under cultivation; (2) by crossing with the cultivated raspberries of Europe; (3) by the use of choice-fruited plants found growing wild, thus taking advantage of Nature's efforts in this line.

4. Those seedlings having much of the European species in their makeup usually proved tender under cultivation, even in the milder climate of the east. But neither of these, nor those of pure eastern native ancestry, proved sufficiently hardy in the prairie Northwest.

5. This is another instance of DeCandolle's law that wild woody plants have not advanced 100 miles north of their natural limits within historic times. But as raspberries of the same species are found indigenous far northwestward, it is quite evident that Nature has accomplished the task of adapting the raspberry to a colder and drier climate. But how many thousand years has she taken to do this work?

6. The great task remains for us to breed a hardy race of raspberries from our native Northwestern form of the species. This must be done: (1) By selection from thousands of pure native sedlings unedr cultivation, the endeavor being to raise as many generations under high cultivation as possible, until varieties are obtained combining perfect hardiness and productiveness of plant with large size and good quality of berry; (2) by crossing with the best tame and native varieties of America, Europe and Asia.

7. The present writer's efforts in this line at the South Dakota experiment station began ten years ago and are just beginning to show good results. From many parts of the Dakotas, Minnesota, Manitoba and Assiniboia, the native raspberries have been gathered; and many thousands of seedlings raised under high cultivation, both purebred and hybrids with other raspberries from three continents. Not all of these have fruited but of those that have fruited a goodly number have been selected as worthy of propagation. One especially is promising at this writing, the "Sunbeam," appearing as the lone survivor to cheer us when the outlook was dark for hardy raspberries. It is the first of our thousands of raspberry seedlings to be named, and is a hybrid of Shaffer's Colossal with a wild red raspberry from Cavalier county, North Dakota, near the Manitoba line. The plant is vigorous, productive, purple-caned, but sprouts freely; foliage distinct; fruit on style of Shaffer's but smaller, worthy of trial at the north where raspberries winterkill, as it has endured 41 degrees below zero without protection.

8. The essential demand of a seedling raspberry or of any other of the quarter of a million fruit seedlings raised at this station is that it must endure the winters unprotected without injury (this means at times 40 degrees F.) with the ground bare, and be productive of fruit of fair size and quality,

9. It is my constant endeavor to breed a cosmopolitan race, not merely one adapted to a narrow range. This cross-breeding of many races may produce this.

10. If 20,000 seedlings will produce this desired plant, well and good. If 200,000 seedlings are necessary, it will be the writer's best endeavor to raise that number. The history of horticulture shows that in large numbers lies rapid progress. And time-saving in an important factor in this rapid age. From the ashes of millions of seedlings will arise, Phoenix-like, the new creations which will dominate our future prairie pomology.

SECRETARY'S REPORT.

Members and Friends of the Nebraska State Horticultural Society:

We are again assembled in our annual meeting for the exchange of ideas, to recall the work of the past year, and to arrange for the future. Although it may not be realized, much good work for the society has been done during the past year, through committee work and at very little expense. The committee on redistricting the state has made nineteen districts where we only had nine before. For this work $200 was set aside, of which $44.35 was used. The committee on freight and express rates was allowed $300 for expenses, or as much thereof as needed, and of this amount $76.52 was used. This committee did some important work.

Our President and G. A. Marshall were delegated as representatives of the society to make a fruit show last September, before the American Pomological Society, at Kansas City. They were allowed $50 for expenses, and used $37.50 of this amount. At this show I understand our society was awarded a bronze medal, but I have not yet received any official notice of it.

Each year we see new faces, but some are missed. The past year we have lost from our membership Professor J. L. Budd of Ames, Iowa; Robert W. Furnas of Brownville and Rev. C. A. Hale of University Place, and H. J. Kent of Lincoln and Godfrey of Lincoln. I have just been notified by the postmaster at Fort Calhoun of the death of Hiram Craig, who moved to California some time ago, and died there.

I have received membership fees as follows:

C. A. Hale	$4.00
Don L. Russell	5.00
Dale Russell	5.00
T. M. Howard	1.00
E. W. Dole	5.00
C. M. Hurlburt	5.00
Dr. A. N. Anderson	1.00
John Williams	1.00

E. G. Jury	1.00
James Watts	1.00
L. A. Ganson	1.00
F. E. Denny	1.00
N. P. Ludeen	5.00

The following warrants have been issued during the year:

WARRANTS ISSUED DURING THE YEAR 1905.

Series 1905.

No.		Amount.
1	Dole Floral Co., premiums	$6.00
2	L. Henderson, premiums	16.00
3	G. S. Christy, per diem winter meeting	15.00
4	E. M. Pollard, per diem winter meeting	12.00
5	Peter Youngers, per diem winter meeting	12.00
6	C. L. Saunders, per diem winter meeting	9.00
7	C. H. Green, per diem winter meeting	12.00
8	G. A. Marshall, per diem winter meeting	12.00
9	Frey & Frey, premiums	19.00
10	C. H. Green, premiums	6.00
11	J. B. Hunter, premiums	4.00
12	David Hunter, premiums	1.00
13	D. Longster premiums	1.00
14	Marshall Bros, premiums	12.00
15	B. A. Murphy, premiums	3.00
16	Isaac Pollard & Sons, premiums	28.00
17	H. J. Rosenbaum, premiums	6.00
18	M. A. Schmale, premiums	2.00
19	Ed Schriver, premiums	2.00
20	W. G. Swan, premiums	1.00
21	A. M. Tremain, premiums	4.00
22	G. M. Whitford, premiums	2.00
23	Don Russell, part pay reporting winter meeting	25.00
24	Isaac Pollard & Sons, apples for lunch at State Farm	13.75
25	Dr. T. A. Peters, balance on expense at winter meeting	20.00
26	Jacob North & Co., suplies	7.25
27	L. M. Russell, salary	125.00
28	Crete Nurseries, stock for Sandoz Experiment Station	20.00

29	Youngers & Co., stock for Chambers Experiment Station.	5.00
29½	L. M. Russell, salary	125.00
30	Marshall Bros., stock for experiment stations	23.35
31	J. A. Brown, committee work	12.76
32	G. A. Strand, committee work	5.00
33	W. G. Swan, committee work	10.34
34	H. S. Harrison, committee work	4.00
35	G. A. Marshall, committee work	12.25
36	Benton Bros., printing programs	4.50
37	Chapin Bros., emblems for Furnas	12.00
38	G. S. Christy, per diem summer meeting	12.00
39	H. S. Harrison, per diem summer meeting	6.00
40	W. G. Swan, per diem summer meeting	12.00
41	C. H. Green, per diem summer meeting	9.00
42	Don Russell, part pay reporting summer meeting	25.00
43	C. S. Harrison, stock furnished York and Chambers stations	25.00
44	L. M. Russell, salary	125.00
45	Don Russell, balance reporting winter meeting	25.00
46	S. W. Christy, grapes for State Fair	9.90
47	G. W. Alexander, premiums	32.00
48	Frank Harney, premiums	2.00
49	G. W. Alexander, discretionary premiums	12.00
50	Frank Harney, premiums	2.00
51	M. B. Atkins, premiums	22.00
52	Aye Bros., premiums	1.00
53	Chas. Brush, premiums	2.00
54	H. R. Brown, premiums	2.00
55	G. F. Bixby, premiums	1.00
56	J. W. Bois, premiums	2.00
57	C. B. Barker, premiums	3.00
58	Isaac Pollard & Sons, premiums	101.00
59	W. S. Blake, premiums	2.00
60	C. B. Camp, premiums	46.00
61	Crete Nurseries, premiums	187.00
62	S. W. Christy, premiums	14.00
63	G. S. Christy, premiums	37.00
64	Wm. Comer, premiums	2.00
65	R. T. Chambers, premiums	1.00
66	J. Daugherty, premiums	2.00
67	John Furnas, premiums	22.00
68	C. H. Green, premiums	115.50

69	Dora A. Hesseltine, premiums	11.00
70	C. B. Hain, premiums	2.00
71	Lewis Anderson premiums	164.00
72	Ed Hayes, premiums	1.00
73	E. Hornung, premiums	2.00
74	Will Heitman, premiums	2.00
75	Chas. Jelinek, premiums	1.00
76	C. S. King, premiums	25.00
77	C. Laub, premiums	1.00
78	Wm. Lindsey, premiums	2.00
79	John Logeman, premiums	5.00
80	Richard Leahy, premiums	4.00
81	Thomas Lynch, premiums	2.00
82	A. Martin, premiums	18.00
83	John Martin, premiums	8.00
84	W. H. Mills, premiums	1.00
85	H. L. Mathews, premiums	1.00
86	J. G. Neff, premiums	59.00
87	C. P. Neal, premiums	1.00
88	H. O'Neal, premiums	2.00
89	M. Robin, premiums	2.00
90	Mrs. M. A. Schmale, premiums	2.00
91	G. W. Shaver, premiums	3.00
92	E. E. Smith, premiums	15.00
93	W. B. Swisher, premiums	2.00
94	J. L. Speese, premiums	18.00
95	Stackhous, & Tyrrell, premiums	104.50
96	F. Schumaker, premiums	3.00
97	W. G. Swan, premiums	4.00
98	J. L. Stokes, premiums	6.00
99	O. R. Trimmer, premiums	4.00
100	G. N. Titus, premiums	3.00
101	E. S. Williams, premiums	4.00
102	G. S. Christy, per diem State Fair	30.00
103	H. S. Harrison, per diem State Fair	24.00
104	E. M. Pollard, per diem State Fair	6.00
105	Peter Youngers, per diem State Fair	24.00
106	Chas. L. Saunders, per diem State Fair	6.00
107	C. H. Green, per diem State Fair	24.00
108	W. G. Swan, per diem State Fair	24.00
109	G. A. Marshall, judging fruit at State Fair	9.00
110	J. H. Hadkinson, labor and judging fruit at State Fair	24.00

111	C. H. Barnard, labor and judging fruit at State Fair....	18.00
112	J. H. Hadkinson, decorations for horticultural hall	20.00
113	Isaac Williams, premiums	2.00
114	Roy Uhl, labor at State Fair	3.00
115	John Shaw, labor at State Fair	9.00
116	Dick Russell, Ass't. Sec. at State Fair	15.00
117	S. W. Christy, fruit for State Fair	7.55
118	Lincoln Ice & Cold Storage Co., storage on fruit	16.90
119	Chapin Bros., cut flowers and vases for decorations	10.00
120	Rudge & Guenzel Co., supplies for State Fair	20.07
121	Jacob North & Co., supplies for State Fair	19.25
122	Western Glass & Paint Co., glass for flower case	2.85
123	Alfred Colles, labor at State Fair	7.00
124	Dale Russell, labor at State Fair	13.50
125	L. Baumann & Co., floral decorations	26.33
126	Rudge & Guenzel, supplies for State Fair	2.25
127	Geo. A. Wilson, repairing lagoon at Fair grounds	27.80
128	John W. Scarborough, labor at State Fair	6.25
129	John Hawkins, labor at State Fair	5.50
130	G. A. VanSickle & Son, painting signs	7.50
131	W. J. Blystone, labor during summer and fall at Fair grounds	56.00
132	G. S. Christy, expense making fruit show at American Pomological society	21.20
133	G. A. Marshall, expense making fruit show at American Pomological Society	16.25
134	Jacob North & Co., printing bulletins and entry cards..	232.90
135	Lincoln Ice & Cold Storage Co., storage on fruit	1.75
136	Nebraska Papar & Bag Co., supplies for State Fair....	6.41
137	Lincoln Lumber Co., lumber for horticultural hall	18.75
138	Peter Youngers, committee work on frt. and ex. rates..	23.25
139	G. A. Marshall, committee work on frt. and ex. rates ...	22.75
140	C. B. Parker, committee work on frt. and ex. rates....	30.52
141	L. M. Russell, salary	125.00
142	C. S. Harrison, delegate to Minnesota	10.00
143	L. M. Russell, postage, express, frt. and telephone for year	70.91
144	Don Russell, balance reporting summer meeting	25.00
		$1.095.44

TREASURER'S REPORT.

WARRANTS PAID.

Series 1904.

No.		Amount.
190	H. S. Harrison	$27.00

Series 1905.

No.		Amount.
1	Dole Floral Company	$ 6.00
2	L. Henderson	16.00
3	G. S. Christy	15.00
4	E. M. Pollard	12.00
5	Peter Youngers	12.00
6	C. L. Saunders	12.00
7	C. H. Green	12.00
8	G. A. Marshall	12.00
9	Frey & Frey	19.00
10	C. H. Green	6.00
11	J. B. Hunter	4.00
12	David Hunter	1.00
13	D. Longster	1.00
14	Marshall Bros.	12.00
15	P. A. Murphy	3.00
16	Isaac Pollard & Sons	28.00
17	H. J. Rosenbaum	6.00
18	A. M. Schmale	2.00
19	Ed Schriver	2.00
20	W. G. Swan	1.00
21	A. M. Freeman	4.00
22	G. M. Whitford	2.00
23	Don Russell	25.00
24	Isaac Pollard & Sons	13.75
25	Dr. A. T. Peters	20.00
26	Jacob North & Co.	7.25
27	L. M. Russell	125.00

28	Crete Nurseries	20.00
29	Youngers & Co.	5.00
29½	L. M. Russell	125.00
30	Marshall Bros.	23.35
31	A. J. Brown	12.76
32	G. A. Strand	5.00
33	W. G. Swan	10.34
34	H. S. Harrison	4.00
35	G. A. Marshall	12.25
36	Benton Bros.	4.50
37	Chapin Bros.	12.00
38	G. S. Christy	12.00
39	H. S. Harrison	6.00
40	W. G. Swan	12.00
41	C. H. Green	9.00
42	Don L. Russell	25.00
43	C. S. Harrison	25.00
44	L. M. Russell	125.00
45	Don L. Russell	25.00
46	S. W. Christy	9.90
47	G. W. Alexander	32.00
48	Frank Harney	2.00
49	G. W. Alexander	12.00
50	Frank Harney	2.00
51	M. B. Atkins	22.00
52	Aye Bros.	1.00
53	Chas. Busch	2.00
54	H. R. Brown	2.00
55	....	1.00
56	J. W. Bois	2.00
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72	Ed Hayes	1.00
73	E. Horning	2.00
74	William Heitman	2.00
75	Charles Jelinek	1.00
76	S. C. King	25.00
77	C. Lamb	1.00
78	Wm. Lindsay	2.00
79	John Logeman	5.00
80	Richard Leahy	4.00
81	Thomas Lynch	2.00
82	A. Martin	18.00
83	John Martin	8.00
84	W. H. Mills	1.00
85	H. L. Mathews	1.00
86	J. G. Neff	59.00
87	C. P. Neal	1.00
88	H. O. Neal	2.00
89	M. Robin	2.00
90	Mrs.M. A. Schmarle	2.00
91	G. W. Shayer	3.00
92	E. E. Smith	15.00
93	W. B. Swisher	2.00
94	J. L. Speece	18.00
95	Stackhouse & Tirrill	104.00
96	F. Schumaker	3.00
97	W. G. Swan	4.00
98	J. L. Stokes	6.00
99	O. R. Trimmer	4.00
100	G. N. Titus	3.00
101	E. S. Williams	4.00
102	G. S. Christy	30.00
103	H. S. Harrison	24.00
104	E. M. Pollard	6.00
105	Peter Youngers	24.00
106	Charles L. Saunders	6.00
107	C. H. Green	24.00
108	W. G. Swan	24.00
109	G. A. Marshall	9.00
110	J. H. Hadkinson	24.00

111	C. H. Barnard	18.00
112	J. H. Hadkinson	20.00
113	Isaac Williams	2.00
114	Roy Uhl	3.00
115	John Shaw	9.00
116	Dick Russell	15.00
117	S. W. Christy	7.55
118	Lincoln Ice & Cold Storage Co	16.90
119	Chapin Bros.	10.60
120	Rudge & Guenzel Co.	20.07
121	Jacob North & Co.	19.25
122	Western Glass & Paint Co.	2.85
123	Alfred Colles	7.00
124	Dale Russell	13.50
125	L. Bauman & Co.	26.33
126	Rudge & Guenzel Co.	2.25
127	George A. Wilson	27.80
128	John W. Scarborough	6.25
129	John Hawkins	5.50
130	G. A. VanSickle & Sons	7.50
131	W. J. Blystone	56.00
132	George S. Christy	21.20
133	G. A. Marshall	16.25
134	Jacob North & Co.	232.90
135	Lincoln Ice & Cold Storage Co.	1.75
136	Nebraska Paper & Bag Co.	6.41
137	Lincoln Lumber Co.	18.75
138	Peter Youngers	23.25
139	G. A. Marshall	22.75
140	C. B. Parker	30.52
141	L. M. Russell	125.00
142	C. S. Harrison	10.00
143	....	70.91
144	....	25.00
	Total warrants paid	$2,935.08

The Nebraska State Horticultural Society,

In account with Peter Youngers, Treasurer.

Jan. 17, 1905, Balance on hand	$2408.30
July 8, 1905, State Appropriation	1500.00
Sept. 16, 1905, Cash, State Agricultural Society	800.00
Oct. 4, 1905, Cash, State appropriation	1000.00
Jan. 2, 1906, L. M. Russell, Membership fee	36.00
	$5744.30
Total warrants paid	2935.08
Balance on hand, Jan. 16, 1906	2809.22

Lincoln, Nebraska, Jan. 16, 1906.

We, your committee, have carefully examined and audited the reports of the Secretary and Treasurer of the Nebraska State Horticultural Society and find them correct.

C. H. GREEN.
CHAS. B. CAMP.
J. A. YAGER.

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