
THIRTY-EIGHTH ANNUAL REPORT

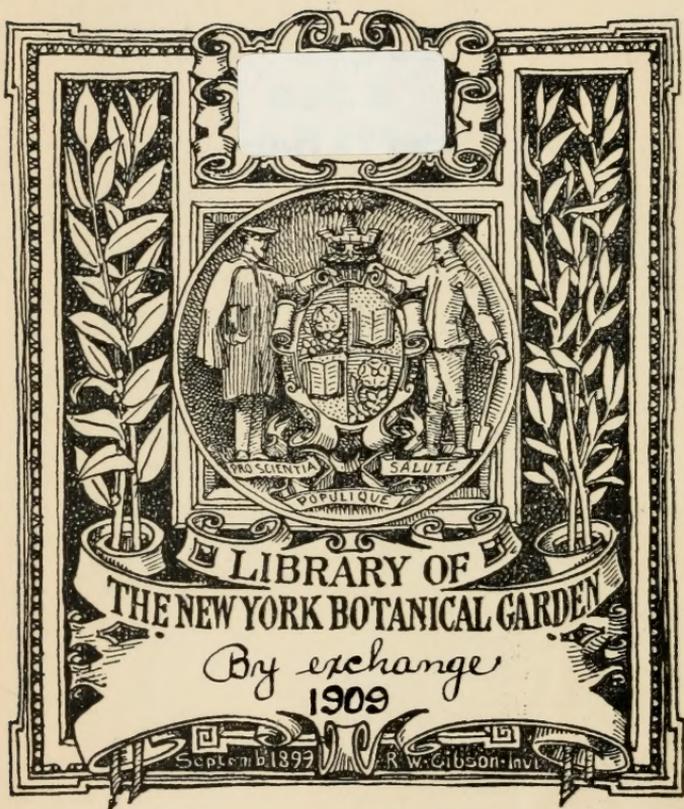
OF THE

Nebraska State Horticultural Society

1907



L. M. RUSSELL



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THIRTY-EIGHTH ANNUAL REPORT

OF THE

Nebraska

State Horticultural Society

Containing all the Proceedings of the Summer Meeting Held
at Omaha, July 11 and 12, 1906, and the Annual
Meeting Held at Lincoln, January 15,
16 and 17, 1907

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By L. M. RUSSELL, Secretary

Lincoln, Nebraska

LINCOLN, NEB.
PUBLISHED BY THE STATE
1907

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1907

LETTER OF TRANSMITTAL.

To His Excellency, George L. Sheldon, Governor of Nebraska:

SIR:—In compliance with legal requisition, the annual report of the Nebraska State Horticultural Society for the year 1907 is respectfully submitted.

L. M. RUSSELL,

Secretary Nebraska State Horticultural Society.

LINCOLN, August 1, 1907.

DEC 28 1909

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OFFICERS.

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

DIRECTORS.

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

STANDING COMMITTEES OF THE SOCIETY.

SYNONYMS.

A. J. Brown, Geneva,

C. H. Barnard, Table Rock,

G. A. Marshall, Arlington.

METEOROLOGY.

Prof. G. D. Swezey, 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, 1907.

HONORARY LIFE MEMBERS.

Beach, Prof. S. A.....	Ames, Iowa
Brackett, G. B.....	Washington, D. C.
Bruner, Prof. L.....	Lincoln
Campbell, G. W.....	Delaware, Ohio
Crouse, Lorenzo.....	Fort Calhoun
Earle, P.....	Postoffice unknown
Garfield, C. W.....	Grand Rapids, Michigan
Greene, Wesley.....	Des Moines, Iowa
Hansen, Prof. N. E.....	Brookings, South Dakota
Van Deman, H. E.....	3630 13th St., N. W., Washington, D. C.
Van Houten, George.....	Lenox, Iowa

ACTIVE LIFE MEMBERS.

Adams, W. R.....	Omaha
Albert, U. G.....	Normal
Aldrich, Benton.....	Johnson
Aldrich, Karl.....	Johnson
Alexander, A. A.....	Peru
Alexander, G. W.....	Peru
Allen, George L.....	Spicer, Oregon
Anderson, A. N.....	Ong
Atkinson, J. E.....	Pawnee City
Backus, H. J.....	Humphrey
Barnard, C. H.....	Lincoln
Beltzer, L. A.....	Osceola
Bessey, Charles E.....	Lincoln
Blystone, W. J.....	33d & Dudley Sts., Lincoln
Bowers, W. B.....	Postoffice 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, Rhode Island
Carpenter, G. J.....	Grand Junction, Colorado
Chapin, H. A.....	Lincoln
Chapin, L. C.....	Lincoln
Chowins, Chas. E.....	Lincoln
Christy, G. S.....	Johnson

Christy, S. W.....	Orchard
Colvin, W. E.....	Postoffice unknown
Coppoc, J. L.....	Chambers
Corbin, E. E.....	Grand Island
Christ, J. W.....	Box 761, Lincoln
Crawford, William.....	Alliance
Cross, F. B.....	Asylum
Damrow, Chas. F.....	Postoffice unknown
Davey, R. H.....	Omaha
Davidson, J. R.....	Aurora
Davies, William.....	Brownville
Davis, W. H.....	Fullerton
De France, C. Q.....	Postoffice unknown
Deweber, H. N.....	Pawnee City
Dillon, J. W.....	Greeley, Colo.
Dole, E. W.....	Beatrice
Dovel, O. P.....	Auburn
Dunkin, J. M.....	Ravenna
Dugan, John.....	34 So. Logan Ave., Denver, Colo.
Dunlap, J. P.....	Dwight
Dunlap, N. C.....	Kearney
Emerson, R. A.....	Lincoln
Erfling, E. C.....	1150 Sherman Ave., Omaha
Ernst, William.....	Tecumseh
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
Gage, J. A.....	Beatrice
Gaiser, A.....	Lincoln
Galbraith, G. B.....	Fairbury
Ganson, L. A.....	Kearney
Green, C. H.....	Fremont
Grennell, E. N.....	Fort Calhoun
Gurney, C. W.....	Yankton, So. Dak.
Hadkinson, J. H.....	Benson
Harris, W. R.....	Forest Grove, Oregon
*Harris, W. T.....	Blackfoot, Idaho
Harrison, C. S.....	York
Harrison, Harry S.....	York
Harrison, W. A.....	York
Hartley, E. T.....	Lincoln
Heald, F. D.....	Station A, Lincoln

* Deceased.

Heath, H. E.....	R. F. D. No. 4, Box 114, Lincoln
Helin, J. F.....	1612 Farnam St., Omaha
Henderson, Lewis.....	Omaha
Hess, Jacob.....	Omaha
Hesseltine, Ray W.....	Peru
Hesser, W. J.....	Pasadena, California
Logg, J. A.....	Salem, Oregon
Hornung, Ernest.....	Raymond
Howe, H. R.....	Auburn
Hurlburt, C. M.....	Fairbury
Jackson, T. C.....	Purdum
Jenkins W. F.....	Arcadia
Jessup J. G.....	Clay Center
Kaar, Theodore.....	910 So. 13th St., Lincoln
Keyser, Val.....	Lincoln
Langdan, J. N.....	Seward
Leonard, I. N.....	Postoffice 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.....	College View
Martin, Arnold.....	Du Bois
Masters, J. H.....	Syracuse
Masters, J. W.....	Room 42, Brownell Block, Lincoln
Martin, F. R.....	4622 Boulevard Ave., Omaha
McComb, H. A.....	Postoffice unknown
McIntosh, H. F.....	Alda
Meek, John.....	Unadilla
Meek, James.....	Unadilla
Mellor, W. R.....	Lincoln
Mergen, Philip.....	Omaha
Myers, M. E.....	Broken Bow
Mohler, William.....	Falls City
Morsch, C. H.....	Greeley Center
Mosher, D. C.....	Colorado City, Colo.
Mosher, P. C.....	Wilber
Murphey, P. A.....	Exeter
Neff, J. G.....	Davey
Nemechek, Paul.....	Humboldt
Nownes, Charles.....	Papillion
Parker, C. B.....	Brock

*Deceased.

Paulson, Paul	Omaha
Payne, Mrs. G. H.	Omaha
Pearson, James	Denton
Perin, L. W.	Lincoln
Perry, T. H.	Elk Creek
Peterson, Frank	Postoffice unknown
Peterson, John	Postoffice unknown
Pollard, E. M.	Nehawka
Pollard, Isaac	Nehawka
Randell, J. C.	Hamburg, Iowa
Reed, M. H.	Blue Springs
Reed, Mrs. J. H.	Blue Springs
Riley, Alfred	Greeley, Colo.
Roberts, B. A.	Albion
Rosenbaum, H. J.	Kennard
Russell, D. L.	Lincoln
Russell, J. D.	Lincoln
Russell, J. M.	Lincoln
Russell, L. M.	Lincoln
Sandoz, Jules	Sandoz
Saunders, Chas. L.	211 So. 18th St., Omaha
Schamp, L. D.	Lincoln
Schumacher, A.	York
Schroyer, J. O.	Humboldt
Slayton, Geo. A.	192 Hillsdale St., Hillsdale, Mich.
Smith, E. E.	Lincoln
Smith, H. C.	Falls City
Smith, H. L.	Geneva
Smith, O. F.	Blackfoot, Idaho
Stephens, E. F.	Crete
Stephens, Frank G.	Nampa, Idaho
Stevenson, J. W.	North Bend
Stilson, L. D.	York
Stouffer, B. R.	Bellevue
Strand, G. A.	Minden
Swan, J. T.	Auburn
Swan, W. G.	Tecumseh
Swezey, G. D.	Lincoln
Tanahill, William	Postoffice unknown
Taylor, F. W.	3940 West Bell Place, St. Louis, Mo.
Tiffany, M. D.	Lincoln
Titus, G. N.	Nemaha
Tracy, Chas. A.	1523 Douglas St., Omaha
Van Metre, C. M.	Valentine
Walker, J. W.	Crete
Warren, G. F.	Harvard

Watt, James.....	R. F. D. No. 5, 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.....	Postoffice unknown
Woods, A. F.....	Washington, D. C.
Yager, J. A.....	Fremont
Youngers, Peter.....	Geneva

HONORARY ANNUAL MEMBERS.

Bomberger, W. M	Harlan, Iowa
Murphy, J. W.....	Glenwood, Iowa

ANNUAL MEMBERS.

Alderman, N. S.....	Deweese
Bellows, W. S.....	Cairo
Davis, Sumner.....	Grand Island
Foal, O. P.....	Table Rock
Frey, J. B.....	Lincoln
Frey, Irwin	Lincoln
McClaren, Dr. J. W.....	Springview
McCandless, A. D.....	Wymore
Nation, J. W.....	Fremont
Pritchard, H.....	Wisner
Ratcliff, W. R.....	Stratton
Ream, J. D.....	Broken Bow
Richards, E. F.....	2611 R St., Lincoln
Swayger, C. F.....	Cheyenne, Wyo.
Williams, Ed.....	Grand Island
Westgate, V. V.....	Lincoln

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 and to associate members who have been members of the society for twelve months and who shall have paid their second annual dues.

ARTICLE IV.—OFFICERS.—The officers of this society shall be a president, first and second vice-presidents, secretary, treasurer, and board of directors of seven members, said board consisting of the officers enumerated in this article, excepting a secretary, and three additional members. The officers, with the exception of the 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 at the January meeting, 1906, for one year, one for two years, and one for three years, and afterwards every year one director to serve 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 the 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 appointed by the board of directors nineteen 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.

HORTICULTURAL DISTRICTS OF THE STATE.

REPORT OF 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:

For District No. 1, comprising Richardson, Nemaha, Otoe, Johnson, and Pawnee counties, we recommend the following for general planting:

APPLES: 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—Grimes' Golden, Winesap, Jonathan, Gano, Ben Davis, Salome, N. W. Greening, Missouri Pippin, and Virginia Beauty.

BLACKBERRIES: Snyder and Early Harvest.

CHERRIES: Early Richmond, Montmorency, and English Morello.

CRAB-APPLES: Whitney No. 20, Hyslop, and Siberian.

CURRENTS: Red Dutch, Victoria and White Grape.

GOOSEBERRIES: Downing, Houghton, Industry, and Red Jacket.

GRAPES: Concord, Worden, Moore's Early, Niagara, Moore's Diamond, and Woodruff Red.

PEACHES: Alexander, Early Rivers, Triumph, Hale's Early, Russell, Champion, Crosby, Hill's Chili, Heath Cling, Salway, and Wright.

PEARS. Kieffer, Bartlett, Sheldon, and Seckel.

PLUMS: American—Forest Garden, Wild Goose, and Wyant. Japanese—Abundance and Burbank.

RASPBERRIES: Cumberland, Kansas, Gregg, Nemaha, Turner (Red) and Cardinal (Purple).

STRAWBERRIES: Senator Dunlap, Splendid, Bederwood, Crescent, Gandy, and August Luther.

For District No. 2, comprising Cass, Sarpy, Douglas, Washington, Burt, Dodge, and Saunders counties, we recommend the following for general planting:

APPLES: Summer—Duchess, Yellow Transparent, Cole's Quince, Dyer, Sweet June, Red Astrachan, Red June, Chenango, Strawberry, Early Pennock, Early Harvest, American Summer Permain, 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,

Winesap, Windsor, Jonathan, Grimes' Golden, Janet, N. W. Greening, Salome, Ingram, Black Twig, and Isham Sweet. For second choice we recommend Missouri Pippin and Iowa Blush.

APRICOTS: Alexis, Budd, and Moorpark.

BLACKBERRIES: Snyder.

CHERRIES: Early Richmond, Montmorency, English Morello, and Dyehouse.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence, and Martha.

CURRANTS: Victoria, Cherry, White Grape, Fay's Prolific, and North Star.

GOOSEBERRIES. Downing, Houghton, and Champion.

GRAPES: Concord, Worden, Moore's Early, Agawam, Brighton, Pocklington, Moore's Diamond, and Woodruff Red.

PEACHES: Alexander, Early Rivers, Triumph, Russell, Champion, Bokara, and Wright for general planting in Cass and Sarpy counties, and for trial in balance of district.

PEARS: Kieffer, Flemish Beauty, Sheldon, Duchess, and L. B. De-Jersey.

PLUMS: American—Wild Goose, Wyant, Wolf, Stoddard, Hawkeye. DeSoto, Forest Garden. European—Lombard, Shipper's Pride, Green Gage, Shrop, and Damson. For trial, Japanese—Burbank, Abundance and Wickson.

RASPBERRIES: Nemaha, Kansas, Palmer, and Cumberland.

STRAWBERRIES: Senator Dunlap, Splendid, Bederwood, Crescent, Sample and Warfield.

For District No. 3, comprising Stanton, Thurston, Wayne, Dakota, Dixon, and Cedar counties, we recommend the following for general planting:

APPLES: Summer—Duchess and Yellow Transparent. For second choice Red Astrachan and Sweet June. For trial, Summer Hagloe. 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 Winesap. Second choice for entire district, Iowa Blush and Missouri Pippin. For trial, Windsor.

BLACKBERRIES: Snyder.

CHERRIES: Early Richmond, Montmorency, and English Morello. For trial, Terry, Baldwin, and Ostheim.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence, and Martha.

CURRANTS. Victoria, White Grape, Cherry, and Fay's Prolific.

GOOSEBERRIES: Downing, Houghton, and Champion.

GRAPES: Concord, Worden, Moore's Early, and Pocklington. For trial, Brighton, Agawam, and Moore's Diamond.

PEACHES: Alexander, Triumph, Champion, Bokara, and Wright for trial only.

PEARS: Kieffer, Flemish Beauty, Sheldon, Duchess, and L. B. De-Jersey for trial only.

PLUMS: American—Wyant, Wolf, Wild Goose, Forest Garden and DeSoto. European—Lombard, Shipper's Pride, and Green Gage. First choice for south half of district, Wild Goose. For trial in entire district. Japanese—Burbank and Abundance.

RASPBERRIES: Nemaha, Kansas, Palmer, Columbia, and Cumberland.

STRAWBERRIES: Senator Dunlap, Splendid, Bederwood, Crescent, Sample, and Warfield.

For District No. 4, comprising Gage, Jefferson, Saline, and Lancaster counties, we recommend the following for general planting:

APPLES: 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, Winesap, Jonathan, Grimes' Golden, Missouri Pippin, and N. W. Greening.

BLACKBERRIES: Snyder and Early Harvest.

CHERRIES. Early Richmond, Montmorency, and English Morello.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence, Martha, Red and Yellow Siberian.

CURRANTS: Red Dutch, Victoria, and White Grape.

GOOSEBERRIES: Downing, Houghton, and Industry.

GRAPES: Concord, Worden, Moore's Early, and Niagara.

PEACHES: Alexander, Early Rivers, Triumph, Hale's Early, Russell, Champion, Crosby, Hill's Chili, Heath's Cling, Salway, and Wright.

PEARS: Duchess, Flemish Beauty, and Seckel.

PLUMS: American—Wyant, Hawkeye, Wild Goose, and Forest Garden. Japanese—Burbank.

RASPBERRIES: Kansas, Palmer, Gregg, and Turner.

STRAWBERRIES: Senator Dunlap, Splendid, Bederwood, Crescent, and Gandy.

For District No. 5, comprising Thayer, Nuckolls, Fillmore, and Clay counties, we recommend the following for general planting:

APPLES: Summer—Duchess, Cooper's Early White, Cole's Quince, Early Harvest, Red June, and Sweet June. Autumn—Maiden's Blush, Wealthy, Famuse, Dyer, and Warfield. Winter—Ben Davis, Gano, Winesap, Jonathan, Grimes' Golden, Janet, and Missouri Pippin.

BLACKBERRIES: Snyder.

CHERRIES: Early Richmond, Montmorency, English Morello, and Dyehouse.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence, and Martha.

CURRANTS: Cherry, La Versailles, Victoria, Prince Albert, London Market, Red Dutch, and White Grape.

DEWBERRIES: Lucretia.

JUNEBERRIES: Dwarf.

GOOSEBERRIES: Downing and Houghton.

GRAPES: Concord, Worden, Moore's Early, Duchess, Agawam, and Brighton.

PEACHES: Amsden, Alexander, Hale's Early, Early Rivers, Russell, Cooledge, Champion, Triumph, Heath Cling, Wright, Smock, and Hill's Chili.

PEARS: Flemish Beauty and Bartlett.

PLUMS: American—Wild Goose, Minor, Forest Garden, Wolf, Wyant, DeSoto, and Hawkeye. European—Lombard.

RASPBERRIES: Kansas, Palmer, and Nemaha.

STRAWBERRIES: Senator Dunlap, Clyde, Bederwood, Crescent, and Warfield.

For District No. 6, comprising Seward, Butler, Polk, York, and Hamilton counties, we recommend the following for general planting:

APPLES: 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—Winesap, Missouri Pippin, Ben Davis, N. W. Greening, Janet, Salome, Walbridge, Ingram, M. B. Twig, Gano, Jonathan, Iowa Blush, Grimes' Golden, York Imperial, Minkler, and Rome Beauty.

APRICOTS: Russian.

ASPARAGUS: Conover's Colossal and Palmetto.

BLACKBERRIES: Snyder.

CHERRIES: Early Richmond, Dyehouse, Large Montmorency, English Morello, and Ostheim.

CRAB-APPLES: Whitney No. 20, Florence, Martha, Golden Beauty, Hyslop, and Transcendent.

CURRANTS: Victoria, Cherry, Versailles, and White Grape.

DEWBERRIES: Lucretia.

JUNEBERRIES: Dwarf.

GOOSEBERRIES: Downing and Pearl.

GRAPES: Concord, Worden, Moore's Early, Elvira, Niagara, Wyoming Red, and Pocklington.

PEACHES: Alexander, Early Rivers, Triumph, Hale's Early, Russell, Champion, Crosby, Hill's Chili, Wright, and Bokara.

PEARS: Flemish Beauty, Seckel, Duchess, and Lincoln.

PLUMS: American—Wyant, Wolf, Weaver, DeSoto, Forest Garden, Stoddard, Cheney, and Hawkeye. European—Lombard, German Prune, and Tagge. Japanese—Burbank and Wickson.

RASPBERRIES: Cumberland, Kansas, Gregg, and Ohio.

RHUBARB: Linnaeus and Victoria.

STRAWBERRIES: Senator Dunlap, Warfield, Sample, Aroma, and Haverland.

For District No. 7, comprising Colfax, Platte, Boone, Nance and Merrick counties, we recommend the following for general planting:

APPLES: 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, Winesap, Janet, N. W. Greening. For second choice, Iowa Blush and Missouri Pippin. For trial, Salome, Black Twig, and Windsor.

APRICOTS: Fully as hardy as the hardiest peaches.

BLACKBERRIES: Unsuccessful except in damp seasons and favored localities. Snyder, and for trial, Stone's Hardy.

CHERRIES: Early Richmond, Montmorency, English Morello. For trial, Dyehouse, Baldwin, and Terry.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence, and Martha.

CURRANTS: Victoria and White Grape.

GOOSEBERRIES: Downing and Houghton.

GRAPES: Concord, Worden, Moore's Early, and Pocklington. For second choice, Elvira. For trial, Moore's Diamond and Brighton.

PEACHES: Alexander, Triumph, Champion, Bokara, Russell, and Wright for trial.

PEARS: For trial only, Kieffer, Sheldon, Flemish Beauty, and L. B. DeJersey.

PLUMS: American—Wild Goose, Wyant, Wolf, Forest Garden. European—Lombard, Shipper's Pride, and Green Gage. For trial, Japanese—Burbank and Abundance. American—Stoddard.

RASPBERRIES: Nemaha, Kansas, and Palmer. Successful only in damp seasons or favored localities.

STRAWBERRIES: Senator Dunlap, Warfield, Crescent, and Bederwood. For trial, Sample and Splendid.

For District No. 8, comprising Madison, Pierce, Antelope and Knox counties, we recommend the following for general planting:

APPLES: Summer—Duchess and Yellow Transparent. For second choice, Red Astrachan and Tetofsky. For trial, Summer Hagloe and Sweet June. Autumn—Wealthy and Utter's Red. For second choice, Plumb'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. To be added for south half of district, Ben Davis, Gano, and Winesap. Second choice for entire district, Iowa Blush, Missouri Pippin, and Walbridge. For trial in entire district, Windsor.

BLACKBERRIES: Snyder.

CHERRIES: Early Richmond, Montmorency, and English Morello. For trial, Terry and Baldwin.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence and Martha.

CURRENTS: Victoria and White Grape. For trial, Cherry, Fay's Prolific, and London Market.

GOOSEBERRIES: Downing, Houghton, and Champion.

GRAPES: Concord, Worden, Moore's Early, and Pocklington. For trial, Moore's Diamond and Brighton.

PEACHES: For trial only, Alexander, Champion, Bokara, and Wright.

PEARS: For trial only, Kieffer, Sheldon, Flemish Beauty, and L. B. DeJersey.

PLUMS: American—Wyant, Wolf, as first choice for entire district. Second choice for entire district, DeSoto, Forest Garden, and Stoddard. First choice for south half of district, Wild Goose. For trial in entire district, Burbank, Lombard, Shipper's Pride, and Green Gage.

RASPBERRIES: First choice for river counties and for trial in balance of district, Nemaha, Kansas, Palmer, Cumberland, and Columbia. For trial in entire district, Cardinal.

STRAWBERRIES: Senator Dunlap, Sample, Warfield, Bederwood, Splendid, and Crescent.

For district No. 9, comprising Holt, Boyd, Keya Paha, Brown and Rock counties, we recommend the following for general planting:

APPLES: Summer—Duchess, Yellow Transparent, and Summer Hagloe. For trial, Red Astrachan. Autumn—Wealthy and Utter's Red. For trial, Maiden's Blush, and Plum's Cider. Winter—Salome, N. W. Greening, Janet, Iowa Blush, Winesap, Walbridge, and Ben Davis.

BLACKBERRIES: For trial only, Snyder.

CHERRIES: Early Richmond, Montmorency, English Morello, and Terry.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence, and Martha.

CURRENTS: Victoria, White Grape, Cherry, Fay's Prolific, and London Market.

GOOSEBERRIES: Downing and Houghton.

GRAPES: Concord, Worden, Moore's Early, Pocklington, and Moore's Diamond. Grapes should be covered in winter to insure success.

PEACHES: For trial only, Alexander, Champion, Bokara, and Wright.

PEARS: For trial only, Kieffer, Sheldon, Flemish Beauty, and L. B. DeJersey.

PLUMS: American—Wyant, Wolf, Stoddard, DeSoto, and Forest Garden.

RASPBERRIES: Kansas, Palmer, and Nemaha.

STRAWBERRIES: Senator Dunlap, Splendid, Bederwood, Crescent, Sample, and Warfield.

For district No. 10, comprising Howard, Greeley, Wheeler, Garfield, Valley, Sherman, Custer, Loup, and Blaine counties, we recommend the following for general planting:

APPLES: 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 Grimes' Golden.

APRICOTS: Russian varieties.

ASPARAGUS: Conover's Colossal and Palmetto.

BLACKBERRIES: Snyder.

CHERRIES: Early Richmond, Large Montmorency, English Morello, Baldwin, Dyehouse, and Ostheim.

CRAB-APPLES: Whitney No. 20, Florence, Martha, Golden Beauty, and Hyslop.

CURRENTS: Victoria, Cherry, Versailles, and White Grape.

DEWBERRIES: Lucretia.

JUNEBERRIES: Dwarf.

GOOSEBERRIES: Downing and Houghton.

GRAPES: Concord, Worden, Moore's Early, Elvira, Niagara, and Wyoming Red.

PEACHES: Alexander, Triumph, Russell, Bokara, Hill's Chili, Crosby, and Wright.

PEARS: For trial only, Flemish Beauty, Seckel, Duchess, and Lincoln.

PLUMS: American—Wyant, Wolf, Weaver, DeSoto, Forest Garden, Stoddard, Cheney, and Hawkeye. Japanese—Burbank and Wickson.

RASPBERRIES: Cumberland, Kansas, Gregg, and Ohio.

RHUBARB: Linnaeus and Victoria.

STRAWBERRIES: Senator Dunlap, Sample, Warfield, Aroma, Haverland, and Crescent.

For District No. 11, comprising Hall and Buffalo counties, we recommend the following for general planting:

APPLES: 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—Winesap, Missouri Pippin, Ben Davis, N. W. Greening, Janet, Salome, Walbridge, M. B. Twig, Gano, Jonathan, Iowa Blush, Grimes' Golden, and York Imperial.

APRICOTS: Russian varieties.

ASPARAGUS: Conover's Colossal and Palmetto.

BLACKBERRIES: Snyder.

CHERRIES: Early Richmond, Large Montmorency, English Morello, Baldwin, Dyehouse, and Ostheim.

CRAB-APPLES: Whitney No. 20, Florence, Martha, Golden Beauty, and Hyslop.

CURRENTS: Victoria, Cherry, Versailles, and White Grape.

DEWBERRIES: Lucretia.

JUNE-BERRIES: Dwarf.

GOOSEBERRIES: Downing and Houghton.

GRAPES: Concord, Worden, Moore's Early, Elvira, Niagara, Wyoming Red, and Pocklington.

PEACHES: Alexander, Early Rivers, Triumph, Hale's Early, Russell, Champion, Crosby, Hill's Chili, Wright, and Bokara.

PEARS: For trial only, Flemish Beauty, Seckel, Duchess, and Lincoln.

PLUMS: American—Wolf, Weaver, DeSoto, Forest Garden, Stoddard, Cheney, and Hawkeye. European—Lombard, German Prune. Japanese—Burbank and Wickson.

RASPBERRIES: Cumberland and Kansas.

RHUBARB: Linnaeus and Victoria.

STRAWBERRIES: Senator Dunlap, Sample, Warfield, Aroma, Haverland, and Bederwood.

For District No. 12, comprising Adams, Webster, Franklin, Kearney, Phelps, and Harlan counties, we recommend the following for general planting:

APPLES: Summer—Yellow Transparent, Early Harvest, Cooper's Early White, and Duchess. Autumn—Wealthy, Utter's Red, and Plumb's

Cider. Winter—Winesap, Missouri Pippin, Ben Davis, N. W. Greening, Salome, Gano, Jonathan, Iowa Blush, Grimes' Golden, and Janet.

APRICOTS: Russian.

ASPARAGUS: Conover's Colossal and Palmetto.

BLACKBERRIES: Snyder.

CHERRIES: Early Richmond, Large Montmorency, English Morello, Baldwin, Dyehouse, and Ostheim.

CRAB-APPLES: Whitney No. 20, Florence, and Martha.

CURRENTS: Victoria, Cherry, Versailles, White Grape, White Dutch, and Fay's Prolific.

DEWBERRIES: Lucretia.

JUNE-BERRIES: Dwarf.

GOOSEBERRIES: Downing and Houghton.

GRAPES: Concord, Worden, Moore's Early, Elvira, Niagara, Wyoming Red, and Pocklington.

PEACHES: Alexander, Early Rivers, Triumph, Hale's Early, Champion, Crosby, Hill's Chili, Wright, and Cooledge.

PEARS: For trial only, Flemish Beauty, Seckel, and Kieffer.

PLUMS: American—Wyant, Wolf, Weaver, DeSoto, Forest Garden, Stoddard, Cheney, Hawkeye, Wild Goose, Robinson, and Pottawattamie. Japanese—Burbank and Wickson.

RASPBERRIES: Cumberland and Kansas.

STRAWBERRIES: Senator Dunlap, Sample, Warfield, Aroma, Haverland, and Crescent.

For District No. 13, comprising Furnas, Gosper, Frontier, and Red Willow counties, we recommend the following for general planting:

APPLES: Summer—Duchess and Cooper's Early White. Autumn—Wealthy and Maiden's Blush. Winter—Winesap, Missouri Pippin, Janet, Ben Davis, and Gano.

APRICOTS: Russian.

CHERRIES: Early Richmond, Dyehouse, Large Montmorency, and English Morello.

CRAB-APPLES: Whitney and Florence.

CURRENTS: Victoria, Cherry, Versailles, and White Grape.

GOOSEBERRIES: Downing and Houghton.

GRAPES: Concord and Elvira.

PEACHES: Alexander, Early Rivers, Hale's Early, Triumph, Russell, Champion, Hill's Chili, and Wright.

PEARS: For trial only, Seckel, Sheldon, and Flemish Beauty.

PLUMS: American—Forest Garden, Hawkeye, and Minor. Japanese—Burbank.

STRAWBERRIES: Bederwood, Warfield, Crescent, and Senator Dunlap.

For District No. 14, comprising Dawson, Lincoln and Keith counties, we recommend the following for general planting:

APPLES: Summer—Duchess, Early Harvest, and Yellow Transparent. Autumn—Wealthy and Utter's Red. Winter—Ben Davis, Winesap, Janet, Missouri Pippin, and Jonathan.

BLACKBERRIES: Snyder.

CHERRIES: Early Richmond, English Morello, and Montmorency.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence, and Martha.

CURRANTS: Red Dutch, Victoria, and White Grape.

GOOSEBERRIES: Downing and Houghton.

GRAPES: Moore's Early, Worden, Elvira, and Concord.

PEACHES: Alexander, Early Rivers, Champion, Crosby, and Wright.

PLUMS: American—Wyant, DeSoto, Forest Garden, and Hawkeye. European—Lombard.

RASPBERRIES: Cumberland and Kansas.

STRAWBERRIES: Senator Dunlap, August Luther, Splendid, Bederwood, and Crescent.

For District No. 15, comprising Hitchcock, Hayes, Perkins, Chase, and Dundy counties, we recommend the following:

APPLES: Summer—Duchess and Yellow Transparent. Autumn—Wealthy, Utter's Red and Famuse. Winter—N. W. Greening, Ben Davis, Gano, Janet, and Winesap.

ASPARAGUS: Conover's Colossal.

CHERRIES: Early Richmond, Montmorency, English Morello, and Dyehouse.

CRAB-APPLES: Whitney, Hyslop, Florence, and Martha.

CURRANTS: Red Dutch, Victoria, Cherry, and White Grape.

GOOSEBERRIES: Downing and Houghton.

GRAPES: Moore's Early, Worden, Elvira, and Concord.

PEACHES: Alexander, Early Rivers, Russell, Hill's Chili, and Wright.

PLUMS: American—Forest Garden, Hawkeye, Wolfe, and DeSoto.

RHUBARB: Linnaeus.

STRAWBERRIES: Bederwood, Warfield, Crescent, and Senator Dunlap.

For District No. 16, comprising Logan, Thomas, Hooker, McPherson, and Grant counties, we recommend the following for general planting:

APPLES: Summer—Duchess. Autumn—Wealthy. Winter—Walbridge, Iowa Blush, and N. W. Greening.

CHERRIES: Early Richmond and Montmorency.

CRAB-APPLES: Whitney, Hyslop, Florence, and Martha.

CURRANTS: White Grape, Victoria, and Cherry.

GOOSEBERRIES: Houghton.

GRAPES: Concord.

PLUMS: American—Stoddard, Cheney, DeSoto, Forest Garden, Wolf, and Wyant.

For District No. 17, Cherry county, we recommend the following for general planting on dry land with good care:

APPLES: Summer—Duchess. Autumn—Wealthy.

Any varieties recommended for Districts 3, 8, or 9 will do well in most places in District 17.

CHERRIES: Early Richmond, Montmorency, English Morello, and Dyehouse. For trial, Early Morello and Terry.

CRAB-APPLES. Whitney No. 20, General Grant, and Virginia.

CURRANTS: White Grape, Victoria, and London Market.

GOOSEBERRIES: Houghton.

PEACHES: Alexander and Wright.

PLUMS: American—Wyant, Stoddard, Cheney, and Hamer.

STRAWBERRIES: Crescent, Bederwood, and Warfield.

For District No. 18, comprising Box Butte, Dawes, Sioux, and Sheridan counties, we recommend the following:

APPLES: Summer—Duchess and Wealthy, with good care. Any varieties recommended for Districts 3, 8, and 9, will do well in most places of district 18, under irrigation.

CHERRIES: Early Richmond, English Morello, Montmorency, Dyehouse, and Terry.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence, Martha, and Transcendent.

CURRANTS: Victoria, White Grape, White Dutch, and Red Dutch.

GOOSEBERRIES: Houghton.

PEACHES: Alexander and Wright.

PLUMS: American—Wyant, Stoddard, Cheney, and Hamer. European—Lumbard and Shipper's Pride.

RASPBERRIES: Cumberland and Kansas.

STRAWBERRIES: Senator Dunlap, Sample, Warfield, Bederwood, Splendid, and Crescent.

For District No. 19, comprising Duel, Cheyenne, Scott's Bluff, Banner, and Kimball counties, we recommend the following for general planting:

APPLES: Summer—Duchess, Yellow Transparent, and Cooper's Early White. Autumn—Wealthy. Winter—Ben Davis, Gano, Janet, Grimes' Golden, Iowa Blush, and N. W. Greening.

CHERRIES: Early Richmond, Montmorency, and English Morello.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence, and Martha.

CURRENTANTS: Red Dutch, Victoria, and White Grape.

GOOSEBERRIES: Downing, Houghton, and Smith's Improved.

GRAPES: Concord and Moore's Early.

PEARS: Flemish Beauty, Bartlett, and Kieffer.

PLUMS: American—Forest Garden, Wolf, Pottawattamie, DeSoto, Cheney, and Stoddard.

RASPBERRIES: Cumberland and Kansas.

STRAWBERRIES: 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.	Prunifolia.
Hydrangea Paniculata Grandiflora.	Golden Leaf (Aurea).
Syringa, all kinds.	High Bush Cranberry.
Weigelia, Variegated and Rosea.	Altheas.
Flowering Almond.	Caragana.
Lilac, all kinds.	Moss Acacia.
Spireas as follows:	Yucca Filamentosa.
Van Houtii.	Forsythia.
Arguta.	Purple Berberry.
Thunbergii.	Golden Leaf Alder.
Collosa Alba and Ruberea.	Tamarix Amaurensis.
Anthony Waterer.	Dogwood.
Bumalda.	Wahoo.
Billardii.	Rosa Rugosa.
	Bechtel Flowering Crab.

BULBS AND TUBERS.

Paeonias.	Dahlias.
Tulips.	Gladiolas.
Lilies.	Tuberoses.

PERENNIALS.

Phlox.	Iris.
Oriental Poppy.	Larkspur.
Columbine.	Foxglove.
Gaillardia.	Cannas.
Bleeding Heart.	Caladium.
Golden Glow.	

CLIMBERS.

American Ivy (<i>Ampelopsis Quinque- folia</i>).	Trumpet Vine.
Honeysuckles.	Clematis.
Wistaria.	Bitter Sweet.

CLIMBING ROSES.

Crimson Rambler.	Prairie Queen.
White Rambler.	Baltimore Belle.
Wichuriana-Creeper.	

JUNE ROSES.

Harrison's Yellow.	Madam Plantier.
Persian Yellow.	

MOSS ROSES.

Luxembourg.	Glory of Mosses.
Crested Moss.	White Moss.

HYBRID PERPETUAL ROSES.

Alfred Colomb.	General Jacqueminot.
Anne De Diesbach.	John Hopper.
Margaret Dickson.	Ulrich Bruner.
Baron De Bonstetten.	Paul Neyron.
Mabel Morrison.	Magna Charta.
Prince Camille de Rohn.	Madame Chas. Wood.
Tom Wood.	Fisher Holmes.
Marshall P. Wilder.	Jules Margotten.
Coquette Des Alpe.	Mrs. John Lang.

WEeping TREES.

Thurlow Weeping Willow.	Camperdown Weeping Elm.
Teas Weeping Mulberry.	Cut Leaf Weeping Birch.

ORNAMENTAL SHADE TREES.

Hackberry.	Russian Mulberry.
Sycamore (S. E. part).	Catalpa Speciosa (S. E. part).
Carolina Poplar.	American Linden.
European Mt. Ash.	White Birch.
Black Walnut.	Horse Chestnut (S. E. part).
Butternut.	Sweet Chestnut (S. E. part).
Ash.	Russian Olive.
Soft Maple.	Oaks.
Elm.	Hard Maple (extreme east).

ORNAMENTAL HEDGE.

Berberry.	California Privet.
Japan Quince.	Tamarix.
Spirea.	

COMMON HEDGE.

Osage Orange.	Russian Mulberry.
Honey Locust.	

FOREST TREES.

Elm.	Honey Locust.
Ash.	Russian Mulberry.
Soft Maple.	Osage Orange.
Catalpa Speciosa.	Box Elder.
Walnut.	

EVERGREENS.

Black Hills Spruce.	Ponderosa Pine.
Pungens.	Austrian Pine.
Englemon Spruce.	Scotch Pine.
Douglas Spruce.	White Pine (extreme east).
Concolor.	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.

PROCEEDINGS.

Proceedings of the summer meeting of the Nebraska State Horticultural Society held at Hanscom Park, Omaha, July 11 and 12, 1906.

SUMMER MEETING.

PROCEEDINGS.

The summer meeting of the Nebraska State Horticultural Society convened at the Hanscom Park pavilion, Omaha, Wednesday, July 11, 1906. The following program was carried out:

WEDNESDAY, JULY 11.

9:00 A. M.

Invocation.....Rev. J. T. Mackay
Address of Welcome.....Mayor J. C. Dahlman
Welcome.....James Y. Craig, President of Park Board
Response.....Rev. C. S. Harrison
Greeting.....J. J. Hess, President of Omaha Florists' Club
"Some Results at the Chambers Experiment Station,"

J. L. Coppoc, Chambers

"What I Have Done with my Home Grounds,".....R. C. Peters, Omaha
"My Experience in Planting and Caring for Trees and Shrubbery,"

Paul E. R. Getzschmann, Omaha

"My Observation of Ornamental Trees and Shrubs Suitable for Planting
in Eastern Nebraska,"

W. R. Adams; Superintendent of Parks, Omaha

2:00 P. M.

"Bedding Plants and Planting Beds,".....Ed. Williams, Grand Island

"The Ideal Carnation,".....Irwin Frey, Lincoln

"Care of Cut Flowers,".....John Bath, Omaha

"Roses,".....M. Stauch, Council Bluffs, Iowa

8:00 P. M.

Music.....Danie Glee Club, Omaha

"Our Unused Capital,".....C. S. Harrison, York

Music.....Glee Club

"Civic Improvement,".....Judge W. W. Slabaugh, President of Omaha

Civic Improvement League

Music.....Glee Club

THURSDAY, JULY 12.

10:00 A. M.

A ride about the City and Parks of Omaha.

The President: The summer meeting of the Nebraska State Horticultural Society will now come to order. The invocation will be delivered by Rev. Mackay.

INVOCATION.

Almighty God, our heavenly Father, we thank Thee that we are able to gather here this morning. We realize that Thou art the creator of all mankind, that all Thy good works are manifest on all sides. O God, may we realize that in working to make perfect Thy creatures upon this earth, we are working in accordance with Thy will. We **need** nothing to proclaim Thy presence; everything is in evidence of Thy **glory**.

We ask Thy blessing upon us, and may we strive to reach the sublime and God-like. Bless the officers of this society; bless the work that this body of men represents, and grant that through the efforts of such work all mankind may come to realize Thy presence and Thy glory. Bring us at last to Thy kingdom, we ask in Thy Son's name. Amen.

The President: We will now listen to the address of welcome by the Honorable J. C. Dahlman, mayor of Omaha.

ADDRESS OF WELCOME.

MAYOR J. C. DAHLMAN.

Mr. President and Gentlemen of the Nebraska Horticultural Society:

I have been invited by your committee to extend a welcome to this society here today. I want to thank you for the kind invitation. I must admit that it is a little early for me to make much of a speech for my training has all usually been later in the evening.

On behalf of the people of the city of Omaha, I will, however, extend to you a most hearty welcome. We hope that while you are in our city you will enjoy yourselves, and feel assured that the people of this city will do all in their power to make your stay a pleasant and profitable one.

You are engaged in a great work, my friends. You may go back as far as you will and you will find that everywhere this same work has been carried on. You are extending this beautiful work, and I hope you will continue to do so, because any man, woman, or child, who has not found and known a plant or flower has very little refinement. Your work is elevating to humanity, and every time and place you do your work, you are doing that much more for the human race.

We are glad that you came here to meet, and we hope that you will come again. I want to say, as the chief executive of this city, that so far as I am concerned, the city is yours. Do as you please while you are here. Don't forget to come up to the city hall and see us there. We will be glad to see you. And judging from the crowd I see here this morning, there will be no necessity of notifying the police. I want to thank you for being here, and to extend to you an invitation to come again. Anything that we can do we will be more than glad to do so. I thank you. [Applause.]

The President: Next on our program is a welcome by James Y. Craig, President of the Omaha Park Board.

Mr. Craig: I am very pleased to have the pleasure of meeting you here today. I do not know who has been the instigator of your meeting here today, but it was a happy thought on the part of some person. I think this is one of the most appropriate places for the State Horticultural Society to have their meeting.

The mayor has said you are welcome to anything in the city, and I hope you will pay special attention to our parks and boulevards. We have some six hundred acres or more of parks and about twelve miles of a boulevard system, all pretty well under way. We would be glad to have you go over our work and make suggestions, although I would advise that you criticise as little as possible for the reason that our resources are very limited for carrying on the work in our hands. Our mayor is very much interested in this work, and if you can get the city council interested, we can make still more improvements. I hope you will have the opportunity to go over this park and boulevard system of ours pretty thoroughly. We will be pleased to have you do so.

And now on behalf of the Park Board I want to extend to you a cordial welcome. We thank you for the honor you have conferred upon us by coming here for your meeting. Thank you. [Applause.]

The President: I am sorry to announce that Reverend C. S. Harrison is not with us this morning for his part on the program. He will not arrive until this afternoon. There is one thing I would like to call your special attention to, and that is the park and boulevard system that Mr. Craig mentioned. There is a ride over this boulevard system arranged for tomorrow morning. We will meet at Fifteenth and Farnam streets at 9:30. Next on our program this morning is a greeting from Mr. J. J. Hess, president of the Omaha Florists' Club.

GREETING.

J. J. HESS, OMAHA.

The pleasing function of welcoming you, gentlemen of the Horticultural Society, having been performed by the honorable mayor of our city in his graceful conception and eloquent style, and by the Honorable James Y. Craig, president of the Park Board, I can but very feebly express the thanks of this society for this act of courtesy, which we highly appreciate.

The majority of the committee of arrangements which had the preparations for this gathering in charge, have selected your humble servant against his protest, but most likely for the reason that he is president of the Local Florists' Club, to respond to the addresses of welcome and to repeat the sentiments expressed by the eminent speakers on the part of the resident members, although my membership in this society dates back no farther than 1889.

Whilst I am grateful for the honor I am fearful what little I have to say will fall short of being satisfactory to you, who, on former occasions of this kind, used to listen to the scholarly and studied discourses of such intellectual giants as J. Sterling Morton and Robert W. Furnas. These illustrious men—peace and farewell to their ashes!—labored from the smallest beginnings in the territorial days to the days of stalwart statehood to promote horticulture and arboriculture in Nebraska.

All objects of general good are better promoted by societies than by individuals; the most powerful influences are those **which** are effected by associated exertions. In every department of life it is made manifest. In civil government, in religious endeavors, in financial enterprises, it is apparent.

America owes much of her success and vigor as a nation to the fact that her climate is capable of producing plants which, as food, bring about in man the highest results, both mentally and physically. This happy result is due mostly to natural conditions and natural laws, but also in a large degree to a systematic or concerted action on man's part to bring this about.

The principles which bind the Horticultural Society together constitute a green oasis in the desert of a new country, where the example, the experience, the advice and the practical demonstration of ultimate success by older settlers gives encouragement and assistance to every new comer. Difficulties in obtaining suitable nursery-stock, barriers to the markets of the world, damages by drouth and noxious insects, insufficient irrigation and other annoyances are overcome wholly or in part by co-operation. Friendly intercourse of horticulturists, frequent interchange of seeds, seedlings, cuttings and similar mutual assistance will nerve our arms and inspire our hearts with a still loftier and nobler zeal in the performance of our labor. As a brotherhood, so to speak, we taste a joy celestial in its origin, pure in its development and sublime in its consummation.

With increasing wealth there always comes the demand for something more than the bare necessities of life in the way of food and clothes; hence there have been developed the various branches of horticulture, furnishing as they do many things, which, strictly speaking, are not required to sustain life, but which nevertheless add to the health, happiness and contentment of the people.

The average farmer probably cares little for blooming trees and fragrant flowers, but he should reflect that many, perhaps some of his family or neighbors, find distinct pleasure in the presence of an orchard or garden. This source of enjoyment, once aroused, should be encouraged, particularly in the youth of the country. Every farmer, as well as every dweller in a city or village, should therefore, if not from the view of financial gain, co-operate heartily with us in the endeavor to extend horticulture.

Although a small eastern portion of our great state with 70,000

square miles has been tilled by the husbandman from thirty to forty years, Nebraska is as yet comparatively in her infancy. It is within reasonable bounds to prophesy that the homesteaders will in fifty years, and maybe much sooner, occupy every quarter section with commodious and modern farm houses, including irrigated gardens, orchards and groves of timber.

The light is dawning and feeble though the dawn may be, it gives hope and encouragement for the coming of the day, when instead of a dozen or two every one of the ninety counties of our glorious state will be represented in our Horticultural Society and help us by their ideas and observations to bring about the most fruitful results.

The President: We will now listen to a paper on "What I Have Done With My Home Grounds," by Mr. R. C. Peters of this city. Mr. Peters has splendid home grounds out at Dundee, on the west side of the city, and it would repay any of you to visit them. There are a great many fine things out there.

WHAT I HAVE DONE WITH MY HOME GROUNDS.

R. C. PETERS, OMAHA.

Somewhat to my surprise I found I was on this program and as the preparation of a paper to be read before experts in horticulture is not in my line of work, I am somewhat at a loss what to say to you. When Mr. Hadkinson telephoned me that he wished me to say something, I told him I did not care to prepare a paper, but it seems he has put me on nevertheless.

There is one thing, however, I wish to impress upon you in the short paper that I read to you and that is, the necessity of business men who are confined to an office to take more or less outside exercise, especially a man of active temperament and one who has in his early days been brought up in active exercise or brought up on a farm as I was. I was always of an active temperament and after leaving the University of Ann Arbor, Michigan, I went into business and confined myself too closely for a number of years, which led to nervous troubles, and about five years ago I found it necessary to make some changes. I traveled considerably three years ago, also the same year I moved to Dundee and rented a place and took up gardening which was a pleasure to me always from a boy up, also raising of fruit and flowers. I found more benefit from my work there in the garden than from all the trips I took that year, although I traveled 18,000 miles, including a trip to California, one south to New Orleans and also a trip to New England and other places. A year or two prior to this I had bought a place in Dundee, five lots and a half, and the occasion of our renting there was to find if we liked it well enough to build. We liked it well, so we have built and set out our ground largely to fruit and flowers, and the pleasure that I have derived and the benefit

to my health has been manifold. My ground is 135-275. I have laid it out with considerable care and have nearly all kinds of fruit that grow here.

What I wish to impress upon anyone laying out grounds is to have a sufficient elevation and slope. It makes the ground appear very much better and makes a better outlook from the house, although perhaps more level ground would be more satisfactory for cultivation, although for trees I think the slope is rather of an advantage.

I have given about two-thirds of my ground to fruit and garden and part of this I fenced off in a chicken park, which I think is of considerable advantage to the fruit trees, and I wish to say furthermore, that in the yard where I have over 100 chickens in which my red raspberries and black raspberries have ripened this year I do not think they have disturbed any fruit whatever. Some of my friends thought they would eat the fruit, but I found they did not disturb it and it seems any one could grow small fruits successfully where the chickens have free run.

I have gone into the raising of the thoroughbred White Wyandottes exclusively. I have experimented with several different kinds but I found these the most satisfactory. Also I have the Buff Cochin, Bantams, also have begun raising pheasants.

I have put in all kinds of fruit which will grow here and I have experimented on some which may not be so successful, such as the Logan Berries, which seem to be doing quite well; also the Quince, Paw Paw, and I also had a fig tree which I wintered out last winter, protecting it with a barrel filled with leaves.

We have had an abundance of red and black raspberries this year, also strawberries and we will have a large crop of blackberries. I have other small fruits also which are beginning to bear. I would be glad for any member of this Society to see what I have done in this line in the past year at my place, although some of the trees were set out two years ago, but we have occupied the place but little over one year, moving there a year ago last April.

I have put my fruit on the north side of my lots, reserving the south side for my garden and between the fruit orchard and garden I have a long row of grapes of 150 feet, which give them an exposure to the sun, there being no trees on the south side. I have a very heavy crop this year and they are in fine condition.

In the matter of flowers I have put out only hardy perennials. I believe this is the best for any person to do who expects to be permanent and build up a place which will be attractive. They will require less care as the plants grow. I have not defaced the open space of my lawn. There were some trees growing there when I bought the place which I left, but I did not deface the open space with shrubbery and do not think it advisable for any one to do. I think a lawn and ground should be laid out in the same form as a picture. Put your shrubbery on the border the same as a frame of a picture, leaving the lawn with what

trees there may be for the picture itself. This makes it very attractive and pleasant to the eye.

There is one thing I have been doing and which I would recommend any one to do and that is to plant a number of shrubs for winter effect. We have a beautiful country here in the summer time, but in the winter it is dreary and I think one should grow a number of shrubs and trees where the bark is colored for winter effect and also where the berries are lasting into the winter, which will lessen the sombre days of winter. I have not done as much in this line as I intend to do, putting out more shrubs for this purpose.

I would also advise putting out a number of sweet-scented shrubs, if for no other purpose than to counteract some of the balmy breezes we get when the wind is blowing from South Omaha. There are a number of shrubs, such as Caly Canthus, Sweet Brier and others, which can be put out, and every one should have at least one basswood tree in their yard for the fragrance it will give.

I have also put out a large number of Tulips, Phlox and Peonies. They are very satisfactory flowers for any one to grow and I would especially recommend the Phlox, which is a continuous bloomer and many of them are sweet scented and with the beautiful flowers they have are very attractive. The Peonies are very satisfactory and are a beautiful flower, as you know, but the bloom is short lived but well worth the care. I have nearly 200 of them out. I have nearly 600 tulips and they were beautiful in the time of bloom. Also I had a good many roses, and they are a very satisfactory flower to have out, as you all know. I have a good many other varieties of flowers, such as the Snowdrop, Scilla, Crocus, Larkspur, Columbine, Hardy Pinks, Chrysanthemums and Lily of the Valley and many other flowers which are all quite satisfactory. The early flower is the Snowdrop. It comes out when the snow is on the ground and has a beautiful effect at that time. The Crocus follows it soon. They die down at an early date, so they may be set out on the lawn and will not be injured at the time it is necessary to mow the same. The Scilla is a very beautiful flower and I would advise any one to put it out. It comes after the Crocus and is a beautiful little flower. I think also the Lily of the Valley every one should have if they have a shady place in which to place them.

I have one annual which I would recommend any one to have if they have a fence or trellis, and that is the English Bean, Scarlet Runner. It has a beautiful red flower and it is an edible vegetable as well as an ornamental flower.

In closing there is one thing I would like particularly to impress upon this gathering, although it is a digression from my topic, and it is something which I do not believe has been urged sufficiently in this state, and I wish to make it emphatic, and that is the necessity of beautifying the school grounds more thoroughly. In my business (which is the farm loan business) I have been thrown out in the state examin-

ing loans, and in many sections about the only dreary spot that is to be found is the school ground, which should be made a most attractive spot. I think there should be a law passed by this state that every school district should have trees and plants put on the school grounds and a tax provided to maintain the same by the school district. The age of the school child is a most receptive one and the time of going to school will always be a pleasant memory in their minds, especially if the grounds are made attractive and it will always be remembered by them, but instead of this we find so many grounds without a tree or a shrub on them, set out on the prairie, subject to all the wind and cold, and not a spot which would attract anyone. It is not only the beauty and attractiveness of the place, but by cultivating trees and flowers you would inculcate in the child a love of nature, which should be one of the prime matters and subjects in its education which should be taught him, and if this paper would lead to a law to plant trees and shrubs in school gardens I would feel that what little effort I have spent in the preparation of this would result in great value.

RESULTS AT THE CHAMBERS EXPERIMENT STATION.

J. L. COPPOC, CHAMBERS, NEB.

Mr. President and Gentlemen of the State Horticultural Society: Our secretary has detailed me to give some results from the Chambers experiment station, which task I undertake with some satisfaction, believing that while no great thing has been accomplished yet some little has been done to advance the interests of horticulture through this station. It may seem to the uninitiated a small matter that this society should give a few plants to certain persons in different parts of the state who are to plant and cultivate them and report results. But let an observing man pass through the different counties of the state and note the ragged-looking orchards to be seen all over the state, and let him make inquiry among the farmers as to what success they have had with fruit trees and many of them will tell that they have spent hundreds of dollars and have very little or it may be nothing to show for it. Here is a case in point: If you should go up into Holt county you will find hundreds of Mariana plum trees scattered all over the south part of the county, and if you ask the planters why they bought such trees they will tell you that the agent told them they were all right. This brings me to the first point to which I wish to call your attention as resulting from the work of the Chambers experiment station. Men are not spending money experimenting with new and untried kinds of fruits, but are buying those varieties which have been tried and proven to be adapted to our soil and climate. When agents come around offering to sell high-priced novelties they are told that we have varieties that we know will do well here, which varieties we prefer to plant. You had better have

your kind tried at the experiment station and if they prove to be valuable then we will buy them.

We have been experimenting in a small way in spraying. We find that the enemy we have to contend with most is not the codling moth but the curculio.

Perhaps I should say that our work with the sprayer was not so much in the way of experiment as for direct results, so that I can only give results in our own orchards as compared with my neighbors.

Our Success in Combating the Curculio.

It appears from reports that there have been many failures in spraying for this pest, and it is noticeable that in nearly all the cases of failure reported paris green was the arsenate used. So last year we used disparene, a preparation of arsenate of lead, with the result that we only had about 5 per cent of wormy apples, while my next neighbor, less than a half mile away, stated to me that the per cent with him was reversed. That is he had only 5 per cent of worm-free apples. He did not spray.

The Spray Material I Use.

As stated above, we used disparene as an insecticide last year, but the price was so high that we concluded this year to make our own arsenate of lead, which I believe any man can do with the exercise of ordinary judgment and care, and thus save the extra expense.

We do not depend on the manufactured arsenate of soda, as it is so unreliable. We take 1 pound of white arsenic and 4 pounds of salsoda, and boil them together until they are dissolved, using 1 gallon of water, replacing what is lost by evaporation. We then take an amount of sugar of lead, owing to the number and size of the trees to be sprayed, and dissolve in water, which will require some time, as it dissolves rather slowly. Water at ordinary temperature will hold about 37 ounces of the lead per gallon. We then take six and one-half pints of the sugar of lead solution and one pint of the arsenate of soda, mix and if it is to be used with bordeaux, pour it into the lime before it is mixed with the vitriol.

We test our arsenate of lead to see whether there is any free arsenic in it by letting it settle, then take a small quantity of the clear liquid and put it in a glass or bowl and pour a little of the lead solution into it, and if there is a white substance formed more lead is required. We use seven and one-half pints to one hundred gallons of water or bordeaux mixture. There are several points in which the arsenate of lead is superior to paris green, among which are, it is more easily held in suspension; it can be used in greater strength without danger of burning the foliage, and it adheres to the leaves better.

We have been much interested in observing the behavior of the different varieties of apples in the different kinds of soil. I believe that this is a subject that should receive more attention at the hands of

fruit growers than has been given it; and what I shall say on the subject will be said more for the purpose of arousing an interest in the question than to express an ultimate judgment in the matter. We find that there are some varieties, like the Northwest Greening, the Whitney and the Janet that do well on any soil with proper care, but there are others which seem to have a decided preference as to where they are to receive their life's sustenance. The Jonathan seems to thrive best in the sand, while the Grimes Golden requires a firmer foundation for its roots; it does very poorly on the sand, while on the clay it is one of the best to plant. Referring to the Jonathan again, it is generally counted a rather shy bearer, but since writing the above I visited an orchard eleven miles west of Chambers and saw some Jonathan trees the limbs of which were bending almost to the ground with great loads of fruit. The ground on which these trees stand twenty years ago was pure sand. The Ben Davis in the orchard of Mr. Calkins, two and one-half miles from this station, on clay soil, has proven almost an entire failure, while here it is not only a thrifty and apparently hardy tree, but the fruit is juicy and of a sprightly flavor. The Maiden's Blush and the Roman Stem yield good crops every year on quite sandy land. The Whitney and Tetofsky are tardy in coming into bearing on the sand, but when they do begin to bear they are quite profitable.

The President: The next subject on our program this morning is "Ornamental Trees and Shrubs Suitable for Planting in Eastern Nebraska," by W. R. Adams. Mr. Adams is superintendent of the Omaha park system.

ORNAMENTAL TREES AND SHRUBS SUITABLE FOR PLANTING IN EASTERN NEBRASKA.

W. R. ADAMS, SUPERINTENDENT PARKS, OMAHA.

To the Members of Nebraska Horticultural Society: In considering the trees and shrubbery most suitable for planting in eastern Nebraska I shall avoid botanical nomenclature, and call them by their common names.

The trees found growing in our woodlands, and which are presumably native, are as follows:

Elm (two varieties), Oak (three varieties), Hackberry, Honey Locust, Kentucky Coffee Bean, Basswood, Sycamore, Cottonwood Poplar, Box Elder, Hickory, Ash, Black Walnut, Willow.

Small trees: Hawthorn, Red Bud, Mulberry, Ironwood.

Shrubbery: Dogwood (two varieties), Wahoo, Coral Berry, Prickly Ash, Buffalo Berry, Bladder Nut, Buttonbush, Elder, Sumac.

Vines: Honeysuckle, Virgin's Bower, Virginia Creeper, Smilax, Sarsaparilla.

Taking these in rotation, for park and shade trees, we find the

white or soft Elm makes a grand and imposing tree, improving with age. Of this we seem to have three subvarieties, which have distinctive features. One being more upright in growth, with smooth bole. One which is literally covered with small, vine-like branches or twigs, and another which has a drooping habit.

The slippery-bark Elm, while young, is a nice tree, with a large leaf, and may be distinguished by its rougher leaves and branches. With age it becomes less graceful, more rigid and sparse in branch and foliage. For economic uses it is more valuable, yet it is not so desirable as an ornamental tree.

As a shade tree and for economic purposes the different varieties of Oak should be more generally used. The Red Oak, notwithstanding the opinions of some that it is slow growing, as most of the hard woods are supposed to be, will, I find, under favorable conditions, keep pace with and outstrip some of those which we call fast growers. It is less troubled with insect pests, and will withstand a gale which will demoralize an Elm or Maple. The same is true of other varieties of Oak. The Hackberry makes a good, dense shade and is a symmetrical tree, and ought to be more largely planted by farmers, as its wood is tough and tenacious, making good handles, eveners and wagon tongues.

Honey Locust makes a graceful shade tree, not too dense. It ought to be more largely planted as a street tree. It is almost exempt from noxious insects, and makes a good hedge plant. The other Locusts, Yellow and Black, are quick growing, and may be utilized on steep banks, and, where not troubled with borers, will be found a good investment, if but for their lasting qualities as fence posts.

The Kentucky Coffee Bean makes rather a unique and pleasing appearance, as most of the pinnate foliage trees do, and when given room to develop while young is a symmetrical tree.

The Basswood, Linden or Lime tree, is an excellent shade tree, especially for low situations, although we find it growing well upon the sides of some of our bluffs here. It is tardy leafing out in spring, and among the first to fall.

The Hickories are almost a thing of the past, owing to the ravages of a small weevil some years past. Its enemy seems to have disappeared, so we should now make efforts to increase its distribution.

The Ash makes a good shade from youth upwards, but will not do very well on high ground.

The Black Walnut makes a good, fast growth while young, and makes a pleasing addition to our collection, and should be encouraged for its economic uses.

The Boxelder is one of the most abused trees here. It has been one of the pioneers probably. It will grow thriftily and gives good shade from youth to age. The tent caterpillars are fond of its foliage, but with a small amount of exertion is easily exterminated, but this requires united effort to accomplish.

The Cottonwood Poplar makes a fine, sturdy pioneer, and should

be admired as such. Apart from this it is of quick growth, of good habit, makes a fine, commanding tree, and even with its cotton-seed distribution I prefer it to its relative, the Carolina Poplar.

The Sycamore makes a good shade tree when young, and where unlimited space can be given, will grow to large dimensions. It is one of those trees which will bear pruning severely.

The Willow. Some of these attain a large size and are useful in landscape work, putting out its foliage early and retaining it until late in the fall.

Of trees introduced into the state, we have the Catalpa, of large, ornamental foliage and wood of lasting quality.

Carolina Poplar, with the exception of being exempt from cottony seed, is not as good as the Cottonwood.

Lombardy Poplar. Good, fastidiate habit.

Boleana Poplar. Good, columnar habit, glaucous foliage.

White Maple. Quick growing shade tree, wanting plenty of room.

Sugar Maple. More columnar. In habit, slower of growth, with good shade.

Osage Orange. Bright green foliage. Desirable as small tree or hedge plant.

Gineo. Desirable ornamental tree of upright growth and hardy.

Ailanthus. An ornamental tree, with frond-like leaves. Some years injured by frost.

Birch. Very desirable and of a graceful habit.

Black Cherry. Grown mostly for its abundance of small fruit, which entice birds.

Sweet Chestnut. Large, upright tree. Seems to do fairly well in Nebraska.

Horse Chestnut. A tree of good habit. Not a very fast grower in Nebraska.

Russian Mulberry. Grows quickly. Not as good as our native, but more hardy.

Russian Olive. Good, ornamental foliage, glaucous green, and worthless for economic purposes.

Willows. Laurel-leaved, ornamental, broad, shining leaf.

Willows. Weeping, Wisconsin and Babylonian. Very graceful trees.

Mountain Ash. Ornamental low trees, bearing an abundance of scarlet berries. Desirable.

Magnolia Acuminata. Will do well here in some situations, and makes a nice tree.

Koelocetruria. A Japanese small tree. Does fairly well in some locations.

Of Pines and other coniferous trees, we have introduced White Pine, which is very good and does well on poor soil.

Austrian. Reliable and of rather stiff growth.

Scotch Pine. Not quite as reliable and shorter lived.

Morghu or Dwarf Pine, does well on high situations.

Norway Spruce. Not very desirable.

White Spruce. Does not grow very thriftily.

Douglas Spruce. Does well when established.

Engelmanii Spruce. One of the best.

Colorado Blue and Green Spruce. Very desirable.

Concolor. One of our best ornamental conifers. Does well.

European Larch. Does well and might be planted more largely with advantage.

Of Shrubbery introduced, we have the Snowball. Very reliable and grows thriftily.

Lilacs are also a good shrub for quick blooming. The Persian variety is preferable.

Mock Orange. Mostly a very tall growing and hardy shrub.

High-bush Cranberry. Hardy. Has a profusion of red berries.

Hardy Hydrangia. A reliable medium-sized shrub. Desirable, with large blossoms.

Tartarian Honeysuckle. A good tall-growing shrub. Pink and white variety.

Japan Quince. Desirable. Hardy when established. Red and white varieties.

Forsythia, or Golden Bell. Yellow bloom in early spring.

Weigelia. Good shrub. Reliable as to hardiness. Pink and red.

Tamarix. Useful, graceful shrub. Sometimes killed back, but comes out again. Quick growing.

Spireas, Van Houtii, Sorbifolia, Thunbergii, Prunifolia, Bumalda and Anthony Waterer do well here and are very desirable.

Dogwoods, with the exception of Cornus Florida, do well with us.

Eucordia, a Japanese shrub. Tall growing, with white flowers. Do well here.

Althea or Rose of Sharon. Do fairly well if sheltered.

Berberis. Purple-leaved, Vulgaris and Thunbergii do well.

St. John's Wort is not very desirable.

Sephandra Flexulosa is killed back.

Smoke Bush does well in some locations.

Of vines introduced, we have the following: Matrimony, Honeysuckle, Wistaria, Clematis, and Trumpet Vine, all of which do well. Ampelopsis Vetchii, or Boston Ivy, of late years seems to be getting better acclimated.

These trees, shrubs and vines enumerated we have tested. Others we are experimenting with, and have in nurseries for that purpose.

A Member: I would like to say in regard to the Norway Spruce, that around the Hall county court house I planted about a hundred of them and they are all growing but about three or four.

Mr. Adams: In five or six years they will begin to go back.

The President: Now if there are any of you here this morning who are not members of our society, we want you to sign up right away.

We think we have a cheap proposition to offer you for your money. We give you a life membership for \$5, and this entitles you to all the bulletins and reports of the society. We hope more of our Omaha friends will take advantage of this.

I see Mr. Getzschmann is not here yet, and if there is nothing else on the program for this morning it might be well to adjourn until this afternoon.

Mr. Green: I move we adjourn until 2 o'clock this afternoon.

Motion carried.

SECOND SESSION.

2:00 P. M.

The President: The first paper on our program for this afternoon is "Bedding Plants and Planting Beds," by Ed. Williams, of Grand Island.

BEDDING PLANTS AND PLANTING BEDS.

ED. WILLIAMS, GRAND ISLAND.

Mr. President, Ladies and Gentlemen: This is the first opportunity that I have had to meet you. I have heard a great deal about you. Also read several of your annual reports, and I assure you that I consider the work that is being done by this society a great benefit to the state of Nebraska in general.

I have been asked to prepare a paper on bedding plants, planting, and care of same. Now, to go into this subject thoroughly it would make a very lengthy paper. So, I have taken the cream off and left the skimmed milk at home. So, I will endeavor to read to you the most essential points.

To begin with, the term, bedding plants, covers the plants that do well when planted out of doors. Everybody knows what a geranium is, one of our most useful plants. I have had the best success with geraniums by potting the cuttings in the fall in two-inch pots. The secret is to get your soil firm at the base of the cutting, water thoroughly, shade for a few days, and the operation is done. It saves handling the plants twice, besides your per cent of plants will be greater than by propagating them in the sand. Geraniums are bad about damping off in the cutting bed. These plants will furnish a good cutting about the middle of February, that gives you your 4-inch and 3-inch stock in bloom by the middle of May, in a temperature of 54° to 56° night, and 58° to 60° day heat, sun heat 70°. Give plenty of air at all times and it is well to give the plants a handling over and take off the large leaves, that lets in the light and helps the plant to break out new shoots.

Now, in regard to varieties, they are so numerous that I won't endeavor to relate them. What you want is a good red, pink, white, a few fancy-leaved ones in both single and double. It is the best to grow a

quantity of each variety than to have fifty varieties and only a few of each, so that when your customers come in and say, "I would like to have five or six dozen all one shade geraniums for my beds," you can fill the order without substituting. I don't believe there is any other line of business that gets the roasting that a florist does. So, my reason for growing a quantity of what I do grow, with the fancy-leaved varieties and the Mad Sallverie.

It is best to lift a few plants of each and pot in a five-inch pot, then you can take your cuttings off during the winter. Mad Sallveries root easily, so that a cutting put in the sand by the first of February will make a nice stock in three months' time.

Cannas are a great acquisition to the flower bed. They are easy to handle and don't take up much bench room. After the first frost, cut the foliage down to within five inches of the ground. In lifting leave enough dirt to just cover the bulbs. Lay in the sun for a few days so as to ripen them up. A good place for the florist to winter them is on boards layed along the ground under the carnation bed. By dividing the clump about the first of March and placing the eyes in boxes of sand, placed on the steam pipes under the bench, they will start nicely and when the foliage is up about five or six inches, pot them up in four-inch pots. This method of starting saves considerable bench room and you don't pot up a lot of eyes that won't make a good plant.

Dahlias when given good care make a nice plant for a back-ground, or to fill in some corner. The same treatment will apply to them as to cannas, with the exception of starting dahlias grown from cuttings make nice plants and will bloom profusely the first year. Cuttings can be taken off about the latter part of February by laying the tubers out and covering slightly with soil and kept moist. The eyes will begin to break freely and the old clumps can be divided later on.

Coleus are in great demand for edging up with or for solid beds. The most satisfactory way I find, also the most economical way to grow them, is to lift up a few plants of each variety before frost, cut them back to within ten inches of the pot and carry them through the winter in a moderately warm house. When spring comes you will have all the cuttings you want. The first of April is time enough to take cuttings; they root in twelve to fifteen days; the old plants are subject to mealey bugs, so keep your hose on them occasionally.

Lantanus and heliotrope treated the same way are better than cuttings taken in the fall, only they don't lift very well, so it is best to put a few in a five-inch pot in the spring and plunge in a frame through the summer.

Other plants, such as abutilon, ageratum, salvia, verbenas, marguerites, double petunias, and feverfew cuttings taken before frost and rooted in the sand will give you good stock to propagate from through the winter.

The following plants can be grown from seed and give good satisfaction, besides saving much valuable room: Single Petunias, Asters,

Lobelia, Mignonette, Moon Flower, Nasturtium, Phlox Drummondi, Stocks, Vincas, Zinnia, Candytuft, seed sown the first of March.

Now, in sowing seed it takes patience and care. A good rule to go by is to cover the seeds their own thickness. First thoroughly water the soil before sowing. Shade during the day until they begin to show up, then be careful not to let get dry or wilted.

Pansies for early plants can be sown in the latter part of August, and transplanted to the frames when the character leaves show, cover with sashes and later on a cover with ashes and later on a covering of coarse manure over all. It is also a good idea to make a sowing in flats about the first of February, which will give you another batch to fill up the frames after the earlier ones are gone.

Althomanthora, in different varieties, are indispensable as a carpet-bedding plant. I have had the best success with them by taking cuttings the latter part of August, putting them in a flat, and half soil and sand, water thoroughly and placed along the edge of a trench on the ground, shaded until root action begins. By spring you have all the wood for cuttings you want, or if your supply is adequate, prick them off in two-inch pots about the middle of April and plunge in a hot bed. This treatment doesn't take up any bench room.

I believe I have named about all the most important bedding plants in the soft-wooded line.

The Hybrid Tea Roses are very satisfactory as a summer bloomer. Take the plants from the trench the first of June, cut them back a little, give them a thorough soaking, and they will bloom profusely. I have carried them over with good success by putting four or five inches of soil around the base, and later on, as the weather gets more severe, the same quantity of coarse manure. In the spring, as the weather gets milder, remove your top covering. Later on remove this second covering. Cut off all dead wood and you will find that in a short time new shoots will show up and give you good roses throughout the summer.

In the hardy line of bedders that give good satisfaction as to blooming qualities, I find that the following varieties do well with us here: Hardy Phlox, Paeonies, Achillea, the Pearl, Campanula, Dielytra, the Bleeding Heart, Delphiniums, the Larkspur, Helianthus, Funkia, the Day Lily, Rynethrum, Rudbeckia, Golden Glow, and Anemone. To increase the stock of these either by cuttings or division, take cuttings off of the soft growth in the spring and division about the first of September.

Now a few words on the planting and care of these plants. The most essential part is to get the ground in proper shape. What I mean by proper shape is this: Whether for fall planting or spring give the beds a liberal coating of well-rotted cow manure. If the ground is dry, water first, and let stand until it can be spaded without the soil sticking to the spade. Then you are ready to do your planting. This applies either to rain, hose watering or sprinkling can. Half the success with bedding plants depends upon the planting out. Plants purchased from a florist,

as a rule, are pot bound. So in setting out be sure and make your holes deep enough.

Plants to make a good showing, as a rule, will stand it to be planted from ten to twelve inches apart. After making your holes, place your plants in and if the arrangement suits you, water each individual plant. After the water has soaked away fill up the holes with dry soil. This method keeps the soil from baking around the roots. It would be well if we could abide by this rule in all our plantings. The soil wants to be kept loosened by frequent cultivation. Don't be afraid to go down well, as that is where you want the moisture to go.

As a rule sufficient rain falls to do most plants, cannas and dahlias excepted, they can take a soaking every evening and be better for them. When watering, give the plants enough water to thoroughly soak them, not a light sprinkling, as that only does more harm than good.

Window boxes, porch boxes and hanging baskets are used extensively. I find that the wire baskets lined with moss are the best, as they hold the moisture better.

The Asparagus Sprengrie is used extensively as a basket plant and seems to thrive nicely. For boxes or vases, I would recommend to mix your soil with stable manure, as it seems to hold the moisture better than the cow manure does and the ammonia in it seems to give the plants good color.

After a flower is through blooming, pick it off, stem and all. Your plant will do better and bloom more freely.

Ornamental bedding is something that is always left to the florist to do, and lucky is the florist that has a man that can do ornamental work, for nowadays everything is specialized. So that to get an all-round man nowadays is a hard proposition. You will find them mostly on the smaller places. Where a man is expected to be able to grow most anything there is to be found, make up designs, decorate, and last but not least, steam-fitter, carpenter and a good wheelbarrow pusher.

I can't close this paper without saying a word or two on bulbs. What is prettier in the spring than a nice bed of Tulips, Hyacinths, and Narcissus. Oftentimes people come in about the first of March and want bulbs, and when you tell them that fall is the time to put them in they look surprised. Bulbs can be put in after a light frost or two. Put them down five or six inches in the ground about December, give them a good covering of coarse manure. As the weather begins, remove your covering. After they are through blooming, which depends on the season, lift them up, cut the tops and the roots off, let lie in the sun for a few days, taking them in at night, then lay on a shelf in the cellar, and about the 10th of May you can plant out your bedding plants.

This concludes my paper, thanking you for your attention.

Mr. Green: I would like to ask Mr. Williams what varieties of hybrid teas he finds best for small bedding.

Mr. Williams: The La France, Liberty, Golden Gate, and Pearl make good ones.

Mr. Frey: I think the Chatenay is a good one also.

The President: Yes, the Madame Chatenay does well with Mr. Brown at Geneva.

Mr. Green: For the benefit of those who read this report I would like to say that these roses are not all hybrid teas, although they are good ones.

Mr. Youngers: I would like to say that the varieties we have, the Golden Gate, Liberty, etc., will stand out and do well with protection.

Mr. Williams: Yes, we have had no trouble at all with them at Grand Island.

The President: We will now have Mr. Frey's paper on "The Ideal Carnation."

THE IDEAL CARNATION.

IRWIN FREY, LINCOLN.

Every man has his ideals, existing in imagination only; the highest and best conceivable, the perfect. So with the lover of the carnation. This being true, all we can do is to give our own opinion of what the ideal is, or what it should be.

Our first thought is a large flower, perfect in form, fragrance and color, and very prolific; doing well with everybody. But this must not be or the flower would lose the prominent position it now holds, as the hybridizer and grower would have no goal to work for and the flower-loving public would get tired seeing the same thing, no difference how fine it is.

Personally, I would not want a flower larger than a well-grown Prosperity or Enchantress. Speaking of Enchantress, I do not know of a variety in commerce that comes nearer approaching the ideal. Still, Enchantress has some faults and can be improved upon. From November to the first of March, the size, stem and color are almost perfect. From this time on, the size and stem remain good, but the color assumes a faded appearance; more so as the season advances. So, I would choose my ideals from the varieties now in commerce, with improvements on the best of each color. For instance, an improved Lawson, like some of our disseminators have told us about, larger in size; color a shade brighter; a foot more stem, and just as productive. Fine picture that, a real ideal, but so far the mind only and not the eye.

At the present rate of advancement, however, the time is not far distant when our present ideals will be surpassed. Take, for instance, the days of Lizzie McGowan and Grace Wilder, that being the limit of my personal remembrance, the wholesale price of carnations ranged from 75 cents up to \$3 per hundred, in seasons of particular demand, while the past holiday season saw the best present day varieties commanding \$12 per hundred. This change has been brought about through the introduction of better varieties; through better methods of growing, gained by study and interchange of experiences. Early planting has played no

small part in this advancement. Ten years ago, the latter part of August or the first of September was thought to be about the right time for benching carnations. At the present time, July is none too early for varieties of strong growth. In fact, the best house of carnations we had the past season were planted the 22d day of June. They received pinching back the last week in July, taking off only those shoots running to bud. We commenced cutting from this house in September; and the plants bloomed steadily all winter, with the largest cut in December, and are still producing the best bloom on our place.

I believe we have yet to see the variety of carnation that will do well in all sections, even under the same treatment and growing conditions. This is why so many growers and disseminators of new varieties are criticised so severely; and while the variety comes up to their description at their own establishment, it is almost certain to fall short somewhere, so criticism follows.

Some odd things are observed by the raiser of seedlings. The past winter at our own place we had one plant, a seedling of Mrs. G. M. Bradt, by Gov. Wolcott, which produced three different colors of flowers—seven pink of Lawson shade, four pure white and eleven variegated. Six of these being on the plant at one time. Another oddity was a cross of Chicago, by Mrs. Lawson, which produced nine plants, all of which were yellow or yellow variegated. I quote these instances so you growers here who have never tried this work may see how interesting it is, and how much pleasure may be had out of it, even though our expectations are never realized.

It is my belief that we should not place our present ideals too high, so that when they are realized we will still have room to form newer and higher ones.

CARE OF CUT FLOWERS.

J. H. BATH, OMAHA.

Officers and Members of the Nebraska State Horticultural Society—
GENTLEMEN: I submit herewith a resume of my experiences as to the handling of cut flowers. From a commercial viewpoint, I think that growers, generally, give too little attention as to how their stock is handled after it is cut.

Of first importance is to have the stock sorted and placed in water as soon as possible after being cut. I find it a good idea to have vessels of water in the greenhouses, placed conveniently, wherein the blooms may be placed, awaiting their removal to sorting room, and if the cut is large, the petals are not soft when being sorted, thereby preventing a great deal of bruising they usually receive.

After sorting, the long and short stemmed stock should be placed in separate jars of proper depths, to keep them together and straight, and on hardening, weak stems will be found to have straightened considerably.

Flowers kept in the cellar over night should always have their stems cut afresh and the water refreshed if it is desired to hold them longer. The temperature of cellar or ice chest should be 45 to 50 degrees Fahr. all the year around.

Too much care cannot be used in packing flowers, whether the distance be one mile or one hundred. The damage comes not from the jar of wagon or cars, but the blooms bruise each other. Wax or manila tissue paper or cotton cloth should be placed between the layers.

Always have a cushion of paper or air space at the head of the box, when packing, because a very slight jar in a forward direction is sure to bruise them badly.

I do not believe the greenhouse employees receive enough instruction on the handling of cut flowers, as they are almost invariably rough with them. The blooms can be handled rapidly and gently. I personally have seen a number of expert rose growers who treated the flowers, after they were cut, in a most shameful manner, such as squeezing long and short together, or laying them down hard, almost dropping them, on the table. This probably is mere thoughtlessness. It takes no more time to handle them properly.

I believe that as many of the flowers as will permit should be broken off, instead of cut with a knife, because more of the pore surface is brought in direct contact with the water in this manner. This applies particularly to chrysanthemums, lilacs, heavy-stemmed roses, and others having heavy stems.

On receipt of stock at store, same should always be gone over, the stems freshly clipped, bruised petals and deformed foliage removed. If they have been shipped from a distance, they should not be used until they have been chilled a second time.

In these days of fancy carnations, we are troubled at times with many split calyxes. This can be remedied, if carefully done, with a needle and thread, or with stemming wire, sewing the parted calyx together.

Too many flowers are usually placed in one vase. Put them in several vases, the flowers won't wilt, as otherwise, the foliage is not destroyed, and you have apparently a larger stock and an infinitely more artistic display for your customers' inspection.

As to preservatives, many have suggested the use of some patented stuff, chloride of sodium, bicarbonate of soda, and even a rank poison, nux vomica, but I believe nature intended cool, clear water, and plenty of it, as the preservative par excellence of cut flowers.

Flowers grown in a greenhouse should never be offered for sale until they have stood in water and kept in cellar or ice chest at temperature of 50° for at least twelve hours, and twenty-four is better. This allows the stems to become filled with water, for the pith acts much as a sponge. Then, and not until then, will the cut flowers keep and be satisfactory to the buyer.

Fresh air is as important as fresh water. For instance, at this time,

carnations will keep but one day at the store, and should I take some of the same lot to my home, where the air circulation is good, they will keep three or four days longer. A draft will wilt a rose badly, and scarcely injure a carnation, so it is best to avoid drafts.

In conclusion, I would say that common sense, coupled with an observing eye, should govern the care of cut flowers.

THE ROSE.

M. STAUCH, COUNCIL BLUFFS, IOWA.

Throughout the vegetable kingdom there is no genus which commands and receives so much attention from horticulturists as that now under consideration. The rose has been immortalized from most ancient times by authors and poets of all countries. It is the emblem of youth, of love, and beauty, and justly designated the queen of flowers.

It is needless to attempt referring to all the purposes for which the rose is well adapted. They are generally familiar in our gardens and as cut flowers have no equal. There is more glass devoted to roses than to any other plant, and I believe there is no plant which brings better returns to the successful grower than the rose.

PROPAGATION.

The propagation of roses may be accomplished in many ways, namely, by seed, cuttings, layers, suckers, sprouts, by division, budding, and grafting, the methods mostly practiced being by grafting and cuttings.

Cuttings can be made during almost the entire year, yet the best time to propagate varieties which are grown for cut flowers, is from November until the middle of April. Cuttings should only be taken from the most healthy plants and the wood should be well ripened. There is quite a diversity of opinion among growers as to blooming qualities of the so-called blind wood versus blooming wood.

It is undoubtedly the best to use the blooming wood, as it is the strongest and best matured, yet blind wood of equal quality is in my opinion just as good. Owing to the scarcity of that kind of wood, coupled with the large demand, it is easy to lose sight of this very important factor and use inferior wood, the result being weakly and poor blooming plants. The cuttings should be two to three eyes. The best plants will come from so-called heel cuttings. After the cuttings are firmly put in the sand, they must be thoroughly watered, the sand must always be kept well watered, but avoid spraying overhead as much as possible.

I find it best to keep the temperature of the sand 68 degrees, and that of the house 56 degrees, the temperature should not vary more than two degrees either way.

In four or five weeks the cuttings will have made roots from one-half to three-fourths of an inch long and should then be potted firmly in small pots, watered well and placed on the bench close to the

glass. During the first few days it is necessary to shade them through the hottest part of the day, but as soon as root action is noticed, shading should be dispensed with. From year to year the advantages of grafted over own-root roses are more recognized and understood, so that today there is hardly any large place where grafted roses do not predominate.

The grafting is done on *Manettii*, which is imported from Europe, and usually arrives by the middle of December. The stock should at once be unpacked and potted or heeled in a cool place, covering it up about two-thirds with soil which is afterwards well watered. They can then be potted as convenient, but must be done before the white rootlets get too long or the stocks commence to grow. They are potted in as small pots as possible, placed in a temperature of 50 to 55 degrees and should get a thorough watering. After this the spraying of the wood two or three times a day is all that is needed. When root action commences and the buds begin to swell, they are ready for grafting. The grafting in itself is very simple. Make an oblique cut about one-half to one inch in length as close to the pot as can be conveniently done, cut the scion to match the same, place the two cut surfaces together and secure them firmly with raffia or twine. It is not absolutely necessary that scion and stock are of even size, but the bark of the scion and of the stock must meet exactly, at least on the bottom and on one side. They are then put in an air-tight case. This case may be of any size and can be built in various ways. We use the center of a bench in a house, covering it with sash raised from two to three feet above the plant. The bench should have a thin covering of moss, over which is put a layer of sand. These are well watered before the grafts are placed on it. The grafts, after being made, should be transferred to the case without delay, the temperature being kept about 75 degrees and the case kept closed for about five days. By this time the scion and stock will have sufficiently calloused to permit a little air. This has to be done very carefully, first giving a fraction of an inch, and gradually increasing, when in two or three weeks they can stand the full air, but even then they must be guarded against the hot rays of the sun for a week or ten days longer, after which they can be treated like other plants.

The treatment of own-root and grafted plants is alike, excepting that the grafted plants should get the support of either wire or cane to prevent their breaking off. As soon as the pots are filled with roots, they must be shifted into three-inch and from these into four-inch pots, if such plants are desired before planting in the benches. During this time the plants should never suffer for want of water nor be kept too wet. They must be guarded against mildew, red spider or blackspot.

The importance of taking the best care of the young plants should never be lost sight of, and only the most competent man should be trusted with this department. It is here where we lay the foundation for our future success.

SOIL.

To grow roses successfully a rich soil must be provided. A good fibrous loam of a stiff rather than light nature is the ideal soil. Where such cannot be obtained, we have to accomplish the purpose by a combination of soils. As a rule most of our large rose places are situated so that they are within easy reach of good soil. The rose is a strong feeder and there is scarcely any soil which will grow roses up to standard without the aid of manure. In most cases one-sixth to one-fifth of manure can be safely added. It should be well decomposed and thoroughly mixed through the soil. Bone meal is also used very extensively. I prefer to apply this when soil is on the benches, being then able to distribute it more evenly through the soil with the aid of a hoe. The bone meal can, of course, be added at the same time the manure is, but as we usually have unskilled labor to assist us in this operation, we are apt not to have it mixed in the right proportion. I aim to use 150 to 200 pounds to a house 25x200 feet.

Having thus prepared our soil, filled the benches and cleaned the house thoroughly of all rubbish, we are ready to plant our roses. None but the best plants should be taken. We plant fifteen to sixteen inches apart, five rows in a six-foot and four rows in a five-foot bed. The soil must be pressed firmly about the plant and a shallow basin left around it. These insure the plants being watered without watering all over the bench before they have taken hold. It preserves the nourishment in the soil and keeps it from souring. This mode of watering should be followed till the roots spread all through the bed.

The plants need stacking and tying soon after they are planted, this being particularly true of the grafted plants. In tying there should always be one or two of the strongest branches brought reasonably close to the wire to insure the plant from shaking around too much or breaking off while syringing. It is essential that the benches are kept free from weeds and the surface of the soil stirred every two or three weeks to permit the free penetration of the air.

The best time to plant is when the plants are well established in either three- or four-inch pots. This may be early in the spring or in the latter part of the summer, as the conditions on the place may require.

I believe in early planting, so that the roses have formed good-sized bushes before fall, in order to produce first-class flowers in the first part of the winter. Later planting than July is not to be recommended where good flowers are wanted during the winter months. Roses planted after that date are usually at their best by March and April. During the summer months, in fact at any time, the rose wants all the air which can possibly be admitted.

While the rose should always have plenty of moisture about the roots, it is a mistake to keep it too wet, as it brings about a soft, rank growth which will not have enough substance in it to produce a good flower, and

by the slightest mistreatment in the fall, will turn out a failure in spite of the promising look during the summer. Therefore it is well to allow the beds to get very much on the dry side at times before watering.

Our aim should be to bring the roses into winter with plenty of good, vigorous, well-ripened wood, not stunted nor soft and spindling. Many a crop of flowers is lost or at least seriously injured and often the prospects for the whole of winter months are ruined by not starting the fire in time. In August and September we will often have chilly, cold and wet days and nights. Do not neglect to run a little heat through the houses, if it is only to take the chill and dampness out of the air; it will repay you with interest; you will not have much trouble with mildew and other fungus diseases; you will also not be so much afraid to syringe when you know that you will have the fire going at night, so red spider will consequently not get a start, which means very much by November, when the weather conditions may be so that you will not dare to syringe sometimes for a week or more.

Meanwhile the roses have been kept nicely tied up, all the weaker stems disbudded or cut back some and we are beginning to cut some flowers from some of the strongest shoots. The stems should not be cut too low on the young roses, leaving four to six eyes, according to the conditions of the plants, while weak stems may be cut lower or cut out entirely. As the plant grows stronger the practice of cutting two or three eyes is the best with most varieties, Beauties being an exception, as most of the flower stems come from the base or near the bottom of the plant, and should be left with four to eight eyes. It is impossible to cut the flowers by any formula or set rule, the difference in varieties and the conditions of the plants vary so much that almost each individual plant demands a different way of cutting.

This, apparently so simple an operation, is accountable in a large measure for our high or low grades of flowers. I find it more difficult to teach the cutting of the flowers than the watering or any other operation pertaining to rose culture.

The temperature most suited to our Tea Roses is from 56 to 58 degrees at night and 66 to 68 degrees in daytime. On exceptionally bright days the temperature may go up to 70 or 75 degrees. Beauties are kept about two degrees warmer.

The airing or ventilating of the rose houses is of great importance during the whole year; particularly during the fall, winter and spring, they need very close watching. It often happens that the ventilation has to be changed four or five times an hour. Good judgment is necessary in airing. Never raise the ventilation too much at one time, but go around often and raise it by degrees. Avoid all sudden changes and draughts; a cold draught of air admitted suddenly is apt to check the plants and cripple the flowers, besides causing mildew, and may mean a set-back for a month or six weeks. This mistake is most apt to occur in the early morning hours, when the sun commences to strike the

glass, and may be partially avoided by shutting down the fires as soon as the sun appears, raising the ventilation part of an inch and also gradually raising the temperature of the house.

The beds must be frequently examined during the cold weather. They might appear moist on top while heat from the pipes has dried them from below; always water so that the moisture penetrates to the bottom and then let alone until a good watering is needed again. Of course there are always places which need a little extra water between times, but the grower will soon find those places.

Most growers give a light mulch of manure about the first of October or earlier, and then no more until the middle of February or March. Artificial fertilizers, such as bone meal, blood, wood ashes or lime, are used during the winter months; a light watering with manure water, beginning in January and using every two or three weeks, is a great stimulant. Artificial fertilizers should be used with great caution, particularly by beginners; it is easily overdone; use a little at a time, and so ascertain the amount most beneficial. From middle of March on manure and manure water or any quick-acting fertilizer can be used **more** freely without injury.

Much more could be said of every operation in the culture of roses, but it would take too much time to enter into every detail.

DISEASES OF ROSES.

Among the many diseases the rose is subject to, the most common and best known are mildew and blackspot, both being a fungus disease. Sickly, poorly ventilated or over-fed plants are the first attacked. The disease is produced by sudden changes of the temperature, draughts of air, too much atmospheric moisture and numerous other causes, mostly due to poor ventilation or heating.

To prevent them means to overcome all these defects, which is possible but not so easily done. Mildew, to which our Teas are most susceptible, is the easiest to combat. Sulphur on the pipes or dust it on the foliage is the best remedy. The American Beauty is the most susceptible to blackspot. As a remedy carbonate of copper is recommended; air-slaked lime and sulphur are also used, but it is best to pick off all the spotted leaves as soon as they appear and burn them. Keep sulphur on the pipes, give plenty of air, in short, work against the conditions which have brought the disease about.

The insects which infest the roses and come mostly to our notice are green-fly, red spider, ell-worm, and trips, the two first named being easily kept down, green-flies by proper ventilation, tobacco fumes and the various forms of nicotine. Red spider enjoys a warm and dry atmosphere and its presence tells us that we have not made the proper use of the hose. Good, hard syringing on bright days, if only done well once or twice a week is the best preventive and cure. Ell-worm, a pest which infests the roots and means certain destruction to the plants, can be kept in check by the use of lime or lime water. Wherever it

is present in the soil, it is best to resort to grafted plants, as Manetti is not susceptible to ell-worm.

The most troublesome of all is trip, as it lodges in the buds and flowers. The damage it does to rose growers amounts to thousands of dollars every year. It is in itself easily destroyed, but owing to its habit of secreting itself, so far nothing has been found which will exterminate it, and at the same time not injure the plants. Various insecticides are recommended to keep them in check, those which appear to give the best satisfaction being paris green diluted in water, fumigation with tobacco and red pepper, or the different nicotides, used either on the heating pipes or on the foliage. Any of them means certain death to the trip if he is caught out of his hiding place. It is therefore necessary to continue to use these two or three times a week if any satisfactory result is expected.

Summing up the whole rose culture, we find that whenever we do not observe the laws governing a healthy plant growth we invite disease and insects to feast on the roses, and thus curtail our profits.

Mr. Henderson: I think that is a very good paper, and there is no criticism at all to give on it.

Question: What proportion and how do you use this lime or lime water?

Mr. Stauch: About a half bushel to a bench 150 feet long. The bench is about six feet wide.

Mr. Green: I would like to hear Mr. Stauch tell us more about the ell-worm. I don't know anything about it, and would like to know.

Mr. Stauch: The ell-worm is a pest which infests the roots of roses. The effect on the plant is that it turns yellow and dies.

Mr. Dole: We white-washed our benches and have not been bothered with the ell-worm.

The President: Professor Bruner, will you tell us something about this ell-worm?

Professor Bruner: There are several different species of this ell-worm, and they infest the roots of different plants. To tell the truth, however, there is not very much known about these things. We don't know their life history. After they once get well established it is very difficult to get rid of them. It seems that they thrive in dry weather and such conditions as well as any other time, and they grow and multiply very fast. Lime seems to be one of the best things to kill these creatures, and I think that is the best remedy when you have a very severe attack of them in the greenhouse. Wash the benches thoroughly with lime water.

The President: We have with us this afternoon Mr. Wesley Greene, Secretary of the Iowa Horticultural Society. We would be glad to have a few words from him.

Mr. Greene: Mr. Chairman, Ladies and Gentlemen, I am very glad

indeed to be with you today, but I do not feel very much like talking. I am always glad to be with horticulturists.

I have had some experience with floriculture, and it is a very entertaining topic to discuss. I am especially interested in the growing of roses, and I think the Bride is a very good one. It burns a little in hot weather. It gives a handsome, large, clear white flower. For amateurs who are growing roses in small lots I would recommend especially the Marie Guillot and the Bride. The Meteor is still the best in the reds.

Mr. Williams: Do you have any trouble in carrying the Bride over into winter?

Mr. Greene: You can do it all right by covering. A friend of mine covers with weeds and clover, which seem to be pretty good. Tea roses should be covered so that they will not suffer from the cold weather.

Question: What do you do for the mildew and black spot?

Mr. Greene: We use the Bordeaux mixture which is about the best. We are not troubled very much with the mildew. Sulphur also is a good remedy for mildew.

Question: Do you use the sulphur dry?

Mr. Greene: Yes, sir.

EVENING SESSION.

8:00 P. M.

At this session some very enjoyable music was furnished by the Danie Glee Club, the club responding to several encores.

CIVIC IMPROVEMENT.

JUDGE W. W. SLABAUGH, PRESIDENT OF OMAHA CIVIC IMPROVEMENT LEAGUE.

A distinguished writer in a recent number of the Outlook, said: "The most attractive city invariably will and does draw the best class of citizens." That same rule will apply to villages and to the farm.

Thomas McBride, president of the Iowa Park and Forestry Association, in his address on Civic Improvement in Iowa, gave this pertinent illustration: "Why," said he, "does one farm sell easily for \$100 per acre while another across the road sells for \$60 per acre? The improvements, one answers; and these are by no means all shown in the buildings. They include the lawn, shrubs, trees, orchard and garden. The approaches, the welcome that greets the owner returning to his own. Are they worth much? Read your own heart, let everything bright speak and tell me if they are not all important." He said further: "Now in Iowa, there are plenty of people who know all of this who agree with us in all these things. The difficulty is to reach such people in such way as to stir them to activity."

"It is the business of the Civic Improvement Club to serve the people by awakening in them an appreciation of themselves, of their own better thoughts, and their better possibilities. It is not to our credit that any part of this state should have been more beautiful when the Indians possessed it than it is now, but such is the truth. We have trodden out the wild garden of natural beauty and neglected to plant another of any beauty, natural or otherwise. This does not mean that there are not hundreds of beautiful places in this state, beautiful homes, beautiful farms, beautiful grounds, and streets, but that there are also thousands of ugly places in this state, ugly farms, ugly homes, streets, tenants and dirty and ugly churches and school houses."

Now what is civic improvement? The object of the Civic Improvement Club is to make a city, village and country more beautiful, healthful, convenient and progressive to live in and to work in. It is the old town meeting revived. The organization of the present day is the most democratic in form, organization and objects. Politics does not enter into it as understood in modern times. But its object is political in its true sense. Its object is to help the people of the state or community. Religion does not enter into it. The people work together for one common object. The betterment of the whole people. It is not alone for women and children although in many cities and communities they are the most important factors in Civic Improvement. Those who should lead in such work are the men of the community for they are most benefited thereby. And in fact he who has most is most benefited by the work of improvement clubs, but how often it is that he does the least, and pleads the excuse "Too busy." In the hurry, business strife and competition we too often forget that a city's growth and prosperity, likewise that of the village and the state, depend upon the enterprise and the prosperity of its people. All could bring about wonders in the way of improvement reform. Business organizations are good in their places, like the Commercial Clubs, Board of Trade and the like, but they look only to the business side of the city's progress, forgetting the great majority of people whose ambitions and enterprise and health and happiness are forgotten.

A farseeing man of wealth in Colorado recently gave \$5,000 as a prize for the best kept lawns. He undoubtedly with his kindness of heart had a selfish interest that was to help the city and thus indirectly help himself. But its effect and influence will never be effaced. Now although this is a horticultural society, you will pardon me for considering some of the many objects of our club, and also some of the objections that are raised to the work of Civic Improvement and what has been and is being done by them. Civic Improvement may be said to have found a three-fold expression in (1) the new civic spirit, (2) the making of the city, (3) the making of the citizen.

Devoting the most of my time to what has been done throughout the

country in this line, for I take it that in a country of this kind with so many progressive cities in the east the older city long since having given up to embellishments and in the west the younger cities rivalling each other in business activity. Much can be gained which are suggestions to us for adaptation in our own communities.

Among the things considered by the wideawake improvement clubs are the following: County park systems, forestry, fountains, good roads and good streets, guide boards to points of interest, increased attractiveness of farm life, photography as an improvement agency, preservation of outdoor features, street signs, street and road planting, athletic and outdoor pastimes, floral exhibitions, open air picnic grounds, parks for all of the people, public lavatories, public gymnasium, rest rooms in towns and cities, shelter houses in parks and cemeteries, artistic public advertising, care of vacant lots, cemetery improvement, garbage disposal, improvement of city water front, beauty in bridge building, practical and artistic street planting, cleaning of streets and alleys, proper naming of streets, public lighting as an aid to city beauty, public squares, sidewalk planting, grouping of public buildings, improvements of yards, prize awarding, vine planting and the like. And there is no reason why improvements of this kind should not be done at the city's expense if in a city, or at the expense of the village if in a village. But those reforms will not be brought about by the city officials in many cases, and for no other reason than that the people do not see their necessity until they are a part of the organization which demands them.

"There is nothing," says the Practical Farmer, "That gives a passer-by a poorer opinion of a farm than a road side incumbered with a weed and scrub nursery. On many a farm which is otherwise apparently clean, the roadside is allowed to furnish weed seeds enough to keep up the supply for the whole farm for the next season. Even where there is some effort to keep the roadside clean, to let the weeds remain until fall when the weed seeds are ripe, and then have a cleaning up, accomplishes very little." And to the stranger or passer-by the roadside, like the first approach to a village or city, to a great extent conveys the idea of that which lies back of it. Too little attention is given to matters of first approach as we might term it. Our first impressions stay with us for a long time and are hard to obliterate.

The first improvement league in America was founded at Stockham, Mass., in 1853, while the development of city and village improvement clubs has taken place in the last dozen years. In fact the great impetus to improvement was given by the World's fair in Chicago, which from its beautiful and systematic construction awakened the drowsy sentiment of the people to what could be and should be, and the various expositions that have followed over the various parts of the country have given new stimulus to the idea of civic betterment and beauty. The

enterprise created in Portland outranks that of any city in the United States within the same space of time. The preparation for their exposition made Portland a city of flowers and their experiences and the lessons taught are still continued and in the minds of the people of the city will never cease to exist. Portland as a beautiful city has been made by this exposition. Likewise the exposition in Omaha had much to do with the creation of a sentiment for a more beautiful city.

The first public *baths* were established in Boston in 1866 and to our surprise, perhaps, Milwaukee next took the matter up in a practical way in 1899.

Under the leadership of Dr. O'Hage, St. Paul utilized a waste portion of the Mississippi river and has made it one of the most successful institutions in the country.

The first *vacation* school was held in Cambridge in 1872.

The first *playground* was in Brooklyn in 1872, but the movement found its best equipment in the Charlesbank in Boston in 1892. And the up to date cities of today find that the playground is as essential as any department of the city's progress taking into consideration the making of citizens. I shall hope to speak of this later. The legislature of Massachusetts in 1898 gave Boston one-half million dollars for its playgrounds. Various cities of the United States contribute large sums to the maintenance and supervision of playgrounds. We have one in the city of Omaha which should be maintained and I hope it will be maintained by the park board as one of the parks of this city. Chicago has extensive playgrounds, some in the various parks of the city.

In 1851 the first steps were taken in New York to establish Central Park. But the park systems in most American cities have been made in the last decade. The municipal gas and electric light plants in American cities have been inaugurated since 1893. So we see we are living in a day of vast material progress and improvement.

It might be said that the first school garden and first public playground was instituted in 1690 when George Fox, founder of Quakerism, bequeathed 16 acres of land to the city of Philadelphia. "Ten acres were for a close to put friends' horses in when they came to the meeting that they may not be lost. The other six were for a meeting house and school house and for a play ground for the children of the town to play on and a garden, to plant with physical plants for lads and lasses to know staples and to learn to make oils and ointments."

One of the first objections that is made in the way of Civic Improvement is that it is too late—the city is too old and can not be transformed to a thing of beauty at this time. This objection has very little foundation. Boston, one of the oldest cities, is being transformed into one of the most beautiful cities. So are changes being wrought in Washington, New York, Cleveland, Harrisburg and many other cities.

London is spending millions to correct former mistakes.

Paris after having spent \$265,000,000 on the Haussmann Improvement from 1854 to 1870 has found it a paying investment; for it is now contemplating spending \$236,000,000 in a new development, exclusive of the cost of buildings, statuary, sewerage and water plant.

Germany, Italy, Austria, Australia and other European countries are actively engaged in the same work.

In Berlin the slums have disappeared since 1870.

In Glasgow 88 acres in the center of the city have been remodeled.

Berlin has transferred 93 acres of slums into streets flanked by artistic buildings. It would be impossible here to name the many plans for the improvement of London which have been recently made. In fact a new London is being built.

. In America the unit of design is the building. In Europe the unit is the street, the district, the whole city. In Europe there is authoritative supervision of all their buildings. Architects are required, as they are not required in this country, to build in accord with the natural surroundings. If expositions can be built beautiful and convenient, why can not villages and cities be so built? American cities in fact have a greater advantage over European cities not only in age, but because they have not followed plans which they felt it their duty to follow.

Recently there appeared in a New York paper an article under the title "*New York in Transformation.*" It applies not only to New York, but to every community in the country of any size where its people are active and up to date and are building for the future. Manila, the capital of our last accession, is being remodeled after American ideas. When our American troops marched into Manila, August 14, 1898, it was the filthiest place in the Orient. Now it is one of the cleanest cities and tourists who visit it pronounce it the most attractive spot in all of the east and this has been done in this old city in eight years.

Improvement has been going in the extension of park system in such cities as New York, Philadelphia, Harrisburg, Milwaukee, Portland; Chicago, Seattle, Staten Island, Cleveland, St. Paul and Minneapolis, San Francisco, Baltimore, Kansas City. And Omaha for the size of the city has one of the most beautiful park systems in the country. God did much for us in making our hills and ravines. And I am pleased to see the numerous cities of the country so earnestly advocating the improvement idea. The Tribune of Minneapolis says: "The city's highest charm by no means all lies in dwellings or splendid public and business constructions. It is also in the development of its natural advantages and the overcoming of its natural disadvantages. Every occupant of a home, whether owned or rented, should feel under obligations to keep it in good order so that the house and grounds may not be an eyesore to the public.

Governor Pardee of California is giving his personal attention to school garden literature. In Moline, special attention is being given to

the publication of ordinances of the city and laws of the state pertaining to beauty, health and cleanliness. The United States has issued a publication, No. 218, in which the author advises the cultivation of individual gardens by the pupils of schools.

He advises that all of the work of cultivation shall be done by the children. The mayor of Kansas City, Kansas, recently requested the owners of vacant lots in that city to allow them to be used as playgrounds for the children. In the United Mine Worker's Journal, an article appears in which it is said:

"Civic Improvement wants to make cities, towns and villages clean, healthful, and attractive places in which to live. It wants to extend the system of public parks in cities and villages. It wants to promote the work of public playgrounds for the children and recreation places for the grown up. It wants to abate nuisances, such as sign boards, curb signs. And it wants to make more beautiful surroundings at depots. To encourage tree planting in a systematic way. It wants to do just what all of us would like to have done and would like to help do if we should only stop to think about the matter."

And John Mitchell recently recommended improvement work of this kind in a very high manner.

Bryce, in his "America Revisited," recently written by him after visiting this country, says: "The desire to have a beautiful land about one, to adorn the house within and the ground without, is not new. It has developed apace since 1870. In one respect it is much more active in the United States than in most parts of Europe. We have in England, so far as I know, none of those village improvement societies which have arisen in the northern states and especially in New England. Neither has the New England city surrounded itself with such a superb ring of parks and open spaces, some hilly and rocky, some covered with wood, and some covered with lakes, as Boston now possesses."

America used to be pointed out by England as a country where utility was everything and beauty was nothing. No one could make such a criticism now.

Space, as I have said, will not permit a full statement of what is being done in the various cities, villages and country places. Marvels are being wrought. Why are not we ahead? I will pick out just a few more of the many.

In Iowa a great deal of time is devoted to preserving places of historical and scenic interest. In one village in Texas the improvement club took up the rescue of the old Bell at La Bahia which is 150 years old and was used by the first settlers. Of course work of the city improvement clubs covers generally all civic progress, but there are certain particular leading features of work taken up by various clubs as the needs present.

In Carlisle, Pa., the club has charge of the street cleaning and

sprinkling of the city and holds monthly meetings in the schools to arouse interest. They have places for waste paper, and insert in the local papers the town ordinances in simple form, that all may know to obey them. Every city and village should do that once a year.

In Los Angeles the demand for seeds and plants on the part of the children was in excess of the supply. In Duluth the school children have raised funds by entertainments to beautify vacant lots. In St. Joe 500 children have been interested in school gardens and have been instructed by lecturers from the State University. The Home Garden Association of Cleveland sold about 100,000 packages of floral seeds to school children last year at a cent a package. In Minneapolis the business men have taken up Civic Improvement. In Carleton, Mo., Civic Improvement is carried on by the women. Shame to the men, the women are frequently the leaders in this important work. In California the city of Petaluma for 10 years has given \$25 monthly to the local improvement club and it has received more than its value in return.

Another city has adopted the same plan. In Muscatine, Iowa, the librarian, in an attractive manner, arranges upon the table in the reading room books and magazines bearing upon Civic Improvement, and states that he will furnish upon request magazines and articles bearing on the same. A number of cities are doing the same.

The Aberdeen Improvement League of South Dakota publishes the following among other things: "The organization has converted Aberdeen from one of the illest looking cities to one of the cleanest in the state." After discussing various things it suggests how to plant various things like the following: "To plant sweet peas plant them early in the season. If possible let the rows run north and south so they can have both the morning and evening sun. Provide a trellis of chicken wire for them to run over. Do not allow seed pods to form. Plant old-fashioned holly-hock in the rear of the yard," etc.

In Philadelphia it is urged that there be provided a Civic Improvement Commission whose duty is to prepare a plan for the development of the city.

The association has an endowment fund of \$100,000. Washington, New York, Cleveland, St. Louis, and Indianapolis have employed experts for the same purpose. And other wide-awake cities will fall in line. Harrisburg built anew under the plans of an expert who was paid \$5,000 for his services.

Mr. Burnham, who planned for a beautiful Washington, and Manila, was in his bungalow in the suburbs of San Francisco planning for the model city of the world when the great disaster came. But such a people as those will wrest victory from the jaws of disaster and defeat.

In Kalamazoo, Michigan, the improvement club is making a raid on loan sharks who have practiced most shameful extortion on poor and destitute people in 264 cases and the Commercial Club is aiding the move-

ment. In Louisville, Kentucky, the Commercial Club is aiding the Improvement Club in arousing interest in a more beautiful and picturesque city. A series of lectures accompanied by a stereopticon has been given in various parts of the city. In Spokane there is an organization called "150,000 Club" just as we should have a "200,000 Club." The club affiliates with the American Civic Improvement League. The club there invited the high school pupils to meet with them at luncheon and make suggestions for a more attractive and beautiful city and to aid in inviting investors and purchasers in making the city the population sought. A suggestion that is worth considering in every city and village. Not only are good suggestions made, but the boys and girls, the men and women of tomorrow, will take an interest in carrying out their own suggestions as they would not otherwise.

In Jersey City, the retail merchants are co-operating in a movement for the betterment of the downtown shopping center. It takes into consideration show window displays, nightly electric exhibitions, musical and other attractions and the bill board and curb sign nuisance.

Kansas City is making a gallant fight in the way of park extensions.

A person who has visited in various parts of the country declares that with the exception of Chicago, no better park system is being planned and carried out than the one now in Kansas City.

A Chicago improvement club has petitioned Gov. Deneen for an earlier Arbor day for the reason that trees and shrubs planted so late will not thrive as well as planted earlier. Civic improvement has crossed into Canada, and Toronto and is now giving the world a lesson in the art of city beautification. The Ontario Association of architects has prepared a plan for the civic improvement of Toronto, which will call for systematic work through many years, but that is the only way to work a definite scheme of development. And no better plan could be adopted for the city of Omaha than to employ an expert with an eye single to planning for the future improvement and beauty of our city. The Civic Improvement league of Salt Lake City recently held a meeting in the parlors of the Commercial Club in which they resolved the following things among others:

- 1st. Sanitary inspectors, two for each precinct.
- 2d. The sidewalks and streets should be kept well cleaned.
- 3d. Citizens should keep their back yards also clean.
- 4th. Encourage the people to plant lawns around the paved streets.
- 5th. Do something about bill boards and curb signs.
- 6th. All school houses and churches should be surrounded by lawns, flowers and trees. Fences should be neat and kept in repair.
- 7th. Distribute seeds among the children and encourage them to raise flowers. Award prizes.
- 8th. In the business districts have sidewalks clean from all advertis-

ing goods, such as buggies, boilers, machinery, coal and the like. Clean out all nuisances which disgrace the city.

9th. Encourage the people who have paved sidewalks, to sweep them at least once a day.

A recent lecturer suggested, among others "applicable to farmers," objections to improvement as follows:

1st. Conservatism. Many farmers keep the roadside cut for no tangible reason, except that they and their neighbors and ancestors did so. One idea is to make a clean sweep of everything. The other is to let everything grow. A modern idea is to make things attractive.

2d. Untidiness. The farmer now in some communities who does not keep his roadside clean is looked upon as shiftless and his farm of little value.

3d. Tramps. Some say roadside shrubbery encourages tramps. That might be said of buildings, but a neat roadside with shrubs never encourages tramps. If it does, they will be tidy tramps.

4th. Shade. Some object to shade and surely that is the farmer who can see nothing in pleasure and in beauty, but seeks the last stalk of corn regardless of the comfort to himself, family and others.

By the trimming of trees high from the ground we would have beautiful roadsides and the cornfield would be little shaded. And still there are others that object because of the seeds that are scattered, the insects that are bred, and some prefer to have the grass for an additional hay crop. Some say the dust gathers too much on the shrubs. Some say it causes dampness and some say drifting of snow.

You will observe in the older states where the embellishments of life are now being considered, these are not objections.

The Atlanta News of Georgia very well says:

"Wherever the homes of the people have come to mean more to them than mere lodgments from cold or rain, wind or snow, places for making the almighty dollar, then there has sprung up, very gradually, perhaps, but none the less surely, a desire to improve them and to make the lives of all happy."

The Greek dwelling must indeed have presented a spectacle which could not have failed to charm. The court yards with Phrygian Onxites, the tall Ionic columns of Parian marble near which recline clad in the graceful robes of that land of beauty, young and beautiful girls flower crowned and singing to the music of the Apollos' cithera, helped to make Greece a power throughout the world in its day. All that the Greeks looked on or touched was made beautiful. Ruskin says "a room without pictures is like a house without flowers." So with a home, city or village.

We seek for beauty in the ruins of ancient cities. It is a far cry down the ages to our time through the dark ages—you might say to a time when intelligent interest is being taken in the decoration and beautifica-

tion of our home and city in our country. And I fear we do not appreciate the influence of beautiful parks, boulevards and lawns upon the character, the patriotism, the health of the future citizenship of our boys and girls.

You build a park or boulevard in the most dilapidated part of our city and the people along its border clean up, paint up and repair, wash their faces, comb their hair and transform themselves into new persons in new homes with new surroundings.

A man was recently walking down the street of one of our cities where improvement work has taken hold on the minds of the boys and girls. He tore a wrapper off a magazine and threw it away. "You mustn't do that, papa," said the boy. "The improvement society-tells us that it is wrong to throw those papers on the street." He was ashamed. He took up the paper and put it in the paper receptacle. He said to another afterwards, "My boy is a better citizen than I am." This is but one of the thousands of incidents that arise unknown to you or me as the result of the movement for improving city, village and farm.

Recently a little boy in illustrating the idea said to another, "You ought to clean up your place, don't you know that pigs don't like nasty pens."

We have done a number of things in Omaha which have shown a marked improvement, resulting from the influence of the smaller clubs and the Omaha Improvement League.

You need only ask citizens of our city who have observed the changes wrought to learn what has been done. I have heard the expression many a time from persons who have been away for a short time during the summer season, "What wonderful changes are being made in the attractive appearance of our city." And how can it be otherwise when last year 1,600 boys and girls, with the influence of the yards, upon others about them which they were beautifying, took part in the contest for prizes. 20,000 one cent packages of seeds were distributed through the schools and a larger number this year. It cannot help but mean improvement.

Lectures have been given with the stereopticon, at which 3,000 school children attended, where they were shown the changes that have been made by the efforts of men and women and boys and girls, in beautifying their home cities. And in one respect a home city is as much our home as the houses we live in, for many during the hard toil of their lives are about the city more than at their home. An exhibition was given last year by the prize winners of the products of their labors, which in interest and beauty can not well be described. The pictures which I have with me best show you. Many things have been done by the clubs of this city. And the citizens of this city owe a debt of gratitude to them for helping to make our city attractive. And too frequently it is-those who gained the least from the movement that do the most work.

The Omaha Improvement Club has had inserted in the charter of Omaha a provision permitting an ordinance requiring the owner of property to cut the weeds thereon, and if he fails to do so, the city can cut them and tax the expense to the owner. It is hoped that our present city council will execute that provision of the charter.

It is the desire of this club also that the weeds along the walks be cut twice a year rather than wait until they have gone to seed furnishing a larger crop for the coming year.

What we want in Omaha among other things is cleaner streets and alleys; a boulevard in the southeast part of the city, small inside parks, more attention paid to trees, tree planting and their protection. A street systematically planted to one kind of trees. A forester whose duty it is to protect trees and to see to proper planting; a public bath house; play grounds, supported by the park board as of its parks; various neighborhood play grounds prepared by the neighbors and the control given into the hands of the boys and girls, thus giving them the responsibility and teaching them the duties of citizenship and making them love their city. Removal of unsightly bill boards and curb signs that mar our beautiful and expansive streets. New additions formed with an eye to beauty, as the Bemis park addition, for instance. School gardens where each child is furnished seeds, taught to plant them and care for the plant. Beautiful approaches to our city. The inheritance tax which under the law is to be used for the construction and maintenance of permanent roads in and out of cities and villages should be made object lessons, beautiful, permanent and attractive. I am a great believer in object lessons. If each village would see that its permanent road maintained under this tax is made a thing of beauty, it will have more to do with cultivating the idea of beauty in surroundings, in public and private, in city, village and farm, than anything else that can be done.

Each citizen will be led by such an object lesson more to do his duty.

Most of us today are profoundly interested in the tremendous struggle the Japanese have undertaken in the far east. We can not cease to wonder at the astonishing progress of that people in the last fifty years in all things that make for the conduct of war. But we are less conversant with the fact, perhaps, that in some things these same wonderful people have for centuries far surpassed the west. The enormous population of those small islands, forty-six millions, requires that every inch of ground be used for something to meet the physical needs of men; but, in a land where even fruit-trees are luxuries, a deep-seated love for the beautiful finds expression in the universal presence of small, flowering trees, mostly plums, cherries, roses, in every door-yard where one would think fruit might be raised. Their flowering trees also fill the grounds of temples, parks, border the streets, highways, country roads, and are planted "along the stretches of soil that divide one rice-patch from another." The entire month of April is a flower fete in

Japan and the island empire blooms over its myriads of delighted people. There is, in fact, a flower festival for every season in the year. Those heathen people, as we all call them, love beauty; and, as it seems to me, they, too, worship God when they so admire the glorious world that He has made. Remember, it is not the cultured people, not the rich people, not the great in that island empire that love these things, but the humble, the poor, the ignorant, if you will, the old. When shall our people be so permeated by the same spirit of true art that the whole land shall bloom, that we shall be even willing to sacrifice a little of our fruit, a little of our wealth for flowers? You see nothing short of complete reformation will satisfy us. The almost forgotten, but justly famous dictum of Matthew Arnold will serve us here:

"The only absolute good, the only absolute and eternal object prescribed to us by God's law, or the divine order of things, is the progress towards perfection,—our own progress toward it and the progress of humanity. Culture has one great passion, the passion for sweetness and light.

"It has one even greater!—the passion for making them PREVAIL. It is not satisfied till we all come to a perfect man; it knows that the sweetness and light of the few must be imperfect until the raw and unkindled masses of humanity are touched with sweetness and light. We must take all along with us in the progress to perfection, if we ourselves, really, as we profess, want to be perfect."

REPORT OF COMMITTEE ON FINAL RESOLUTIONS.

Resolved, By the Nebraska State Horticultural Society, that we tender to the park commissioners and to Mr. Balduff, the thanks of this society for the use of the park and pavilion in which to hold our meeting.

Also, to the Omaha Florists' Club for the generous treatment of the society while in the city.

Also, to the press and Commercial Club for the interest they have manifested in making this meeting a success.

Also, that we express our appreciation of the excellent music furnished by the Danie Glee Club.

And, finally, we express our thanks to the citizens of Omaha, who have so generously tendered the use of their automobiles for the trip about the city.

C. H. BARNARD,

A. J. BROWN,

W. G. SWAN,

Committee.

ANNUAL MEETING.

Proceedings of the Annual Meeting of the Nebraska State Horticultural Society, held in Room 110, Nebraska Hall, University of Nebraska, Lincoln, January 15, 16 and 17, 1907.

ANNUAL MEETING.

The President, Mr. J. H. Hadkinson, called the meeting to order at 2 o'clock.

INVOCATION BY REV. W. M. BALCH.

O Lord, of whom it is written that Thou didst place our first parents in the Garden of Eden, Thou who dost care for the Universe and all the inhabitants thereof which Thou hast created, Thou who hast clothed the hills and valleys with beauty and the soil with fertility that men may be fed, we come to Thee at this time with thanksgiving and praise for all Thy many mercies and blessings. We thank Thee that Thou hast given us the trees with their verdure and their blossoms that the eye of man may be pleased therewith. We thank Thee that all thy mercies are over all Thy works forever. We pray that Thou will be in the hearts of all men as Thou art in all the beauties and abundance of nature. We ask that Thou will be, especially, in the hearts of these men who are gathered here together at this time. We ask that Thou will bless them in their deliberations and guide them in their efforts to serve the common good so that they may work in connection with Thee and that all may be for the adorning of the earth and causing it to bring forth its fruit in due time for humanity's sake. Lord, we pray Thee that Thou will not look upon us with indifference, but will be gracious unto us and help us in all our efforts. We thank Thee that we have the privilege of cooperating with Thee to make this beautiful world more fair, abundant and beautiful. We ask that Thou will help all those who are assembled here at this time to have an eye single to Thy honor and glory so that we may be prosperous in all that we may have to do and in our service may we find true reward. Bless this association and let the richest result of labor be upon each member. These things we ask in the name of Thy Son who came to earth to redeem humanity. Amen.

The President: The next number on our program is an address of welcome by Dr. C. E. Bessey. I am informed by our secretary that Dr. F. E. Clements will read his paper for him. We will now have the pleasure of listening to Dr. Clements.

ADDRESS OF WELCOME.

BY DOCTOR BESSEY.

Gentlemen of the State Horticultural Society: While I am not able to be with you in person today, I wish to bid you a most hearty welcome to the rooms of the Botanical Department of the University. It is now twenty-one years since you first met with us, and in that time we of the

department have learned to have a much higher regard for your knowledge of the great art of growing fine fruits, while on the other hand I trust that you have learned that the science of botany contains much knowledge that has proved useful to you in your work. But more than this professional regard is the mutual friendship that has sprung up between us. We who are making scientific study of plants have learned to regard you who study plants for practical ends as our close personal friends. We look forward with pleasure each year to your coming, and welcome you to these rooms. We gladly turn them over to you, feeling that they will still be used for the promotion of a knowledge of plants, for after all, Horticulture is only one of the practical applications of botany, and so in a sense you are all botanists.

And in a certain sense, botanists are in turn becoming horticulturists. The time was, when a botanist was a man who wandered alone over the fields or through the woods, looking for new and unfamiliar wild plants, which he dried and then labeled, and put away in his herbarium. Today, while we still love this work of botanizing, we grow plants and watch them even more closely than you do. Go out into the University Plant House, and see the hundreds of seedlings that the young botanists are growing in order to learn something as to their manner of living, their relations to the richness and the moisture of the soil, to the humidity of the air, and the kind, amount, and intensity of the light. We have to know much of the gardener's art in order that we may compel plants to grow as we wish them. The essential difference is, that you grow plants for their use or beauty, while we grow them in order that we may become more intimately acquainted with them. You consider the finished product, be it fine fruit or beautiful flower, while we try to find out what is their structure, and how they came into being. Both of us are working in the great field of botany, but in different parts of it. You are working on one side, while we are at work on the other. Sometimes each party has ignored the other, and forgotten that after all both are in the same great field of human activity. In some places in this country, there is no sympathy between the two parties, to their great mutual loss. The horticulturists need the science which the botanists can bring, and the botanists need the practical ability and experience which the horticulturists possess.

Gentlemen of the Horticultural Society, I welcome you to the University, and I welcome you especially to these rooms of the Botanical Department. May your papers, discussions and deliberations result in great profit to yourselves, and in still greater profit to this good state of ours,—the state with rich soil and good water,—with pure air and clear skies,—which grows great crops of corn and wheat,—on whose prairies and hills there roam millions of fattening cattle and swine,—and whose orchards bend under the weight of their red- and golden-colored fruits.

Again I bid you a hearty welcome. [Applause.]

The President: Gentlemen, what is now your further pleasure?

A Member: It will be our pleasure to hear from our President.

The President: It does not seem as though there is a place for the President, but I think, perhaps, he could summon up courage enough to say a few words.

I am sure we have a very kindly feeling toward the University. While I was a student here, I spent many years on the campus and at the University here. This is one of the pleasantest spots on the continent for me. I like to come here, I feel at home here. I feel thankful to Dr. Bessey for his friendly address of welcome and I believe you will all have the same feeling.

There are a few things that I would like to speak of that have come to me from time to time. I will say, however, as your President I have not done what I think I ought to have done. I have not attended as many of the meetings as I ought to have. Nevertheless, there are things that I would like to mention as a food for thought, or food for topics, I don't care which, and if anything can be gotten from them which will be to the best interests of our society, I shall feel pleased. There have been some changes in our methods during the year and of what our secretary has done. Many of these things will be embodied in his report and of which will he give you a thorough knowledge. There are a few things that I noticed at our State Fair—I would like for our society to take some action, looking toward a room for the Synonym Committee to work in. Another is, Superintendent of the Hall, who shall be a helper of the Board of Directors, but independent of the Board. Another point, a matter of considerable importance to us as a society, and that is membership. I would like to have each of you consider yourself as a committee of one for that purpose. Probably the matter will be brought up in these meetings as to the best way of increasing our membership. I know that some of the people in the audience here have some thoughts and have made some notes along this line which I hope will be brought out. I wish this matter to be made one of the features of these meetings to discuss as to how we can get a larger membership throughout the state. Another item is and which really comes back upon yourself and makes me a party to it—we have a committee, a standing committee of the society and for years we have had no report from that committee. Dr. Bessey kindly called my attention to it three or four weeks ago and I should have asked our secretary to have notified the various members of this committee to have them make us a report. Nevertheless, I ask the same now. And then a little matter of beautifying our homes which will come up in a report tomorrow on ornamental gardening. The time has come when our farm homes should be beautified as well as our city homes. I think other matters of which I might speak will be embodied in our secretary's report.

Mr. A. J. Brown: Gentlemen, I would like to suggest that the

recommendations of our President be reduced to writing and that some of those things come before the society for action at this meeting; and unless we have them brought to our attention they are very liable to be overlooked. I, therefore, move you that our President put these ideas in writing. Now, all that are in favor of that, say Aye.

Carried.

The President: The next on our program is "Planting Fruit Trees," by Mr. A. J. Brown.

Mr. Brown: This matter of planting fruit trees is an old subject and has been discussed in the meetings of this society for the last thirty-seven years, so I don't think I shall have anything startling to give you along the line of new ideas. If I shall say something that will be of benefit to our society I shall be more than repaid for my effort.

PLANTING FRUIT TREES.

A. J. BROWN, GENEVA.

Among the pleasant recollections of my early boyhood are those of an old orchard that was a favorite resort of my brother and myself.

This orchard stood south of the house (an old pioneer's log cabin) on a southern slope. At the foot of this slope ran a noisy little brook, which to the west of the orchard spread out into a small pond, making fine wading (we called it swimming then) in summer and skating in winter.

As I look back after the lapse of nearly half a century I can see that orchard as plainly as though I had been there yesterday. I can see just where the best apples grew, the Golden Sweets, Maiden's Blush, Black Gilliflowers, Greenings and others are as plainly seen now as they were then, and when about fifteen years afterwards, I moved to Nebraska, this orchard was my ideal and inspiration in the planting of my first orchard in the state.

For thirty-five years I have been preaching the gospel of tree planting and I have endeavored faithfully to practice what I have preached. When asked to say something on this subject it seemed to me that the whole ground had been so thoroughly covered in the recent past that there was nothing more to be said; but our Secretary said, "Tell them how to plant a tree."

Thirteen years ago I read a paper before this society (see page 95, Report of 1894) on the subject of "Orchard Planting and Management," from which I have quoted part of the following suggestions, and if you should find some things that seem to conflict with the earlier statements, kindly remember that we have had thirteen added years of experience and observation.

I wish to emphasize the thought that it does not pay to do anything, no matter what it is, unless you do it right; and unless you are willing to take the time and trouble to do it right it is better to leave it undone.

This applies with double emphasis to planting and caring for trees. I think I am safely within reason in saying that more than twice as many trees are lost through neglect as from all other causes combined. I think all will agree with me as to the desirability of a generous supply of fresh fruit in the home.

It is the mission of this society to educate the people of Nebraska to the fact that the home garden and orchard can, by a small outlay of time and money, be made to furnish our tables with a constant supply of fresh fruit; beginning with strawberries in June and ending with the last of the winter apples in April or May. We are now holding our thirty-eighth annual meeting and in the thirty-seven years of earnest work just past, we have proven some things beyond a question; among them the fact that nearly all varieties of sour cherries do well in all parts of the state, in fact we can say without hesitancy that they succeed better on the great plains west of the Missouri river than in any other part of the country.

Apples, crab apples and plums are successfully grown in all parts of the state. It is now only a question of what variety to plant in your particular locality. Peaches bear abundantly in nearly every corner of the south Platte country, and in many localities north of the river. While we never can expect to compete with many sections of the country in a commercial way, yet there is no reason why every one who has a small piece of ground should not raise enough peaches of splendid quality, for home use. It is true, we are limited somewhat in variety, but by a proper selection we may have good ripe peaches constantly from the twentieth of July until the first of October.

Some varieties of pears succeed well over a large part of the state and there is an increasing number of them shown each year at our Autumn fruit shows, and more attention should be paid to this fruit. I have known Flemish Beauty, in Fillmore county, to give ten consecutive crops, and some years as many as six bushels from a single tree. Blight is the only serious difficulty in the cultivation of pears and this can be overcome in a large measure by proper care.

The whole matter of growing standard fruit in Nebraska is a question of variety, and the great work before this society for the immediate future is to place itself in position to give more definite information on this subject. Our recommended list (see page 165, Report of 1906) which was adopted at the summer meeting of 1905, is a safe guide to any one planting. This list is also published in pamphlet form and can be obtained from the secretary free.

In planting for home use a much longer list of varieties is desirable than for commercial planting, and I wish to be understood as speaking from the home orchard standpoint all the while. I am a firm believer in the adage, "Variety is the spice of life," and I believe it to be desirable in almost every way to have a larger list of varieties than is commonly advised, always avoiding too many summer and fall apples. I would

plant some varieties of apples for quality's sake, no matter if they were not the best of bearers, and would not omit those whose chief recommendation is size and color. Study the list recommended by this society for your district, and plant in addition, any other sorts of high quality that are succeeding with your neighbors. Be sure and plant varieties that ripen consecutively, leaving no gaps unfilled. In planting set a little deeper than the trees stood in the nursery, pressing the earth firmly about the roots and, unless the earth is very wet, put a bucket full of water to each tree to settle the earth still more firmly about the roots and to fill all vacuums. Cut back the branches to one-third of the previous year's growth, and follow planting with clean, constant and thorough cultivation.

Nearly all varieties of apple trees should be planted thirty-five feet apart, cherries, pears and plums sixteen to twenty feet and peaches twenty to twenty-five feet apart each way. I believe that thorough cultivation is better than mulching and would plant a wind-break on the north, west and south sides to prevent high winds from blowing off the fruit. Keep the ground clean by frequent stirring, always doing everything in the most thorough manner, and your reward will be an abundance of the very best fruits.

DISCUSSION.

Question: I would like to inquire as to the best way to take care of pear trees?

Answer: Don't give them very much care. Let them grow.

Mr. Beltzer: I want to say a word in regard to water. When I came down here I expected I would have to explain some. I believe in water. I believe in watering trees. I had a little bit of experience during 1893 or '94, whenever it was that we had that dry season. I planted some cherry trees and I gave them all the care that I knew of and I tell you I lost them. I could not imagine the trouble with my trees and so I dug them up. I cultivated them well and when I dug up the trees, I found at about five inches down that the ground was just as hard as a brick. You should use a lot of water and a good lot of mulcher.

Question: How deep a hole would you dig?

Mr. Brown: I would have been glad if I could have got along without saying a word about planting trees, because I think that every member of this association knows how to plant trees. I would plow just as deep as I could, I wouldn't care if I plowed down fourteen inches; I would do it by sub-soiling and then I would dig a hole large enough to put the tree into. I would dig just as large a hole as necessary to accommodate the tree and plant it in that way. That is the proper way to prepare the ground. I might dig a little deeper, but I don't think it is necessary in Nebraska soil. If the ground is not loose beneath the tree you have not plowed the ground right. That is the reason I didn't say anything about it in my paper. During the thirty-five years I have been in Nebraska I have not missed a year when I have not planted trees and I have always

used an abundance of water unless the ground was very wet. I don't believe in wetting the ground and then tramping it, but leave the ground wet without tramping.

Mr. Yager: I have had some experience with stock such as Mr. Beltzer mentions and if it is the same kind of stock that he spoke about, he did his part of it which was to the effect that he dug these cherry trees up every week or so to see why they were not growing. I think that had a great deal to do with not getting the trees to grow. Mr. Brown has not recommended anything of that kind. I don't believe that is right. Another thing Mr. Brown touches on which is of vital importance. It is true that the whole matter of planting trees and getting them to grow successfully has been threshed over a good many times in these meetings and anyone actively engaged in horticulture knows or ought to know by this time how to plant trees. It is a fact that a great many of those who plant trees are not familiar with the best methods of planting and do not get the success they ought to. I do believe there is great need of enlightenment along that line. Many people wish to do the best by their trees possible but they fail for various reasons. I think the point that Mr. Brown made is a good one.

In relation to cutting trees back. This has all been talked over ever since we were members of this society; but I think it is one of the most essential things of all. The limbs must be cut back. Brown recommends two-thirds of last year's growth to be cut back. There is no definite rule by which you may go, but a large portion of last year's growth should be cut back to get good results. It is very essential. It is just as essential as the water and the digging of the hole deep and all those things. You can take two trees, two or three years old right from the nursery with good branches that have grown last year, good thrifty trees, both of them similar in all respects and plant them in the same soil; cut the branches of one of them back two-thirds of last year's growth and the other one plant without cutting the branches back, and the result will be so much better and in favor of the one having its branches cut back, so that a person with this experience or knowledge will afterwards always follow that rule. He is sure to secure better results and a better shaped tree.

Mr. Emerson: I would like to ask how much you should cut back a cherry tree, and how much you should cut back a peach tree.

Answer. A peach tree ought to be cut back more than a cherry tree. You cannot cut back a peach tree too much. I remember several years ago of a number of peach trees being planted on Watson's ranch near Kearney, Buffalo county. They were instructed to cut back to the trunk. The peach trees had great limbs on them, some of them four feet long and they had wonderful success with those trees. You can hardly cut a peach tree back too much, but a cherry tree should not be cut back more than two-thirds of last year's growth.

Mr. Brown: I believe if I were planting a peach orchard I would get rather small trees and cut back within a foot and a half of the ground.

The President: You gentlemen remind me of a little experience I had once in a meeting of this kind. You can imagine the way I felt when Dr. Bessey said to me at one time here in a room at the other end of this building I thought I had said something pretty big, I knew something about gardening and had said something good. After I had sat down beside him after a little while he said, "Young man, do you realize how many people will know what you have been talking about when it goes out in the report?" I have often thought of that remark when we are having these discussions as to how it will appear in the report. Now, it is not only the benefit that we get out of these discussions here, but it is the benefit the people at large will receive and get out of it as it appears in the report. Therefore, speak louder, speak plain so that everything may be well understood. (To which the reporter says "Amen.")

Mr. Brown (continuing): To get rid of evaporation that goes on so rapidly, a peach tree is a little more tender and after transplanting commences dying down. Take a peach tree, say, four or five feet in height, leaving all the limbs on, it is more inclined to commence dying from the top, but if you cut it off within a few feet of the ground it will commence budding out soon.

Mr. Marshall: In northern Nebraska and perhaps as far south as Lincoln, the peach tree should be limbed out very near the ground. The top being composed of many rather small limbs with no central body at all. The reason for this is that when the tree has been frozen down by a severe winter which occurs occasionally, the new growth will start much more readily from the stubs of these many small limbs than from the trunk.

We have practiced this for some time and have been much more successful with the low limbed tree handled in this way, than with the high headed one.

Mr. Brown: We have them cut close to the ground in order to carry them through the winter. The root does not kill but the body does kill.

Mr. Heath: I would like to ask if when they are through bearing, we can make them live longer and bear by trimming.

Mr. Marshall: Those trees that we keep the tops cut down to a certain height do better than those that the tops are allowed to grow on. It is very important to have the limbs low down if you wish to renew the top occasionally by cutting back.

Mr. Christy: I think I can improve by cutting off or cutting back more on peach trees than on other trees. They will branch out in a few years and be much improved. The peach tree will stand all the trimming that you want to give it and on this account the peaches are better.

There is one thing that I wish to say about watering the trees—to fill the hole full of water and then throw the dirt in around the tree. In

such case the tree is not solid enough. They will not remain standing straight, especially the Winesap.

Mr. Brown: I said to pack the ground and then put the water on.

A Member: I would like to hear a word from Mr. Russell on this subject.

Mr. Russell: It may be I don't know any more about it than the rest of you do. There seems to be as many opinions as there are people in the room. Our experience is that when you plant a peach tree, if you take a tree say five or six feet high, cut it down within three feet of the ground, it seems to do better. I like that way better than to cut it back to the ground; but I would rather cut it to within a foot of the ground than to leave the whole top there because there is the probability of the tree shrinking and shriveling if the whole top is left on. By cutting back, you have the top in proportion to roots. I like the low headed spreading tree better than the high upright ones; for when your trees are heavy laden with fruit, the taller ones are more liable to break down than the low ones. Whereas if you have a low headed tree with four or five branches, you can lose one branch and still have a pretty good tree left. You can renew your trees wonderfully by cutting them back. A few years ago we had an orchard that was planted rather close. We cut one row out clear across the forty acres. Afterwards that row gave us more peaches than any other row in the orchard. It is true the first year the trees will not do so well, but the second year they are much better. So I favor cutting back a tree pretty well.

Mr. Williams: There is one point that I would like to have discussed and that is as to the kind of cultivation—whether we shall advise farmers in their orchards to cultivate instead of seeding. The average farmer of today according to my observation does not cultivate. He does not take the time to cultivate them but allows the ground to go to grass and weeds and pastures it.

Mr. Brown: If I were not cultivating the ground I would make a hog pasture of it.

The President: It seems to me that we ought to have a little more discussion on this pruning business. It may be that I have got a wrong impression, but if it goes out to the public that we are to cut our trees, in the case of a farmer who has a few trees, apple trees, for instance, six inches in diameter, he gets an axe and goes and slashes into those trees and the results will be bad and my experience is that the result will be worse than the good that is done. I used to advocate, before I got more experience, that the pruning knife was the largest and best instrument for that purpose and ought to be used in shaping a tree. I recall to mind where I had to do some landscape work and there were some maple trees that had to be removed. Those maple trees subjected to—well I don't know what you may call it—an operation by a wood butcher. Everything, limbs and all, were cut off square on the top. In

fact, everyone was cut off square. I am referring to limbs about four or five inches in diameter. If we had to do this I think the better way would be, as an old German once told me, to cut them just like you would cut a bologna, cut it so the moisture would flow away from it instead of staying on top.

I don't wish to say so much myself and I would like to have the audience discuss the subject more. But I dislike to have a discussion or talk of this kind on pruning to go out before the public because I am afraid it will give an erroneous idea. We will all understand it, but the general public will misunderstand it and get a wrong idea unless we are more guarded in what we say. I am afraid Brother Heath has got an orchard that has been savagely cut. I don't know what shape it is in, but I think he has been doing some heavy pruning from what he told me, whether he did it judiciously or not I could not say. Severe pruning of trees in this climate from my experience is somewhat of a detriment, if I am wrong I wish to be corrected.

Mr. Beltzer: Mr. President, up in our county I know of one orchard which is probably twenty-five years old. The owner asked me about pruning. He said he wanted to go to work in his orchard and asked me for some advice. His orchard had been neglected and looked bad. He had it in fairly good condition in earlier days. I told him the general impression of the horticultural society was that heavy pruning would be good for it. He did not pay much attention to what I said, but he did prune heavy and cut off limbs and I think there are now more dead trees in his orchard than in any other orchard I have seen. Some years ago I did some heavy pruning. I thought a bushy tree did not look nice and I went into it with a saw and pruning knife. Every time I say anything about it, it throws a bomb in the audience which explodes. These trees were never removed. The trees are the finest ever grown anywhere; and the nurseryman don't like that.

Mr. Swan: I always carry a pruning knife in my pocket and if it is sharp I will use it any time I see any occasion that I think demands its use.

The President: The next number on our program is a paper entitled, "Planting Small Fruit," by G. S. Christy.

PLANTING SMALL FRUIT.

G. S. CHRISTY, JOHNSON.

The Raspberry.—While the planting of raspberries may be successfully performed in the fall, if care is taken to protect each plant with a forkful of coarse manure, yet spring is the time for general planting and the time when it may be done at the least expense. Fall planting has this advantage that if you fail to get a stand you can replant in the spring and not lose a year as if spring planting alone is depended upon. Raspberries should be planted as early as possible after the frost is out

of the ground and the soil will work well. Never plant any small fruit plants in the mud, as your soil will bake and there is no chance for the crowns to break through the crust and you are pretty sure to lose your plants and your work also.

Just here I want to speak of watering plants or trees when planting, as I have often seen a pint or a bucketfull poured in with each plant. For trees, shrubs or plants to grow it is necessary that the roots be pressing firmly against the soil, in fact they may be said to squeeze the moisture necessary for growth from the soil by pressure. If a large amount of water is poured in with the plant it prevents pressing the soil firm and as the dryer soil surrounding quickly absorbs the water and the soil is soon nearly as dry as the ground adjacent and in drying rapidly the soil cracks away from the roots and leaves an air space between the soil and a large part of the surface of your feeders and trouble will result. A better plan is to dip the roots of the plant in water just before planting, this causes the soil to adhere to the plant but does not prevent the proper packing of the soil around the roots.

Good strong raspberry plants may be set very rapidly with a tiling spade, sink the spade six or eight inches into the ground, throw the handle forward and drop the plant in back of the spade so that the crown is about an inch below the surface, remove the spade and firm the soil with the foot, but to make sure of a perfect stand, although the work is much slower make a small hole for each plant, place the soil around the roots by hand, be sure to press the soil well over the roots but leave it loose above the crown which should not be more than an inch below the surface, remember, more raspberry plants are lost from deep planting than any other cause.

Plants can also be set very rapidly by first making a shallow furrow where the row is to be with a small plow. The plants can then be placed and covered very rapidly by hand. The black cap raspberries should be planted in rows seven or eight feet apart and two to four feet in the row, Cardinals, Haymaker and a few other of the heavy caned sorts should be eight or ten feet apart and four or five feet in the row.

In *Blackberries*, plants from root cuttings are the best to plant and may be planted the same as raspberries in rows eight feet apart and be sure you keep them in rows, if the plants are set several feet apart they will soon fill in the entire row, but it is advisable to put them not more than two feet as you will get a full crop of berries sooner with plants set this way. You may reasonably expect a good crop the second year and a full crop the third year. The cheapest plan to get a blackberry patch is to plant the root cuttings where you want the berry patch. Root cuttings three or four inches long are about as sure to grow as plants are, and are much easier planted. They will make a crop the second year and plants seldom do much better. To plant have your ground in good condition, fall plowing preferred, make an old fashioned corn marker,

except that your rows should be eight feet apart. Mark out the rows and drop the root cuttings about a foot apart, cover with a cultivator, when the weeds start, use the harrow and by the time the weeds start the second time you should be able to follow the rows and can use a small shoveled cultivator to clean out the weeds. I have also secured a good stand by making a shallow furrow with a plow and planting the cuttings, being careful not to cover more than three or four inches deep.

I have tested nearly all the leading varieties of blackberries, but the Snyder seems to be the only one to tie to. Mercereau and Blowers beat it in 1906, but nearly all varieties did well last year, consequently a longer test will be necessary before we discard Snyder.

Currants and *Gooseberries* may be propagated from cuttings and are very easily transplanted, but they should be on the shady side of a stone wall or picket fence, or in the shade of a cherry tree. The fence being the better places as it gives shade, without robbing the plants of necessary moisture. Our hot sunshine is not to the liking of the gooseberry.

Strawberries.—While some success has been attained in planting with a machine that plants five or six acres, as there are very few berry growers whose plantings are extensive enough to pay to invest \$50 to \$75 in a machine, so we will confine our remarks to hand planting. Rows should be four feet apart and the plants from ten inches to two feet apart in the row, depending on the ability of the variety to make plants.

Summer and fall are sometimes recommended as the time to set strawberry plants, but with our climatic conditions fall setting will fail three times in five. I depend entirely on early spring. It is often recommended to wait until the blossom buds have started in the spring, then when you transplant there will be no trouble picking off the blossom buds to prevent bearing the first year. Owing to the late spring and rush of work I followed this plan in 1906; at present I estimate my loss at \$1,000. Next spring our planting will begin as early in April as the weather will permit.

When the weather is favorable strawberries may be planted with a spade, as recommended for raspberries, if you have a small boy to drop the plants behind the spade. The plan I have found most satisfactory is to have the ground plowed in the fall or very early spring, have it free from trash and do not be afraid of doing too much work on the ground before planting; be sure you have harrowed, floated, and disked until you have thoroughly established capillary attraction with the soil beneath. Mark out your rows, then have a boy make the holes with a small spade, one about three and one-half inches wide preferred. One boy will make holes for two planters; have your plants in a bucket with just enough water to cover the roots; spread the roots and put the plants in the ground deep enough that the crown of the plant will be even with the surface; press the soil solidly about the roots, and be careful that there are no "rat holes" beneath the plants, and you are

pretty sure of a stand. One person can do a very good job alone with a common dibble, but it is slower and I do not like the work as well.

Mr. Swan: If any man should come into my field and offer to plant raspberries with a spade, I would send him home. You can't plant raspberries in that way. They have such fine roots. I used to plant strawberries with a spade, but some of the roots would stick out on top of the ground. I never could get anything to grow in that way. As we all know, the best way is to get down on your hands and knees, and do it. I would plant strawberries four feet apart. I have for the last few years been setting out a number of young apple trees and I have planted strawberries right along in the rows and they did fine. This fall I planted the Senator Dunlap and planted them a foot apart in the row and about five feet in width. Next year I will get more berries than before. As long as I plant young apple trees I shall plant strawberries there.

Mr. Harrison: I believe that about ninety-nine raspberries out of a hundred that are planted die. My idea is that they are planted too deep generally. I am glad that Mr. Christy touched on that subject.

Mr. Christy: Mr. Swan's trouble in planting is not in putting in the plants right. Of course it is better to get down on your hands and knees. I have had success in that way, of course. One row would be all right, while the next row would not be of any account. I have an idea that Mr. Swan's plan is all right.

Mr. Williams: I agree with Mr. Harrison, of York, that a large per cent, I don't want to say hardly ninety-nine out of one hundred, are lost by transplanting, but a large number. I don't think the trouble is with deep planting. I like deep planting, but I would plant four inches deeper than the tip. The trouble is with the average man, even with some commercial planters, say nothing about the farmer, who generally fails to plant them with reference to that matter. The old wood or part left on is a mere handle, as I call it. They don't recognize the principles of planting. You know or should know how the raspberry plant is formed, with the bud proper from the nodule, right at the crown or the junction of the old stem and the root, and that is the life of the raspberry plant. The average planter, I think, takes that stem as a nodule and sticks in the ground, plants it six inches below the top of the ground and allows the nodule to come from those stems. I always cut away the new growth and let the plant start in the spring from the old stem which appears from the tip. The bud is right at the junction, close to the stem. I plant four inches deep. I dig a sort of a basin so as to allow the new bud to get a start and then it comes up all right. According to my experience, there is no better time to plant than when the new tip has formed and a new growth of three or four inches. If I go to a bed and take up a plant of three or four, six or eight inches growth, I can protect that young sprout and can see it and can handle

it better by having a little dirt on it and can get a good stand with it by leaving enough dirt around the roots to protect it. On the other hand, by setting out a plant that has been shipped in, boxed and packed up for a long while it has become heated and you are likely to lose them. Last spring I bought a thousand plants and it took them a long while to get a new growth. I have had a long experience in handling them and I think there is where we fail in not allowing the old nodule, the old part of this tip to remain. They grow from that.

Mr. Yager: Replying to what Mr. Williams has said, I would hate to have the idea go out from this meeting that the raspberry tip ought to be planted four inches deep. I am very positive that is too deep, and I am positive that with such raspberry plants as are usually secured from nurseries that a person would encounter failure in planting them that deep. I don't think that the crown ought to be more than two and a half inches below the top of the ground. He is right about the new growth. We have heard a good deal of talk about handling evergreens so to protect them from dying out, and I think that principle applies to the raspberry plant. I think one of the things that has been the cause of so much trouble is the fact that they have been subject to the action of the wind and the heat, and they have been improperly handled between the time they have been dug and the time the customer usually secures them. There is not much difficulty in making good, healthy raspberry plants grow if conditions are all right and the plant has been transported from the ground where it was dug to the new place where it is to be replanted. The difficulty or trouble comes largely to improper care between the time it is dug and shipped and the time the customer gets it and before it is put in the place where it is supposed to remain.

I notice Mr. Murphy, from Iowa, in the audience and I would ask, Mr. President, that he be requested to help us out along this line.

Mr. Murphy: I don't know as I can help you out any along this line. I came over here to learn something. But my experience in handling raspberry plants is that if you cover the crown very deep you don't get any rapid growth. Conditions vary according to circumstances, but it is sure if there comes a rain or something like that or if the ground becomes packed over the plant, I am satisfied that it is gone. It is quite important to get the ground in proper condition before you plant and digging the hole large enough and spreading the roots out in proper shape so as to put the plant in properly. There is no question but that is the best way in the long run and then you will have all kinds, sizes and ages of plants before you get a good stand. The strawberry is the same way.

Mr. Williams: I am advocating a four-inch deep planting. I do this for the sake of getting the plant well established so that it will not wave about when the wind blows. My trouble usually has been that the wind waves them all about in the ground and you cannot overcome or avoid this by shallow planting. Give the plant a chance to get out

of the ground before covering it up, so that when it is filled up finally it will be about four inches deep.

Mr. Beltzer: The raspberry plant is a good deal like the story told of a mother who had two sons and the way they treated their mother. One boy lived in California and the other lived in the north. She wrote a letter to one and said something about coming to see him. The one in California said, "Dear mother, we would like to have you with us, but it is too warm out here;" and the other one in the north wrote, "Dear mother, we would like to have you with us, but it is too cold here."

There is something peculiar about the raspberry plant. If you plant it shallow in dry weather it will just dry out. If you plant it too deep, and especially in wet weather, it will die out. I remember what a time I had, and I have just one recommendation to make and I think if you follow that you will succeed. I don't dig the plant until the tip has sprouted and growing and has got a body or stem from one to two inches long, then I take them, box them for shipping, and I will venture the statement you will not lose one out of a hundred. It may be that everybody is not situated so they can do that, but you had better do the same as they do with strawberry plants, about setting them out in the fall. They don't ship strawberries now, very much, until spring and that is the only way to do with the raspberry plant. Don't let them ship them to you early.

Mr. Marshall: If these remarks are not enough to set the average man crazy, I am a fool [Laughter]. It makes me think of the man who had a sycamore tree and he wanted to trim it. He got out where the tree was, ready to go to work to trim it, and he asked everybody who came along how to trim that tree, and he would note it down. After he had got all this information he trimmed his tree, and when he had trimmed it he had a pole sixteen feet high. This is the way you are doing in regard to the raspberry plant. One says plant it shallow, the other says plant it deep, another says plant early, another late. The only thing I can do is to speak from my experience. I have planted many thousand plants and the only general rule I can give is to use common sense. If it is a wet season, plant shallow; if it is a dry season, plant deep. There is one thing true that when you plant deep if you leave a basin about it in Nebraska you are running a great risk or danger, because if a hard rain should come on you can say, "Good-bye raspberry plant." It will never come up. Another trouble in planting deep is that the plant gets up and has three or four leaves, it is in danger of the cutworm, and then it will never come up. On an average we should throw a little dirt over them and plant early. We have planted early, have planted medium and planted late, but the success was when we had the plants at home and planted early. If we had got them at home, we waited until they came up. I have seen a team stuck in the field in pulling out plants on account of so much dirt being moved with them. If you have got to ship them, you don't want to ship them with the dirt on.

The President: In getting down to solid facts, I think we ought to be extremely careful when we are speaking to remember that these discussions are to be printed and to ask ourselves, "How will these look in print to the people who read them?" We ought to bear this thought forcibly in mind. Everybody has an idea and anyone who speaks should consider how his remarks will appear. Our secretary will certainly have to trim a good deal of this.

Mr. Marshall: What would a man think who was reading these printed reports and notice that every man who came down here had the same idea, and no difference of opinion whatever?

Mr. Christy: The first raspberry plants I ever planted I secured from a very reliable nurseryman. He told me to be careful not to plant them too deep. He says just lay them down and put a little dirt over them and you get them to grow better in that way than any other. Of course, that would be too shallow planting.

Mr. Camp: I want to bring up a question here. A member said that a certain way was a farmer's way of dividing up plants. I would like to have a nurseryman tell me why my plan of taking up that crown bush and of dividing it up into pieces so as to make more and have some dirt on it, is not the best way? I want to remove that plant; I have use for the crown, but I don't want to lose the plant. Now, I would like for a nurseryman to answer it. The stenographer's record here, if he keeps it correct, will show that I have asked that question.

Question. How old is your plant?

Answer. Twenty-six years old. It is all one big crown.

A Member: You can do it that way but it would not be practical. In the second place, it is not necessary to mutilate your old bush in order to get a new one. The way to get a new crown bush and which is easier is to take cuttings and put them in the ground and they will grow just like weeds and it is easily done. Anybody who will practice this will have a good stand in a short time.

Mr. President: If you try both methods and determine for yourself, I think that would be the best way, and that would add so much to your experience.

Mr. Bomberger: If I may speak, I wish to say there is one point mentioned here that was not brought out satisfactorily. That is, the raspberry should be planted early. I would prefer to put them out by hand. Do the digging as late in the fall as possible, but they should be set in time to get a good growth before winter. For spring planting, heel them in the shallow on the south side in some place easy to get at quite early in the spring, in layers of dirt not too deep. Cover with mulch of some kind. Have your ground in just as good a condition as possible and plant as early in March as possible. I find by this process there is no trouble in having the finest stand of raspberries. My idea of the raspberry is that it is a cold climate plant. It will propagate itself during the fall weather. I think the best success I ever had

was when I planted as late as possible from early plantation, but plant early in the spring in well prepared ground. Of course, the raspberry plant is a hard plant to handle. My experience is unsatisfactory in shipping. I think the plant needs to be handled in cool weather.

Mr. Russell: Mr. Bomberger is here from the Iowa Horticultural Society. He is secretary of the Southwestern Iowa Horticultural Society. Also Mr. Murphy from Glenwood, Iowa. They both being duly appointed delegates from the Iowa State Horticultural Society, with their credentials, and I move you, Mr. President, that these gentlemen be made annual honorary members of our society.

Seconded. Carried.

RANDOLPH, IOWA, January 4, 1907.

L. M. Russell, Secretary Nebraska State Horticultural Society, Lincoln, Neb.

DEAR SIR: This is to certify that W. M. Bomberger is duly appointed delegate of the Southwestern Iowa Horticultural Society to the annual meeting of the Nebraska State Horticultural Society at Lincoln, Neb., January 15, 16, and 17, 1907.

F. P. SPENCER, *President S. W. Iowa Hort. Society.*

DES MOINES, IA., January 4, 1907.

L. M. Russell, Secretary State Horticultural Society, Lincoln, Neb.

DEAR SIR: This is to certify that J. W. Murphy, of Glenwood, Ia., is the duly appointed delegate from the Iowa State Horticultural Society to attend the winter meeting of the Nebraska State Horticultural Society to be held in Lincoln, January 15, 16, and 17, 1907.

Yours respectfully,

WESLEY GREENE, *Secretary.*

The President: We have given considerable time to the discussion of small fruit. We have a valuable paper on "Planting Evergreens" which I hope will also be fairly discussed. I believe we ought to take this subject up now. The paper is by Charles A. Scott, who is in charge of the station at Halsey.

PLANTING EVERGREENS.

C. A. SCOTT, HALSEY.

Mr. President and Members of the Nebraska Horticultural Society: I feel a good deal like Mr. Brown did when he arose to speak about apple trees. It seems to me that I am threshing over an old subject, but if I shall be able to bring out any point that shall be for the good of this society, I shall be fully repaid for my efforts.

I am not familiar with all the ornamental evergreens that are suitable for planting in this state and I will mention only a few of our hardy forest trees that are entirely suitable for ornamental planting. First of all, from the standpoint of beauty and hardiness combined, we have

the Colorado Blue Spruce. It is one of the very hardiest of evergreens. I have seen it growing successfully from the peaks of the Rockies to the Atlantic coast. Of all our category of trees there is not one that outstrips it in delicacy of foliage.

The next tree in hardiness is the White Spruce, from the Black Hills. It lacks in beauty of foliage when compared with the Colorado Blue, but makes up for that deficiency in rate of growth, being quite a rapid grower. The Austrian and Scotch Pine are very hardy trees that will prove successful in all parts of the state.

For the eastern part of the state there are many evergreens that will grow successfully and in addition to the above species may be added the Norway Spruce, which is well known to all of you. It grows successfully as far west as Grand Island. The White Fir (*Abies Concolor*) is a beautiful tree and remarkably hardy. In the same region the Red Fir (*Pseudotsuga taxifolia*) will, I am sure, be found to be a successful tree. It is neat, clean-cut and always has the appearance of being very much alive. One or two such trees always have an enhancing value on a lawn. Throughout Central Kansas I have seen some very fine specimens of this species, that range from 15 to 25 feet in height. In this state, at Ravenna, some very nice trees of this species can be seen.

The White Pine is hardy in the eastern part of the state, but I would not advise planting it west of York. There are a number of Dwarf Mountain Pines, generally known as horticultural varieties, that are entirely hardy, but these are strangers to me and I cannot give their names or advise using them for planting except in the eastern portion of the state.

The Chinese Arborvitae is a hardy tree and it makes a good variation on the lawn.

While ornamental planting is of great importance to the people of our state, I feel that it is not of as much importance as the planting of windbreaks and shelterbelts.

WINDBREAKS AND SHELTERBELTS.

These two terms are used interchangeably and mean one and the same thing. By either term we mean a belt of trees around the farm buildings or around the farm to afford protection against wind storms. The farmers of Nebraska have in many cases planted a single row of Cottonwood trees along the boundary lines for this purpose. It is a good start in the right direction. The Cottonwoods have now grown up, the crowns of the trees in many instances being thirty and forty feet in the air, with nothing beneath them but the supporting trunks to check the velocity of the surface winds. To make the rows of Cottonwood trees effective windbreaks they should be supplemented with a few rows of evergreen trees. The pine and spruce retain their leaves the year round and are therefore more valuable for windbreak purposes than the broad-leaved trees. Four rows of evergreen trees planted along the south, west and

north sides of a farm will make a very effective windbreak, but more, rather than fewer, rows of trees should be planted. For windbreak planting it is very desirable to plant trees that make a fairly rapid growth, and for the western part of the state I would advise the planting of Scotch and Austrian pines. In the eastern part the Norway Spruce should take first place, Scotch and Austrian pines taking second and third places.

For this planting, smaller stock should be used than would be advised for ornamental planting. Three-year-old stock is a very convenient size for such planting and it is much cheaper than older and larger stock.

The ground in which the trees are to be planted should be prepared by plowing thoroughly the fall before they are to be set. In the spring it should be smoothed and a furrow thrown out with a plow or lister. The furrows in which the trees are to be set should be six feet apart and the trees should be set six feet apart in the row. The trees should be set in the furrow and the soil may be filled about them with a spade or, in case of extensive planting, a cultivator may be used. Mr. Christy's method of planting strawberries and raspberries will succeed in a measure, but if it is worth while to plant a windbreak it is worth while to do it right, even if it requires getting down on one's hands and knees.

The ground planted to trees should be cultivated as long as the trees will allow a team and cultivator to pass between the rows. Any cultivation that will keep the weeds down and keep the soil in a good, friable condition will answer all purposes.

COMMERCIAL PLANTING.

Commercial planting of evergreens cannot be advised in Nebraska except in rare instances. In the eastern part of the state on low, moist ground, waste places along streams, the European Larch should yield a good financial profit. This may be springing a new proposition on some of you, but I am suggesting this species after due consideration. The larch makes a good pole and post. It is very durable in contact with the soil, and when planted closely, say 4x4 feet, it grows straight as an arrow and prunes itself. Along the small streams there are numerous corners and nooks that grow up to Boxelder, Dogwood and the like, almost worthless stuff, that if planted to larch would in time yield posts and poles that would return money for the time and labor spent.

Mr. Barnard, of Table Rock, set out a few rows of European larch, not over thirty years ago, and he is now selling telephone poles from those very trees. A satisfactory telephone pole costs at least \$1 each. I bought some recently and they cost me that. Considering that it requires 2,700 trees per acre when the trees are set 4x4 feet, the number of poles grown on an acre should be at least 25 per cent of the number of trees planted, which means 675 poles worth \$1 each, and a large number of posts in addition.

In the western part of the state there is an opportunity for extensive

planting in the sand hill district. In this case the pine is the tree that promises the best returns. The Scotch, Jack and Western Yellow Pine all promise to grow successfully. The returns will be posts, poles and timbers.

The one objection to commercial planting is the long term of years before a return can be expected. Another feature that argues strongly in favor of tree planting is the fact that satisfactory farm labor is becoming very scarce. A plantation when once started requires very little attention until the crop is ready to harvest.

TIME TO PLANT EVERGREENS.

Evergreens of all kinds should be planted early in the spring, as early or earlier than fruit trees or broad leaved forest trees. Under no circumstances should an evergreen be allowed to await transplanting or setting until the season's new growth has begun. When setting small stock a hole should be opened up with a spade or plow sufficient to let the roots be spread out laterally.

Trees three feet or more in height that are set out for ornamental purposes should be set when the ground is frozen. In this case the tree must be trenched before the ground freezes, then when the ball of earth about the roots is frozen the whole lump is moved on a sled or other convenient vehicle to where the tree is to be set. The hole to receive the tree must be prepared beforehand; the frozen ball of earth about the roots is set in the hole and as much earth as possible is filled in about it. When the ground thaws out it is necessary to again fill in and pack the soil about the ball of earth.

DISCUSSION.

Question: What do you think of the American Larch?

Answer: It does not compare with the European. I don't think it is worth while to give estimate of returns because we have not had any estimate of it and what their growth would be.

Question: Do you know of any evergreen becoming scarce on the market?

Answer: No, I think not. I see no reason why because it readily grows. It is true that the European Larch is one of the species that is worthy of our attention.

Mr. Emerson: I would like to recommend for eastern Nebraska, Norway Spruce; for the western part I would recommend Scotch Pine, along the sand-hills, I would say.

Mr. Marshall: How far west would you recommend Norway Spruce?

Answer: The farthest west specimen I have ever seen was at Grand Island. It made splendid growth there. It is on low land, river bottoms and valleys, along Wood river. Mr. Corbin is a member of this society, I think. He has it on his bottom land. He has Norway Spruce fully 13 feet in height and making splendid growth.

Mr. Marshall: The reason I asked was I thought possibly you might have misled us a little in recommending Norway Spruce in locating its territory.

The Speaker: I would not go west of Kearney or Ravenna in Buffalo county.

Norway Spruce is doing splendidly in Minnesota as a windbreak and is doing nicely over in northern Illinois. The situation is different in different sections of the country. You must understand the conditions and distinguish between low and high ground. Of course, the better the soil the better the growth.

Mr. Merwin: My observation is that you should keep the Norway Spruce and the Norway Pine near together.

Speaker: I think, perhaps, that might be true.

Mr. Brown: If I were drawing a line for Norway Spruce, I would put it east of Lincoln, that is with reference to high and low ground.

A number of years ago we had a horticultural meeting at O'Neill and there was an old gentleman there from Hastings. He recommended European Larch. I said, "The European Larch is worthless with us." He replied, "Have you any specimens in your county?" I said, "Just one." He said, "If you have one why can't you grow a thousand?" But you cannot answer that in that way. The fact is that the European Larch is worthless when you get on the plains.

The Speaker: Gentlemen, I recommend keeping it along the low ground.

Mr. Brown: Thirty years ago or better I was working for Mr. Stephens of the Burlington Railroad. We planted trees from Lincoln as far west as Lowell. Today, I think, if you will follow that line of road you will find larger trees farther west. I think it is a mistake to recommend European Larch for Nebraska. If I recommended any kind I would recommend the Black Hills Spruce as the best evergreen for Nebraska. It is a nice tree.

A Member: I think the European Larch is good for grasshoppers. Some years ago we planted two varieties including the European Larch. The next season the grasshoppers enjoyed the European Larch so well that they ate up everything; that is what became of those evergreens.

The Speaker: I would advise putting the rows six feet apart—you put them four feet apart if you wish, but in order to have good plantation I would prefer setting them a little wider.

Mr. Camp: In regard to the limbs being close to the ground for a windbreak, if you had six rows there would be four in which the limbs would all be shaded off. If I plant six rows instead of four they will do better; for a windbreak though sixteen would be still better.

Mr. Murphy: I planted Norway Spruce one spring and it was on about the highest piece of ground anywhere around. It is right on top of a hill. That Norway Spruce is living yet and making good growth. I believe there is a great deal of difference in the hardiness of Norway

Spruce. Some are hardier than others. I know I planted a row for a windbreak on the north side of my house four or five years ago and about half of them died. I think if they stand the first three or four years the Norway Spruce will prove hardy.

Mr. Yager: Those of us who have homes know that there is nothing that makes home more cheerful than to see evergreens, as well in the winter as in summer. In relation to what Mr. Scott has said about the European Larch, in our city of Fremont there are three trees and two of them have been planted for twenty years. There is one nice specimen of the many I have known that have been planted, but there has been a great deal of disappointment on the part of the planters on planting the European Larch.

While on the evergreen question I would like to emphasize the fact that the planters in this state should not lose sight of the Colorado Spruce. I think some years ago we were talking about the red cedar, but when the cedar rust came along we ceased talking about it and began talking about cutting it out. It hurt the trees in our orchards. I am of the notion that there is no better evergreen than the Colorado Spruce. There is nothing that can beat it as far as my observation goes. You can have it most anywhere in this state. It is a thing of beauty and joy to the family for all time.

The next to that I would put the Black Hills Spruce and plant lots of them. As far as I know there is no disease that has attacked the tree. They grow on the highland and the lowland and they transplant readily; and that makes it better, more handy than to transplant from the nursery. I think it is wise to recommend very extensive planting.

The President: There is one point that I disagree with Mr. Yager on the landscape question and from the planter's point of view for commercial purposes and for beauty. The Black Hills Spruce is undoubtedly a good hardy evergreen. It is not pretty—it is not nearly as pretty as the Larch. I have some in mind in the cemetery at Omaha. I can see in the distance the trees and the Larch in the spring is exceedingly pretty. It is not on rich soil. They are on poor clay soil. The Black Hills Spruce, however, has its place undoubtedly and it is hardy.

I have also in mind the Concolor of which there are a few specimens in Omaha twenty-five feet high, but the fool axeman has control of them—he has cut the lower limbs off as high up as he can reach. We have very little trouble with them.

Regarding the Black Hills White Pine, we have four on the place. I have some White Pine, single rows that have been planted for fifteen years. There is something nice about the White Pine, you can go into a long windbreak of them and you can collect fine specimens.

Brother Harrison sent me some Colorado Spruce and has sent me some nice ones. We shall always remember him by those trees. There is no better monument on my place. We owe a great deal to Mr. Harrison for these western trees, but I wish to express my thanks for the great benefit that will come from the planting of them.

Mr. Bomberger: The Norway Spruce is a cheap tree. We have worked with it about twenty-two years. It is a tree that seems to grow, but I would not advocate its general planting. Of course, we are on the higher ground. If we were living from thirty-five to fifty miles north and along the Northwestern railroad or Northern Iowa there might be some difference. There is where the Norway Spruce and the Larch is a success. On the rather rolling ground south of the Northwestern line of railroad throughout the state I don't think the Norway Spruce is a success. It is all right if everything else is all right. The Norway Spruce must have a favorable location. In the planting of evergreens I don't think we need so many rows. With our experience I would start with a less number of rows. I would put the most valuable kind in the center and put rows on each side and on the west I put the White Pine and next inside I would put the Colorado Spruce. You have all the trees that are adapted to western soil. Then, I would put on the outside of it Scotch Pine. I believe I prefer the Scotch Pine to the Colorado Spruce. Listen to the idea that I have come to after my misfortune. Scotch Pine on the outside and Scotch Pine on the inside. Many people have advocated that the Scotch Pine ought to be cut out entirely. For ten or twelve years the Scotch Pine does very nicely, after that it runs out. We are now removing those trees, they do not make a permanent windbreak.

When we get to talking on evergreens we get on a subject that is very interesting. The European Larch is the best all round pine for Iowa. I think we have some around there that are thirty-eight or forty years old.

The President: Now, in the spring if you wish to transplant evergreens take burlap and wrap around the tree like a surgeon would in binding the limb of a person. You can bind it in different way so that you can move it around anywhere. If you want to transplant it or remove it you can put it into a trench so as to keep the roots damp in the meantime for several days. You can do the same way with shrubs. You can burlap your evergreens and transplant them and you can handle them with great ease and facility and after transplanting will grow. A friend of mine in Omaha says I am quite careless in handling evergreens in this way. Of course, I don't want to advocate this plan to new planters.

Mr. Secretary, have you anything in the question box?

Secretary: I have nothing.

Mr. Beltzer: If it is not out of order I have a motion to offer.

The President: I will receive it.

Mr. Beltzer: I move you, Mr. President, that the line be stricken out of Article IV where it reads: "The secretary shall be elected by the Executive Board" and that there shall be inserted in place thereof "and be elected by the members belonging to this society."

Mr. Brown: If Mr. Beltzer's motion is really an amendment to our Constitution, if that is what he intends it, it can be endorsed today and taken up at the session tomorrow, which would be legitimate. In any event it would have to lay over one day and I therefore move that it be laid over until tomorrow.

It is a constitutional matter and must come up as an amendment of the Constitution.

The President: I think that is right. I would like to have you bring this up in the morning and when it is presented and voted upon I will appoint some hour for the discussion of it.

Mr. Swan: Mr. President, I have a resolution which I would like to offer:

Believing that our annual state fair is an important factor in the development and spread of the horticultural interests of the state of Nebraska and that its future possibilities for good are unlimited and of inestimable value to the farmers of the state of Nebraska: Therefore, be it

Resolved, That the Horticultural Society of the state of Nebraska, in convention assembled, hereby recommend that our legislature enact into law the bill of the Nebraska State Board of Agriculture asking for an one-eighth of a mill levy for permanent state fair buildings and improvements, and that we use our united influence to honorably cause said bill to become a law.

And I move the adoption of the resolution. Carried.

H. S. Harrison: Mr. President, I wish to offer the following resolution:

WHEREAS, The regents of the State University have recommended to the state legislature an appropriation of \$40,000 for the erection of a building on the State Farm to be devoted to the exclusive use of horticultural work.

WHEREAS, The present equipment in the department of horticultural work is inadequate and insufficient and far below the standard of equipments of other departments of no more importance: Therefore, be it

Resolved, That we, the State Horticultural Society, in annual session assembled, do hereby approve this recommendation of the regents and instruct our committee on legislation to use all honorable means to secure said appropriation.

And I move the adoption of the resolution. Carried.

Mr. Emerson: I am heartily in favor of a move of this kind and shall favor the request of the regents. I did not know that this resolution was coming up. I notice that your interests are in a horticultural building and I feel that all that is necessary is, if you just as leave have the resolution include the other request for a building at the farm but just as you please about this. While I don't care to say that the others are more important than this, but still I would be glad to have the other buildings included with it.

Mr. Brown: I would like to offer the following resolution to change as a constitutional amendment to be acted upon tomorrow:

Resolved, That article IV of the constitution be amended by striking out the word "eight" in the third line and inserting therein the word "seven"; and by inserting in the fourth line between the words "article" and "and," the words, "excepting the secretary," the intention being to

take the voting power away from the secretary so that he will not be a member of the Executive Board.

Mr. Beltzer: I offer the following resolution as a constitutional amendment:

Resolved, That that part of article IV of the constitution where it reads "the secretary shall be elected by the Executive Board" be stricken out," and the following be inserted, "and be elected by the members belonging to this society."

Mr. Williams: Mr. President, I have a resolution also that I wish to offer:

Resolved, That the constitution of the Nebraska State Horticultural Society be changed to give the voting power to all annual members; to extend the right of franchise to all members, both annual and life members.

If it is desired I will prepare the resolution in writing and it can be handed to the Secretary.

The President: If there is no objection we will now listen to the report of the secretary.

REPORT OF SECRETARY.

The last season has been one of profit to the horticulturist in general having had one of the greatest fruit crops in the history of the state. There being a big crop of most varieties of apples. Grimes' Golden being so plentiful that at gathering time some sold for 50 cents per bushel. The grower would have done well had he stored them, for during the Christmas time they were retailing in Lincoln for 50 cents per peck. Cherries were in abundance. Strawberries cut short, by two weeks of dry weather just as they were beginning to ripen. Grapes a good crop as was shown from the exhibit at the fair. The peach crop was good in some portions of the state while a failure in others owing to the buds being damaged in March. The florists have had about all the business they could attend to, some of them being too busy to make their usual exhibit at the state fair.

In accordance with the changes in our constitution at the last annual meeting the executive board arranged for an open office at the state house, in the room with the State Board of Agriculture.

A little time was necessary to get into working order, it being our purpose to issue each month a bulletin pertaining to some branch of horticulture. To the present time I have sent out bulletin No. 7, sending one to each member of the society. In order to get them in the hands of more people, I sent letters to 282 different newspapers over the state asking them if they would print as reading matter our bulletins or a part of them. From the above papers mentioned, I received replies from thirty-two, saying they would be glad to use our bulletins, or such part as they could. I

am sending regularly to these papers all bulletins issued, also to each member of our society. I have received letters of encouragement from a number of people to whom these bulletins have been sent. We have added to our membership list since our last report thirty-one members, twenty-two life and nine annual. I am sorry to announce since our last annual meeting the death of Harvey Link, of Millard.

Just before the opening of the state fair last fall, we added improvements to our Horticultural Hall at a cost of \$311.75 in the way of additional shelving and two closets with sewer connections. On Wednesday of the week of the fair we had a free fruit day, at which time we gave out more than ten thousand packages of fruit, between 10 and 2 o'clock, giving to each person passing out of the hall a sack of fruit. For this we purchased 50 barrels of apples and 700 baskets of grapes, at a cost of \$337.20, the fruit costing \$278.70, storage and labor \$58.50.

While this is a great advertisement for our society, I believe a better way would be, after the fair is over with, take the premium fruit, distribute to newspapers and charitable institutions.

The following cash has been received since last meeting and turned over to our Treasurer, for which I hold his receipt:

Membership	\$111 00
Incidentals	4 10
Fruit sold at the state fair.....	54 25
	<hr/>
	\$169 35

The following warrants have been drawn on the Treasurer:

No.		Amount
1	Ernest Hornung, premiums	\$11 00
2	Wm. Mohler, premiums	6 00
3	John Williams, premiums	1 00
4	Lewis Henderson, premiums	19 00
5	Frey & Frey, premiums.....	17 00
6	Dole Floral Co., premiums	11 00
7	P. B. Floth, premiums	5 00
8	G. S. Christy, per diem	15 00
9	Peter Youngers, per diem	9 00
10	Chas. L. Saunders, per diem.....	6 00
11	C. H. Green, per diem	12 00
12	W. G. Swan, per diem	12 00
13	Don Russell, part pay reporting summer meeting.....	25 00
14	Whitehead & Hoag Co., membership buttons.....	75 50
15	E. F. Stephens, premium	1 00
16	L. M. Russell, salary	125 00
17	C. S. Harrison, stock for York Exp. Station.....	20 00
18	Youngers & Co., stock for Chambers Exp. Station.....	8 90
19	Benton Bros., printing 1,000 cards.....	2 50

No.		Amount
20	L. M. Russell, postage, freight, express and hotel bills for delegates	59 92
21	L. M. Russell, salary, three months.....	125 00
22	C. S. Harrison, committee work	3 00
23	A. J. Brown, committee work	3 00
24	G. A. Marshall, committee work	3 00
25	Don Russell, balance reporting winter meeting.....	25 00
26	J. H. Hadkinson, per diem summer meeting.....	6 00
27	H. S. Harrison, per diem summer meeting.....	9 00
28	C. H. Green, per diem summer meeting.....	6 00
29	Peter Youngers, per diem summer meeting.....	12 00
30	W. G. Swan, per diem summer meeting.....	12 00
31	A. J. Brown, per diem summer meeting.....	9 00
32	J. A. Yager, per diem summer meeting.....	6 00
33	Don Russell, part pay reporting, summer meeting.....	25 00
34	Jacob North & Co., supplies and programs.....	27 25
35	Harry Porter, supplies	3 30
36	Chapin Bros., plants and shrubs for fair grounds.....	11 50
37	Rudge & Guenzel Co., office fixtures.....	25 00
38	Don Russell, balance reporting summer meeting.....	25 00
39	D. W. Smith, labor	30 60
40	F. G. Davis, repairing lagoon.....	8 65
41	G. W. Alexander, grapes for fruit day.....	34 20
42	D. W. Smith, labor	7 50
43	G. S. Christy, fruit for fruit day.....	143 90
44	G. W. Alexander, premiums	74 00
45	J. W. Murphy, judging fruit	25 00
46	R. T. Chambers, premiums	6 00
47	S. R. Hall, premiums	3 00
48	Vincent Arnold, premiums	2 00
49	C. H. Barnard, fruit for fruit day.....	55 56
50	C. H. Barnard, labor at fair and committee work to Mr. Camp	30 00
51	C. H. Barnard, premiums	120 75
52	G. W. Alexander, discretionary premiums.....	8 70
53	Marshall Bros., premiums	55 75
54	H. J. Rosenbaum, premiums	5 00
55	J. E. Atkinson, premiums	16 10
56	Brewster & Williams, premiums.....	91 00
57	Fred Behlen, premiums	3 70
58	John Ballard, premiums	6 00
59	Crete Nurseries, premiums	161 55
60	C. B. Camp, premiums	65 00
61	J. G. Neff, premiums	9 70
62	Dole Floral Co., premiums.....	78 00
63	Em. Dymond, premiums	70

No.		Amount
64	Arnold Martin, premiums	15 40
65	J. Martin, premiums	11 00
66	John Martinson, premiums	2 00
67	David Hunter, premiums	3 70
68	Geo. Dominy, premiums	6 00
69	C. H. Green, premiums.....	154 00
70	S. E. Greer, premiums	100 00
71	R. Garey, premiums	1 00
72	Dora Hesseltine, premiums	37 40
73	G. W. Hummel, premiums	5 70
74	Chas. Jelinek, premiums	1 00
75	S. C. King, premiums	2 00
76	Theo. Kaar, premiums.....	13 80
77	J. F. Lynch, premiums	2 00
78	W. H. Mills, premiums	1 00
79	J. M. Russell & Co., premiums.....	16 00
80	M. A. Schmale, premiums	9 00
81	W. G. Swan, premiums	4 05
82	E. E. Smith, premiums	7 00
83	T. E. Snodgrass, premiums	5 00
84	N. A. Whorton, premiums	1 00
85	E. S. Williams, premiums	2 00
86	A. J. Brown, per diem state fair.....	24 00
87	G. A. Marshall, per diem state fair.....	24 00
88	H. S. Harrison, per diem state fair.....	24 00
89	Peter Youngers, per diem state fair.....	24 00
90	C. H. Green, per diem state fair.....	24 00
91	J. H. Hadkinson, per diem state fair.....	18 00
92	W. G. Swan, per diem state fair	24 00
93	C. B. Camp, fruit for fruit day.....	18 00
94	W. L. Crandall, premium	1 00
95	J. W. Scarbrough, labor	18 00
96	Effie Vannell, labor	9 00
97	Dale Russell, labor, whitewashing and decorating.....	30 00
98	Dick Russell, labor, whitewashing and decorating.....	18 00
99	Dick Russell, assistant secretary.....	14 00
100	L. M. Russell, incidentals, June 1 to September 8.....	68 97
101	J. D. Garner, labor	8 00
102	A. M. Farmer, labor.....	8 00
103	G. W. Shaver, fruit for fruit day	20 00
104	G. S. Christy, premiums	52 15
105	S. W. Christy, premiums	5 00
106	Benton Bros., printing	23 50
107	Rudge & Guenzel Co., supplies.....	10 72
108	Jacob North & Co., entry books and cards.....	13 25

REPORT OF TREASURER.

No.		Amount
109	R. M. Tidball, lumber	29 65
110	Benton Bros., cards	1 75
111	W. J. Blystone, labor on grounds during summer and fall...	79 50
112	Nebraska Paper & Bag Co.....	24 25
113	Chapin Bros., three boxes smilax	19 50
114	W. A. Shikley, judging floral exhibit	25 00
115	L. M. Russell, salary, June, July and August.....	250 00
116	Lincoln Sash & Door Co., sawdust	6 00
117	L. W. Pomerene Co., plumbing	222 75
118	R. M. Tidball, lumber	51 85
119	Lincoln Transfer Co., drayage	5 00
120	Harry Porter, supplies by Hadkinson	4 50
121	Jacob North & Co., envelopes	3 80
122	Globe Delivery Co., drayage	4 90
123	Lincoln Ice & Cold Storage Co.....	79 43
124	Benton Bros., bulletins for Sept. and October.....	37 00
125	Jacob North & Co., stationery and receipt books.....	14 00
126	Rudge & Guenzel Co., supplies.....	3 75
127	Lincoln Transfer Co., drayage.....	2 50
128	L. M. Russell, salary, Sept., Oct. and Nov.....	250 00
129	Benton Bros., bulletins	24 00
130	Jacob North & Co., solicitors' books	3 75
131	L. M. Russell, incidentals, Sept. 11 to Dec. 21, '06.....	85 95
132	Benton Bros., bulletins, programs and tags.....	42 00
		<hr/>
		\$3,970 70

Total number of warrants, 132; amount, \$3,970.70.

Unpaid warrant No. 63.....	\$0 70
Unpaid warrant No. 83.....	5 00
Unpaid warrant No. 84.....	1 00
	<hr/>
	\$6 70

The President: If there are no objections the report will stand as read.

We will now listen to the Treasurer's report.

REPORT OF TREASURER.

THE NEBRASKA STATE HORTICULTURAL SOCIETY,
 IN ACCOUNT WITH PETER YOUNGERS, TREASURER.

1906.

Jan. 16, balance on hand.....	\$2,809 22
Jan. 25, cash, from G. S. Christy, fruit sold at fair, 1905.....	25 00
June 1, state appropriation.....	1,500 00
June 1, cash, membership fees, from L. M. Russell.....	56 00
Sept. 6, cash, L. M. Russell, for fruit sold.....	19 25

Sept. 7, cash, L. M. Russell, for fruit sold.....	35 00
Nov. 8, state appropriation	1,000 00
Dec. 31, cash, membership fees from L. M. Russell.....	55 00
Dec. 31, cash received for sundries, L. M. Russell.....	4 10
	<hr/>
	\$5,503 57
Total warrants paid	4,078 46
	<hr/>
Balance on hand January 15, 1907.....	\$1,425 11

WARRANTS PAID.

Series 1906.

No.		Amount.
1	Ernest Hornung	\$11 00
2	Wm. Mohler	6 00
3	John Williams	1 00
4	Lewis Henderson	19 00
5	Frey & Frey	17 00
6	Dole Floral Co.	11 00
7	P. B. Floth	5 00
8	G. S. Christy	15 00
9	Peter Youngers	9 00
10	Chas. L. Saunders	6 00
11	C. H. Green	12 00
12	G. W. Swan	12 00
13	Don Russell	25 00
14	The Whitehead & Hoag Co.....	75 50
15	E. F. Stephens	1 00
16	L. M. Russell	125 00
17	C. S. Harrison	20 00
18	Youngers & Co.	8 90
19	Benton Bros.	2 50
20	L. M. Russell	59 92
21	L. M. Russell	125 00
22	C. S. Harrison	3 00
23	A. J. Brown	3 00
24	G. A. Marshall	3 00
25	Don Russell	25 00
26	J. H. Hadkinson	6 00
27	H. S. Harrison	9 00
28	C. H. Green	6 00
29	Peter Youngers	12 00
30	W. G. Swan	12 00
31	A. J. Brown	9 00
32	J. A. Yager	6 00
33	Don Russell	25 00
34	Jacob North & Co.....	27 25

No.		Amount
35	Harry Porter	3 30
36	Chapin Bros.	11 50
37	Rudge & Guenzel Co.	25 00
38	Don Russell	25 00
39	D. W. Smith	30 60
40	F. G. Davis	8 65
41	G. W. Alexander	34 20
42	D. W. Smith	7 50
43	G. S. Christy	143 90
44	G. W. Alexander	74 00
45	J. W. Murphy	25 00
46	R. T. Chambers	6 00
47	S. R. Hall	3 00
48	Vincent Arnold	2 00
49	C. H. Barnard	55 56
50	C. H. Barnard	30 00
51	C. H. Barnard	120 75
52	G. W. Alexander	8 70
53	Marshall Bros.	55 75
54	H. J. Rosenbaum	5 00
55	J. E. Atkinson	16 10
56	Brewster & Williams	91 00
57	Fred Behlen	3 70
58	John Ballard	6 00
59	Crete Nurseries	161 55
60	C. B. Camp	65 00
61	J. G. Neff	9 70
62	Dole Floral Co.	78 00
64	Wm. Comer (series 1905)	2 00
64	Arnold Martin	15 40
65	J. Martin	11 00
66	John Martinson	2 00
67	David Hunter	3 70
68	George Dominy	6 00
69	C. H. Green	154 00
70	S. E. Greer	100 00
71	R. Garey	1 00
72	Dora Hesseltine	37 40
73	G. W. Hummel	5 70
74	Chas. Jelinek	1 00
75	S. C. King	2 00
76	Thos. Kaar	13 80
77	J. T. Lynch	2 00
78	W. H. Mills	1 00
79	J. M. Russell & Co.	16 00

No.		Amount
80	M. A. Schmale	9 00
81	W. G. Swan	4 05
82	E. E. Smith	7 00
85	E. S. Williams	2 00
86	A. J. Brown	24 00
87	G. A. Marshall	24 00
88	H. S. Harrison	24 00
89	Peter Youngers	24 00
90	C. H. Green	24 00
91	J. H. Hadkinson	18 00
92	W. G. Swan	24 00
93	C. B. Camp	18 00
94	W. L. Crandall	1 00
95	J. W. Scarbrough	18 00
96	Effie Vaundell	9 00
97	Dale Russell	30 00
98	Dick Russell	18 00
99	Dick Russell	14 00
100	G. N. Titus (series 1905).....	3 00
100	L. M. Russell.....	68 97
101	J. D. Garner	8 00
102	A. M. Farmer	8 00
103	G. W. Shaver	20 00
104	G. S. Christy	52 15
105	S. W. Christy	5 00
106	Benton Bros.	23 50
107	Rudge & Guenzel	10 72
108	Jacob North & Co.....	13 25
109	R. M. Tidball	29 65
110	Benton Bros.	1 75
111	W. J. Blystone	79 50
112	Nebraska Paper & Bag Co.....	24 25
113	Chapin Bros.	19 50
114	W. A. Shickley	25 00
115	L. M. Russell	250 00
116	Lincoln Sash & Door Co.....	6 00
117	L. N. Pomerene Co.	222 75
118	R. W. Tidball	51 85
119	Lincoln Transfer Co.	5 00
120	Harry Porter	4 50
121	Jacob North & Co.....	3 80
122	Globe Delivery Co.	4 90
123	Lincoln Ice & Cold Storage Co.....	79 43
124	Benton Bros.	37 00
125	Jacob North & Co.	14 00

No		
126	Rudge & Guenzel	3 75
127	Lincoln Transfer Co.....	2 50
128	L. M. Russell	250 00
129	Benton Bros.	24 00
130	Jacob North & Co.....	3 75
131	L. M. Russell.....	85 95
132	Benton Bros.	42 00
Series 1905.		
53	Charles Brush	2 00
72	Ed Hayes	1 00
96	F. Schumacher	3 00
117	S. W. Christy	7 55
143	L. M. Russell.....	70 91
144	Don Russell	25 00
		\$4,078 46

LINCOLN, NEB., November 8, 1906.

This is to certify that I have this day received from Peter Youngers, Treasurer of the Nebraska State Horticultural Society, the following list of warrants in exchange for state warrant No. in the sum of \$1,000:

No.	Name.	Amount.
1	Erest Hornung	\$11 00
2	Wm. Mohler	6 00
7	P. B. Floth	5 00
44	G. W. Alexander	74 00
51	C. H. Barnard	120 75
53	Marshall Bros.	55 75
56	Brewster & Williams	91 00
59	Crete Nurseries	161 55
60	C. B. Camp	65 00
61	J. G. Neff	9 70
62	Dole Floral Co.	78 00
64	Wm. Comer	2 00
69	C. H. Green	154 00
70	S. E. Greer.....	100 00
72	Dora Hesseltine	37 40
76	Theo. Kaar	13 80
81	W. G. Swan	4 05
82	E. E. Smith	7 00
94	W. L. Crandall	1 00
100	G. N. Titus, series 1905.....	3 00
		\$1,000 00

Witness my hand and seal this 9th day of November, 1906.

H. L. COOK, *Deputy Auditor.*

The President: I will appoint as an auditing committee Mr. C. H. Green, chairman of the committee, Mr. H. W. Marshall and Mr. J. A. Yager, and both reports will be referred to that committee.

Mr. Williams: Mr. President, I offer the following resolution:

Resolved, That the final clause of article III of our constitution which relates to membership, be so amended to read, "which privilege shall belong exclusively to active members and also associated members after the payment of the second year's annual dues."

The President: The resolution will be taken up at some future time.

Mr. Williams: I would like to say that I am perhaps a little democratic in my make up and favor as large a privilege as possible, the voting privilege, to be extended to members of this society and do not favor the present status so that if a man may have dropped out for a year or two, he is not likely to drop out ten years; and so that privilege should be extended to him after the payment of his second year's annual dues.

Mr. Brown: Mr. President, I move that these resolutions be made a matter of hearing at 3 o'clock tomorrow afternoon as I do not believe we will have time to discuss it in the morning session. Carried.

On motion the meeting duly adjourned to 9 o'clock tomorrow, January 16, 1907.

SECOND DAY.

WEDNESDAY, January 16, 1907.

The President: The meeting will now come to order.

Before commencing I would like to ask that all persons having papers, or in discussing papers or in asking questions, that you will be brief and to the point, and that you will address the chair or the stenographer, so he can get what you say correctly.

As you all know, there is a joint session at 12 o'clock at the capitol; I do not know what it is, as I am not much of a "politicker" myself. It is something about a senator—you all know the rest of it. What I desire to say is, that we want to get through so as to adjourn at 11:30, so that those who desire may attend that session. We will endeavor to get through, although we have some very valuable papers.

The first on the program this morning is the "Planting of Trees," by W. R. Adams, superintendent of parks, Omaha. Mr. Adams is not here, but his paper is here, and I have been asked to read it.

PLANTING SHADE AND ORNAMENTAL TREES.

W. R. ADAMS, SUPERINTENDENT PARKS, OMAHA.

In all work pertaining to arboriculture, as in horticulture and agriculture, the cultivation of the soil is of the first importance; therefore, when planting trees, cultivate the adjacent soil as thoroughly as circumstances will permit, so as to obtain the best results.

The planting of trees is done for the embellishment of our homes and grounds. It gives both pleasant shade and shelter, and nothing contributes more to the beauty, or enhances the value of lands more, than the judicious planting of trees and shrubbery.

Where trees are planted at intervals of so many feet apart, as in street planting, the space for such work is often very much restricted, so that it is not possible to get a circular hole of sufficient diameter. In such cases the excavation should be extended lengthwise, and where the soil is of poor quality it should be removed and substituted by a good supply of black, rich loam to give the trees a good start. This is especially necessary where the top soil has been removed by grading or the land is of poor quality. Where not confined by space, there is no excuse for making small holes, for even if the soil is sufficiently rich it will give a greater area of cultivation. The holes should at all times be sufficiently large to take all the roots spread easily to their utmost extent without bending, and as already mentioned, if the ground is poor, rich soil should be substituted.

The manner of planting is simple. Hold the tree in an upright position in the hole, spread the roots in a natural position, sift the fine

earth among the roots, lift the tree slightly as the earth is filled in, and tamp firmly, or water very thoroughly, which I consider the better way, as you are sure then to have the earth packed well about the roots.

The preparation of land for wind-breaks, groves and the larger plantations for domestic or commercial purposes, is done as a "matter of course" on a more extended scale. After the land has been well ploughed and harrowed, it is marked out to the required distances, which can be done with a lister, then a subsoil plow should be run back and forth in each furrow to thoroughly soften the earth. By this method you cultivate deeply and greatly facilitate the work of planting. Trees of small size are used for this class of planting, as they are less affected by drought, and recuperate more quickly after transplanting than would those of a larger size.

When planting of any sort is done, exposure of the roots to the sun or wind must be avoided as much as possible. To counteract this recourse is had to the puddling of the roots while planting.

Care should also be taken against exposure while in transit by packing with moss, hay or straw, and if received in a dry condition (as will sometimes occur) they should be well sprinkled and shaded some hours before the planting is done.

Where planting is done on land of poor quality, the application of manure of some form will be of much benefit from time to time. Whether trees are isolated or in groups they should be liberally watered at intervals and the ground around them kept well pulverized between waterings. This applies more especially to the first and second years, or until the trees get established.

The pruning of trees at the time of planting should consist of fore-shortening the branches of those of medium size to sufficiently balance the tree, and in some measure equalize the branches with the loss of roots caused by digging, for we all know that it is an utter impossibility to get all or nearly all the roots of a newly-dug tree.

In transplanting larger sized trees, I cut most of the lateral branches close to the bole, and find that as a rule they reproduce a head and are more thrifty than those upon which the laterals are partly allowed to remain. This I find is the case more especially in spring planting.

In many instances it may be necessary to shorten back long, straggling roots, but this should be confined to a few out of all proportion to the rest, but all badly bruised roots, or those accidentally broken, should be taken off with a clear cut.

The after-pruning of trees depends altogether for what purpose they are intended. Street trees should be planted thirty to forty feet apart to get room to develop properly, and necessity requires that the branches be at least eight or ten feet from the ground in their earlier growth, but in a few years both the space between the trees and the height from the ground will have to be increased, but this depends on the varieties

of trees and their habit of growth. We cannot have any arbitrary rules, but we can all see the mistakes and folly of planting too closely. And then, instead of thinning out, cutting off the branches thirty feet or more to let in light and air and destroying the symmetry of the tree. In street-tree pruning our object should be to encourage the natural characteristics of the tree to its fullest extent.

Park trees are planted for the double purpose of giving ample shade and enhancing the beauty of the landscape, and the pruning of such trees is done, if possible, on lines which will tend in these directions.

The pruning of trees in their more advanced stages should be done by or under the direction of one who is conversant with the natural form of growth of the varieties treated, as well as the proper method of performing the work. Before beginning he should study on and decide what branches are necessary to remove to give proper balance, or it may be to try and forestall and prevent injury by storm, shortening or lightening some of the limbs, or the removal of those which are crossing or crowding others, shutting out sunlight and air. At the same time neither overdoing or neglecting to remove what he knows should be done now, not leaving it for the future.

There are two ways of doing most things—the right and wrong. The right way to prune a tree is not the easiest, for a branch should be cut close to the parent tree, or branch, so that the future healing or barking over will become less of an effort to nature. Where a bough is of any size it should always be cut upwards as far as possible, and then downward. This will prevent splitting and the stripping of bark. The edges of the cut should be smoothed with a sharp knife or chisel, when jagged, and if of any size, say an inch in diameter, should be painted to prevent rotting or the encroachment of insects. It is well the color should correspond with the color of the bark, and is usually composed of lead, oil and lampblack or graphite and oil.

It may be well in conclusion to say that the selection of good stock for planting is of the utmost importance. They should be clean and smooth-barked, of vigorous growth, not stunted, nursery grown; which will insure good roots with more fibre, and where it is possible to be, home grown, which means a great deal in our state, where acclimation and the more hardy varieties will be assured by men of known integrity.

In connection with this subject, the propagation of many species of trees might be done by nuts and seeds, at a small cost. Most of these may be had for the gathering. Among which are oak, hickory, hackberry, ash, maple, etc., and these could be sown on rough hillsides and gullies, worthless for almost anything but the raising of trees; and these, part from the shelter afforded, would in a very few years be valuable for many purposes on the farm. All tree seeds should be put in as soon as gathered and covered with earth, to about their own thickness.

DISCUSSION.

The President: You have heard this paper of Mr. Adams. Mr. Adams is the superintendent of parks at Omaha, Neb., and there are some very good points in this paper, which is now open for discussion. Mr. Adams may be here before we are through.

A Member: There is one point in that paper that I take issue with Mr. Adams. He says there is a right and a wrong way to prune trees, and to cut the limbs close to the tree. I want to say that I have seen trees pruned, limbs two, three, and some cut six inches to a foot away from where the section of the tree branches out, where it grows to normal size. In my opinion it would be a mistake to cut so close where a portion bulges out. I would like to hear the experience of some of the others in the audience.

Mr. Green: Do I understand that you recommend the cutting off of limbs eight inches to a foot from the tree?

Member: I say I have seen results from it. I do not say that I would recommend it.

A Member: I believe where you have a variety that enlarges rapidly at the base it is just as well to cut the limb close. If you have a limb that gradually enlarges down to the trunk I would cut it off close to the trunk.

A Member: I have been experimenting some along this line of trimming and pruning. My experience has been in cutting off a limb is to cut right close to the swell, where it swells out or the limb forks. If you leave a stub there the stub decays eventually and affects the health of the tree. Do not cut into the swell, but cut right close to it; it seems to heal over in one or two years, according to the size of the limb taken off.

The President: I want to get all out of this paper there is in it, and you must all feel at liberty to ask questions.

Mr. J. A. Yager: Just a word about the paper as to painting the wounds after pruning. I think many people do not attach sufficient importance to fixing up the wound after cutting off a limb. In my experience, where large limbs have been removed, if the wound is not covered over soon, decay sets in, extends into the tree and eventually injures it very badly. I think that all limbs larger than an inch, no matter on what kind of a tree, after cutting, they should be covered over with some kind of paint, and it is just as well to put on the same color of paint. I think the practice is a good one. There are several reasons why such a suggestion would be a good one; any kind of paint is better than none, and in my opinion it is highly essential.

Mr. Wm. Mohler: I think, if a man has time to cut limbs off at all, he had better paint them; if he can't paint them all, then he had better cut off only half as many, or just what he can paint, rather than cut them all and leave some unpainted.

A Member: I want to endorse that suggestion. Even if it is only a

small apple tree two years old, you will find it will pay you largely to cover with grafting wax. You will sometimes find a small limb from a small tree covers a larger proportion of its surface than does a limb on a larger tree. I have noticed it in trimming apple trees two years old—take a two-year-old apple tree properly trimmed, and leave the wounds unpainted or unwaxed and the tree is either killed or greatly injured in its growth, while if it is covered with grafting wax the tree doesn't appear to know that anything was done to it; it goes right along growing without injury.

Mr. C. S. Harrison: There is one comment I would like to make on the paper, and that is in regard to painting. I had quite a lot of trimming done in my orchard last spring during some real dry weather, and I noticed wherever the trimming was done, especially upon some plum trees, where the cuts were not painted until the next day, that during that twenty-four hours those cuts checked. So I believe it is well worth your while to keep the fresh cuts painted as fast as they are cut, for even in so short a time as twenty-four hours, if the weather is dry, it will check the cuts.

Mr. Roberts: There occurs to me a question regarding painting. I have an orchard, and when pruning I apply white lead to the cuts, covering the wounds with white lead. With a small limb, say the size of a lead pencil, they will almost heal over the same year, pruning about June 1st. In small limbs, trim close to the body and paint at once. If you cut off four to six inches from the body of the tree, the snag will hang on from year to year and die back; so I say by all means, in the North Platte valley, cut your limbs off close to the tree and paint over with white lead.

The President: We have next on our program "Forestry Planting," by Professor Miller of the State University.

Mr. Miller: I will confine myself to the discussion and planting of some of the broad-leaved trees and hard woods. In a question of this kind it is difficult to know exactly what to cover. I will undertake to discuss the planting of seven species. I am not going into the details of planting of these except as they come up incidentally. What I desire to do is to trace a plantation of each species through, giving the plantation, the cost and results. I may say what I have to present is based upon work that was done in the eastern part of the state in December, 1904, covering a territory east of the 99th meridian. Measurements were made to determine the rate of growth and the opportunities for profit of the different species, such as cottonwood, catalpa, etc. In each instance I have taken a typical plantation of each species, determining the cost and the returns as based upon our measurements. These plantations were scattered over the entire region. Take the cottonwood, for instance, we measured groves in every part of the territory, but no attempt was made to take only the best groves. As measured, some of the cottonwood groves on the uplands were fairly well managed and

some very poorly managed, so that our results I think represent conditions as they actually exist. The results therefore are not based upon theory. There are a number of points I might allude to in this discussion, but perhaps if I confine myself to the history of the particular plantations that we have figured on as type of the plantations referred to, I will have exhausted my time.

FOREST PLANTING IN EASTERN NEBRASKA.

FRANK G. MILLER, PROFESSOR OF FORESTRY, UNIVERSITY OF NEBRASKA.

PURPOSE OF THE STUDY.

The study of forest plantations in eastern Nebraska upon which this report is based was made to ascertain the tree species best suited for planting in the region. To this end the species planted in the past were studied with reference to their silvical requirements, notes were made on the effect of different methods of planting, and typical plantations were measured to find the amount and value of the product.

THE REGION.

The region covered by this report includes that part of Nebraska east of the ninety-ninth meridian.

TOPOGRAPHY, DRAINAGE, SOIL.

Eastern Nebraska is a broad plateau sloping gently from the west toward the Missouri river. The surface is diversified by many valleys and by large areas of bottomland. Away from the streams the topography is often marked by rolling hills and steep slopes.

The entire region is drained by numerous small streams flowing into the Niobrara, Elkhorn, Platte, and Nemaha rivers, which, in turn, are tributary to the Missouri.

The soil is well adapted to tree growth. For the most part it is a loess—that is, a fine, sandy loam—mixed with a large quantity of silt and more or less calcareous matter. This absorbs water readily and retains it for long periods, especially where surface cultivation is given.

Toward the sand-hills the soil supports practically no natural forest growth, and the little tree planting done is confined chiefly to the valleys. Recent experiments, however, have demonstrated that some species of pine trees can be planted successfully on the sand-hills proper.

CLIMATE.

The region is characterized by rather severe winters and warm summers, sudden and extreme changes of temperature, wide seasonal and yearly deviation in precipitation, a clear, pure, moderately dry atmosphere, and a high percentage of sunshine.

The prevailing winds are from the south and southeast during the spring and summer and from the northwest in fall and winter. Their

average velocity is high. The southerly winds of summer frequently come as hot waves, which, by causing excessive transpiration, injure tree growth. Moreover, the strong northwest winds of winter are more injurious to trees than is commonly supposed. Transpiration goes on at all seasons, and since the northerly winds blow when the ground is frozen, the trees are unable to secure the soil water and suffer or even die from drought as certainly as in summer.

Occasionally prolonged hot or cold periods occur, which are a very severe test to trees, and species which have been introduced from other localities sometimes die. In the unusually cold winter of 1898-99, for example, a large percentage of the Osage Orange hedges were killed, not only in Nebraska, but throughout the central Mississippi valley.

PRECIPITATION.

The following table shows for eastern Nebraska the total annual precipitation, the total for the growing season, and the ratio of the seasonal to the annual rainfall:

STATION	Elevation	Period of Observation	Average Annual Precipitation	Precipitation During Growing Season	
				April to August, Inclusive	Ratio to Annual Precipitation
	Feet	Years	Inches	Inches	Per Cent
Omaha	1,040	27	31.4	20.8	66
Desoto	1,100	24	29.6	19.3	65
Genoa	1,585	21	26.8	17.9	67
North Platte	2,809	29	19.1	13.4	74
Yankton, S. Dak.	1,206	20	25.8	17.9	69

Although the average annual precipitation for Nebraska for the period from 1876 to 1904 was but 23.27 inches, the above table shows that more than two-thirds of the total falls during the growing season, thus giving the state a very favorable showing against states farther east, where the total annual rainfall is considerably greater but more equally distributed through the different seasons. This fact explains, in large measure, the success which has attended tree planting.

On the other hand, the wide deviation in the amount of precipitation from year to year is a factor which tends to restrict the number of species that can safely be recommended. For example, the precipitation in 1881 was 30.91 inches. In 1893 the precipitation was only 16.18 inches, and the years 1894 and 1895 also experienced a shortage in rainfall, making three consecutive dry years. This period was very severe on planted timber, and some species proved unadapted to certain localities or situations where they hitherto had been successful. Much of the cottonwood and willow, for example, which had done well for several years on the upland, was either badly injured or killed. Thus it is clear that in selecting a species for a given locality, not only the average but the extremes of weather conditions must be taken into account.

FOREST PLANTING OF THE PAST.

Nebraska is essentially a prairie state. Only about 3 per cent of the total area was originally covered with natural timber, and nowhere was the forest area large. Even in the eastern counties, where the greatest amount of timber is found, probably less than 10 per cent of the area was originally occupied by forest. The scarcity of natural timber, together with the character of the climate, has led to an unusual amount of forest planting. The average of the figures returned by the assessors for 1903 and 1904 shows that the entire state has 286,000 acres of planted timber. Of this amount, about 248,000 acres, or nearly 87 per cent, is in the territory east of the ninety-ninth meridian.

The object in past planting was primarily to secure protection against the storms and winds that so frequently visit Nebraska prairies. Its commercial side was considered only incidentally. The tendency, therefore, was to select the quick-growing species, especially those near at hand, which could be had cheaply. Though there has been a comparatively large amount of planting done, the major part is in poor condition today. This may be accounted for in several ways. The trees chosen were often ill adapted to the conditions. Thus it frequently happened that a species adapted primarily to the bottomland soils was planted indiscriminately on the uplands, or that a species was planted on sandy land which could succeed only in a loam with a clay subsoil. Still another cause of failure has been lack of care and management. There is scarcely a plantation in Nebraska which has been managed with the same care that the enterprising farmer gives to his field crops. Instead, the vast majority of plantations have had little care or none at all. Almost invariably they have been made free range for live stock. In many cases they have been severely damaged by unchecked fires. Again, instead of improving the plantation by cutting out the dead, dying, and defective timber as material was needed, the better trees have usually been selected.

PRESENT STATUS OF FOREST PLANTING.

In general, the planted area in eastern Nebraska is decreasing, though not uniformly so, for in some of the newer counties, particularly those in the northeastern part of the state, there is an increase. However, with the rapid rise in the price of land, together with an increased timber supply, due to planting by the early settlers, the activity in forest planting so characteristic of pioneer days has gradually declined, till in most parts of the state the planting done is more than offset by the cutting of the early plantations for fuel, posts, lumber, etc. Nurserymen say that the demand for forest tree seedlings declined very rapidly from about 1894. All agree, however, that there is a revival of interest in tree planting at the present time.

FOREST PLANTING OF THE FUTURE.

In past planting commercial considerations were largely ignored, but in the future these should be especially emphasized. The farmer should

plant trees primarily with a view of raising wood crops, and to this end only the better and more profitable species should be used. 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.

A SURVEY OF EXISTING PLANTATIONS.

The plantations here given are fairly well distributed over the region of this report. In but few cases were two groves of the same species measured in the same locality. The study was not confined to the best plantations only. Those groves of a given species which were typical of actual conditions at the present time were selected and measured. With cottonwood, for example, the study includes both fairly good and rather poor plantations, growing under widely different conditions of soil, moisture, and management.

The contents of any given plantation were determined by measuring a representative portion of it, called a sample plot, seldom less than one-tenth of the total area of the grove, often much more, and when the grove contained an acre or less, the entire area was measured. The sample plot in each case was selected to represent average conditions of the plantation. All trees on the sample plot were then calipered, and classified as dominant, intermediate, and overtopped. An average or sample tree for each class was then selected, felled, and analyzed. The stem was cut into 7-foot lengths down to 1 inch, and the branch wood into 4-foot lengths down to 2 inches in diameter. Frequently nearly all the trees would class as dominant, and the cutting of one sample tree would be sufficient to determine the total contents of the plot, disregarding the few trees that might fall in some other class. Care was taken in each case, however, to select enough trees to determine accurately the total volume of the plot.

The volume of each sample tree, including the stump, stem, and branch wood, was computed first in cubic feet. Adding the volume of the group of trees on each sample plot, the total contents of the plot were obtained, and from this the total volume of the grove could be reckoned. In all cases the results were reduced to the unit of 1 acre. The volume in cubic feet was reduced to cords by using the factor 0.86 as the divisor.

TABLE 1.—*Comparative height of the principal species for planting in eastern Nebraska.*

AGE	Cotton- Wood	Silver Maple	Black Walnut	Green Ash	Hardy Catalpa	Honey Locust
Years	Feet	Feet	Feet	Feet	Feet	Feet
5.....	19	10	11	11	12	11
10.....	33	22	18	19	19	18
15.....	46	33	24	24	23	23
20.....	55	44	30	28	27	27
25.....	61	53	36	32	30	31
30.....	65	60	42	36	33	35
35.....	67	66	46	38	.....	39
40.....	69	72	51	40	.....	43
45.....	71	76	54	41	.....	.....
50.....	73	80	57	43	.....	.....
Number of trees measured....	394	59	130	216	83	12

The table shows that all the species except silver maple make a better height growth during the first five years than for any other five-year period. Silver maple increases its rate of height growth over that of the first five years up to the twentieth year, and thereafter slowly declines. Cottonwood, green ash, and black walnut decline in height growth after the thirtieth year, the first two very rapidly. Black walnut maintains a very uniform growth up to that time. Hardy catalpa grows at a fairly uniform rate up to the twentieth year, and then gradually declines. Honey locust grows somewhat more slowly than hardy catalpa for the first ten years, but leads after that time, and its height growth up to the fortieth year is very uniform.

TABLE 2.—Comparative diameter, breasthigh, of the principal species for planting in eastern Nebraska.

AGE	Cotton- wood	Silver Maple	Honey Locust	Black Walnut	Hardy Catalpa	Green Ash
Years	Inches	Inches	Inches	Inches	Inches	Inches
5.....	2.3	1.8	2.0	1.1	1.6	1.1
10.....	5.1	3.1	3.6	2.6	2.8	2.1
15.....	7.5	4.0	4.6	4.0	3.7	2.9
20.....	9.4	5.1	5.3	5.2	4.9	3.6
25.....	11.0	6.5	6.1	6.1	5.9	4.4
30.....	12.2	7.5	6.7	6.7	6.4	5.0
35.....	12.9	8.4	7.3	7.1	.....	5.3
40.....	13.3	9.0	.....	7.5	.....	5.4
45.....	13.6	.....	.....	7.6	.....	5.5
50.....	13.8	.....	.....	7.8	.....	5.6
Number of trees measured.....	50	11	12	23	24	57

The stump was considered as a cylinder and the stem and branches as paraboloids. The volume of the sample tree being known, the total volume of the group or class it represented was obtained by the use of the following formula: $V = v \times \frac{N}{s}$ in which V = volume of the whole group or class; v = volume of the sample tree; S = basal area of group or class represented by the sample tree; s = basal area of the sample tree.

According to this table silver maple, honey locust, hardy catalpa, and green ash make their best diameter growth during the first five years. Cottonwood increases its rate of diameter growth from year to year up to the fifteenth, and black walnut up to the twentieth. The rate of diameter growth of the six species for the periods given is in the order named. Hardy catalpa declines rapidly in diameter growth after the twenty-fifth year, cottonwood and green ash after the thirtieth, and black walnut after the fortieth. Honey locust and silver maple both show a fairly uniform diameter growth to the end of the periods for which figures are given.

Heartwood composes the central portion of the stem, and may be distinguished from the sapwood by a difference in color. It is harder and more durable in contact with the ground than sapwood. The proportion of heartwood to sapwood increases with the age of the tree. Hence, when durability is required, old trees are more valuable than young ones.

The contents in fence posts were obtained by ocular estimates in the field. Experience proves this method to be accurate, especially where the trees run small in diameter, as in the great majority of the plantations measured. For example, in catalpa plantation No. 4 (p. 15) the survey gave \$163 worth of first and second class posts, and the owner cut and sold \$167 worth per acre from four acres a few months later. In all cases a post was reckoned as 7 feet in length. A second-class post varies from 3 to 3.9 inches and first-class from 4 to 5.9 inches in diameter at the small end. A log 6 to 7.9 inches in diameter at the small end was considered equal to two first-class posts, 8 to 9.9 inches as three first-class, and from 10 to 12 inches as four first-class posts. It will be seen that these dimensions are very liberal.

To calculate the volume in board feet of cottonwood and black walnut, the saw-log length of each tree was determined with a top diameter limit of 6 inches. The standard length of logs in Nebraska are 12, 14, and 16 feet, with a few 10 and 18 feet, the preferences being in the order named. With these standards as a guide, the trees were divided into saw logs, according to the demands of the trade. From taper measurements curves were drawn, and from these a model tree was constructed by which it was possible to know the diameter of any tree at any height and the diameter of any log at the small end outside the bark. From another set of curves the thickness of the bark of any tree at any height could be determined; therefore the diameter of any log inside the bark. The logs were then scaled by the Doyle rule.

As a guide in future planting, calculations were made on the cost of and returns from plantations of cottonwood, catalpa, green ash, honey locust, Osage orange, black walnut, and white willow. The figures in each case were based upon a typical example.

All items of expense were carried with 5 per cent compound interest from the year the plantation was established. Thus the costs given are a trifle higher than the actual, since some of the expenses, such as those for cultivating, except for the first year, and pruning, were not incurred at that time. However, it has not been possible to obtain data to show just when these expenses were incurred, so it is assumed that all were paid out the first year. The returns in each case are reduced to a net annual income with 5 per cent compound interest. In reckoning the returns for catalpa, Osage orange, black walnut, honey locust, and green ash, it is assumed that the stakes, or third-class posts, and fuel wood which can be obtained—products which are disregarded in the calculations—will pay the cost of harvesting the whole crop. Experience proves that they will do this.

TABLE 3.—Amount of heartwood in trees of various diameters.

DIAMETER BREST HIGH OUTSIDE OF BARK	COTTONWOOD		BLACK WALNUT		HARDY CATALPA	
	Diameter Inside Bark 8 Feet High	Diameter of Heart- wood 8 Feet High	Diameter Inside Bark 8 Feet High	Diameter of Heart- wood 8 Feet High	Diameter Inside Bark 7.5 Feet High	Diameter of Heart- wood 7.5 Feet High
Inches	Inches	Inches	Inches	Inches	Inches	Inches
1.....	0.7	.....	0.5	0.2	0.8	0.7
2.....	1.5	0.6	1.4	.9	1.7	1.5
3.....	2.4	1.3	2.2	1.5	2.5	2.2
4.....	3.3	1.9	3.1	2.2	3.2	2.9
5.....	4.1	2.6	3.9	2.8	3.9	3.5
6.....	4.9	3.2	4.8	3.5	4.7	4.2
7.....	5.8	3.9	5.7	4.2	5.5	4.8
8.....	6.6	4.5	6.5	4.8	6.2	5.5
9.....	7.5	5.2	7.4	5.5	6.7	6.0
10.....	8.3	5.9	8.2	6.2	7.2	6.6
11.....	9.2	6.5	9.1	6.8	.....	.....
12.....	10.0	7.2	10.0	7.6	.....	.....
13.....	10.9	7.8	.....	.....	.....	.....
14.....	11.7	8.5	.....	.....	.....	.....
15.....	12.6	9.2	.....	.....	.....	.....
16.....	13.4	10.0	.....	.....	.....	.....
17.....	14.3	10.8	.....	.....	.....	.....
18.....	15.1	11.6	.....	.....	.....	.....
No. of trees measured	49		23		25	

DIAMETER BREST HIGH OUTSIDE OF BARK	SILVER MAPLE		GREEN ASH		HONEY LOCUST	
	Diameter Inside Bark 8 Feet High	Diameter of Heart- wood 8 Feet High	Diameter Inside Bark 7.5 Feet High	Diameter of Heart- wood 7.5 Feet High	Diameter Inside Bark 7.5 Feet High	Diameter of Heart- wood 7.5 Feet High
Inches	Inches	Inches	Inches	Inches	Inches	Inches
1.....	0.9	.....	0.7	.....	0.7	0.1
2.....	1.8	.....	1.4	.....	1.5	.7
3.....	2.8	.....	2.2	0.1	2.4	1.4
4.....	3.7	0.5	3.0	.2	3.3	2.1
5.....	4.6	1.3	4.0	.6	4.3	2.9
6.....	5.4	2.1	5.1	1.3	5.3	3.8
7.....	6.2	2.9	6.4	2.4	6.3	4.7
8.....	7.0	3.7	.....	.....	.....	.....
9.....	7.8	4.5	.....	.....	.....	.....
10.....	8.5	5.4	.....	.....	.....	.....
11.....	.....	.....	.....	.....	.....	.....
12.....	.....	.....	.....	.....	.....	.....
13.....	.....	.....	.....	.....	.....	.....
14.....	.....	.....	.....	.....	.....	.....
15.....	.....	.....	.....	.....	.....	.....
16.....	.....	.....	.....	.....	.....	.....
17.....	.....	.....	.....	.....	.....	.....
18.....	.....	.....	.....	.....	.....	.....
No. of trees measured	11		58		12	

The preceding table shows that hardy catalpa has throughout a high percentage of heartwood. This is one of the many excellent qualities that make it so valuable as a post timber. Green ash develops no heartwood for some years, which accounts for the short life of posts from young trees. Honey locust begins to develop heartwood early, and the amount, though small at first, increases rapidly with age. Black walnut, though noted for its durability, does not develop enough heartwood to make a durable post until it is about 7 inches in diameter. Cottonwood

has a smaller proportion of heartwood than black walnut, but even the heartwood of cottonwood decays quickly. Heartwood is not formed in silver maple for some years, and then it develops more slowly than in cottonwood.

COTTONWOOD.

Cottonwood deserves a prominent place in Nebraska tree planting. It grows very rapidly and can be propagated easily and cheaply, and the wood is coming into wide use. It is planted principally for fuel and lumber, but in the sand hills, and sometimes elsewhere, it is used extensively for fence posts. A cottonwood post lasts about three years, or five in exceptional cases. Posts are usually set out when green, with the bark on, which in part accounts for their short life.

The fuel value of cottonwood is relatively low, but owing to its rapid growth it is doubtful whether any other tree adapted to Nebraska conditions will produce as many heat units per acre in a given time. Under average conditions a plantation, on bottomland, will produce three cords per acre annually for the first twenty-five or thirty years. The majority of the bottomland groves reported run below this figure, but a large amount of cutting had been done in them before these measurements were taken, and none has been under the most favorable management.

Cottonwood grows best on rich, well-drained bottomlands. On uplands it will succeed in low situations, such as ravines and valleys, but on high, dry land is very apt to be killed by drought, and at best will yield considerably less than on bottomlands. The trees may do well for one, two, or several years, and then suddenly die. In the season of 1894, one of the driest in the history of the state, a very large proportion of cottonwood on the dry upland was either badly damaged or killed altogether.

The yield table for cottonwood is of interest as showing the relative value of saw-log and fuel-wood products. The table shows a total yield of 53,514 board feet of saw logs. These saw logs contain 260.1 cords of fuel wood. The common stumpage value of saw logs is \$10 per thousand, and of fuel wood \$2 per cord.

53,514 board feet, at \$10 per thousand.....	\$535 14
260.1 cords, at \$2.....	520 20
Difference.....	\$14 94

In other words, unless saw logs command at least \$10 per thousand on the stump, it is more profitable to sell the wood at \$2 per cord.

Though the average of saw-log yields is low, the growing of cottonwood lumber under proper management would pay good returns. It is coming more and more into use as a building material. From its tendency to warp, it cannot be used where it is exposed to the weather, but for rough interior woodwork it is excellent. The lumber is also used locally for bridge planking, and gives excellent service. Elsewhere cottonwood is sold for the manufacture of paper pulp, boxes, furniture backs, and washboards.

TABLE 4.—Yield of cottonwood.
BOTTOM LAND.

No. of Plan- tation	County	Area of Grove	Age of Grove	Dominant Trees		Yield Per Acre							
				Aver- age Di- ameter Breast- high	Num- ber Trees Per Acre	Saw-logs			Fuel Wood in Addition		Total		Aver- age An- nual
						Bd Ft.	Cu. Ft.	Cord	Cu. Ft	C'rds	C'rds		
1	Colfax ...	2.50	16	6.6	268	284	1566	18.2	1679	19.5	1.2		
2	Madison...	2.70	18	9.8	290	.....	4147	48.2	4147	48.2	2.7	
3	Platte.....	.48	18	8.5	413	.....	4109	47.8	4109	47.8	2.7	
4	Hamilton..	.60	22	11.4	280	.....	3709	43.1	3709	43.1	2.0	
5	Dodge.....	2.40	22	10.8	2.1	1612	2842	33.0	3561	41.4	1.9		
6	Dixon.....	5.00	23	13.8	180	5756	5016	58.3	7083	82.4	3.6		
7	Pierce.....	40.00	25	12.1	185	3007	3544	41.2	4809	55.9	2.2		
8	Wayne.....	1.60	25	12.4	240	1790	3440	40.0	4362	50.8	2.0		
9	Jefferson..	.70	25	11.2	338	2362	2139	24.9	3193	37.1	1.5		
11	Madison... 2.80	26	11.7	250	250	3597	6747	78.5	8171	95.0	3.7		
11	Merrick... 2.30	26	14.2	96	96	4282	1774	20.6	3638	42.3	1.6		
12	Madison... 2.00	29	12.0	220	220	3154	4820	56.0	6152	71.5	2.5		
13	Colfax..... 4.00	34	11.0	137	137	940	3201	37.2	3594	41.8	1.2		
14	Lancaster. 10.00	35	16.7	134	134	3185	4361	50.7	5324	61.9	1.8		
15	Hall..... 2.20	36	13.8	120	120	5080	2358	27.4	4812	56.0	1.6		

UPLAND.

16	Stanton ...	1.50	11	4.8	800	.....	.....	.....	1830	21.3	1.9
17	Pierce.....	2.20	13	6.7	410	.....	.....	.....	1975	23.0	1.6
18	Wayne.....	5.50	17	4.3	702	.....	.....	.....	1214	14.1	.8
19	Saunders..	1.50	18	13.1	220	1593	3388	39.4	4102	47.7	2.7
20	Cum ng ...	4.50	18	6.9	308	.....	.....	.....	2047	23.8	1.3
21	Colfax.....	1.75	20	5.4	612	.....	.....	.....	2034	23.7	1.2
22	Lancaster. 12.00	30	11.4	160	160	297	1853	21.5	2012	23.4	.8
23	Madison... 50.00	31	18.8	129	129	4019	3740	43.5	5310	61.7	2.0
24	Wayne..... 2.70	33	14.4	126	126	6052	2373	27.6	4662	54.2	1.6
25	Cuming... 2.50	33	11.6	181	181	2167	3272	38.0	4383	50.8	1.5
26	Cuming... 12.00	33	9.9	172	172	763	2813	32.7	2192	37.1	1.1
27	Otoe..... 20.00	34	12.7	179	179	1389	2511	29.2	3133	36.4	1.1

Plantation No. 2.—This plantation is situated on land that is subject to overflow in wet seasons, and for this reason is especially adapted to the growing of trees. The altitude is approximately 1,500 feet. The soil is a rich, sandy loam and very deep.

The ground was put in a good state of cultivation just before it was planted, and the trees were set in furrows, 1-year-old seedlings being used. The spacing was 8 by 12 feet, thus requiring 454 trees per acre. A crop of corn was grown between the rows the first year, and the trees have never received any further cultivation. No data could be obtained on the returns from this crop, but it safe to assume that it met the expense of the cultivation, which is therefore omitted in calculating the cost. The grove has never been pastured, and only the dead or dying trees have been cut out from time to time.

The trees are tall, straight, and thrifty. Owing to wide spacing, the stems are branchy. Of the present stand of trees 77 per cent will class as dominant and the remainder as intermediate. The ground is covered with a fairly dense stand of weeds and grass.

No data could be obtained on the cost of establishing this plantation,

but the estimated cost is given below. The fuel wood would have a stumpage value of at least \$2 per cord were it cut and sold. However, the wood is being consumed at home, thus saving the haulage, which would be at least fifty cents per cord. In reckoning the returns, therefore, a stumpage value of \$2.50 per cord is assumed.

Preparation of ground.....	\$2 50
Trees, 454, at \$2.50 per thousand.....	1 14
Planting	2 00
Cultivation (cost paid by corn crop).	
	<hr/>
Total.....	\$5 64
Interest on \$5.64 for eighteen years, at 5 per cent, compounded.....	7 93
	<hr/>
Total cost with 5 per cent compound interest at the end of eighteen years.....	\$13 57

48.2 cords, at \$2.50 stumpage, farm value (value at
end of eighteen years).....\$120 50

Deducting the cost, \$13.57, from the value, \$120.50, leaves \$106.93 as the net value, which is equivalent to annual net income of 5 per cent compound interest of \$3.80 per acre.

The plantation affords an excellent example of what can be done by growing trees on land that is too wet for field crops. By planting it to trees, it furnishes a continuous supply of fuel, affords protection to the home, and yields a rental value above that of farm lands in the same locality during the same time. If the spacing had been closer and the plantation given good care, the returns would have been increased. The yield table for cottonwood shows that this plantation has given an annual yield of 2.7 cords per acre. Others made an equally good showing, and two furnish much higher yields.

HARDY CATALPA.

A considerable amount of hardy catalpa and its hybrids has been planted in southeastern Nebraska. The hardy kind succeeds well in this part of the state, but most of the hybrid forms have failed, and on this account catalpa is in ill repute with many people. A study of the table, however, will prove that hardy catalpa will not only succeed, but under right conditions will yield paying returns. Plantation 4 is now being harvested. Six acres were cut clear the past two winters, and the fence posts have yielded a gross return of \$207 per acre. The owner values the additional fuel wood at \$5 per acre. The cost of harvesting the crop was \$25 per acre. The first-class posts sell for 14 cents, the second-class for 9 cents, the third-class, or stakes, for 4 cents. The value of the fence posts in No. 12 is \$332 per acre, and material worth \$52 per acre has been sold from this plantation in the past two years, making its gross value \$383 per acre, to say nothing of the large number of posts that were previously cut from it.

All the plantations herein reported are in the region south of the Platte river and east of Hastings. As a rule, the species has not done well west of York. It was not found in plantation form north of the Platte river, though many single trees in good condition were noted. Successful plantations may be seen at Yankton and Viborg, S. D. Hardy catalpa can probably be grown on good soils throughout the region covered by this report, except in the sand-hills. Wherever it will succeed, no other tree will pay so well. It requires a deep, fertile, porous soil, and the situation is still more desirable if the water table is within 10 or 15 feet of the surface. These conditions exist in many of the river bottoms, especially in the Platte river valley.

TABLE 5.—Yield of hardy catalpa.

No. of Plantation	COUNTY		Area of Grove		Age of Grove		Dominant Trees		Yield Per Acre							Fuel Wood	
									Total		Posts			Average Annual Posts			
											1st	2d	Total	1st	2d		Total
			Acr's	Yrs	Inch	Number of Trees Per Acre	Ct.Ft	C'rds	No.	No.	No.	No.	No.	No.	C'rds		
1	Pawnee ...		13	14	4.3	1583	2378	27.7	647	1363	2010	46.2	97.3	143.5	2		
2	Pawnee ...		8	15	3.1	2571	1687	19.1	18	510	528	1.2	34	35.2	1.3		
3	Richardson		.75	17	2.9	2624	2196	25.5	220	156	376	12.9	9.2	22.1	1.5		
4	Butler.....		14.50	19	3.7	1747	1759	20.5	460	1096	1556	24.2	57.7	81.9	1.1		
5	Lancaster.		.75	20	3.3	800	1010	11.7	.....	256	256	.....	12.8	12.8	.6
6	Adams.....		.32	20	3.3	1737	1229	14.3	34	179	213	1.7	9	10.7	.7		
7	Richardson		.50	20	6	376	1237	14.4	721	300	1021	36.1	15	51.1	.7		
8	York		2.50	21	4.7	406	651	7.6	242	140	382	11.5	6.7	18.2	.4		
9	York		1.70	23	5	241	651	7.6	326	160	476	14.2	6.5	20.7	.3		
10	York		2.00	24	5.5	592	1421	16.5	702	532	1234	29.3	22.2	51.4	.7		
11	Lancaster.		.52	25	6.7	660	1655	19.2	931	542	1473	37.2	21.7	58.9	.8		
12	Nemaha...		2.40	25	6.6	747	4129	48	1829	845	2674	73.2	33.8	107	1.9		

Plantations Nos. 1 and 2.—These plantations occupy adjacent grounds, belong to the same person, and have been given exactly the same care. They are treated together, therefore, in order to compare the returns. They are situated on upland prairie. The altitude is approximately 1,200 feet. The soil is a sandy loam with a small admixture of gravel. The subsoil is of clay. The land occupied by No. 1 was in virgin prairie sod till the spring of 1899, when it was broken out and allowed to stand idle till the following year. No. 2 is on land that was old and worn out when the trees were planted.

Plantation No. 1 was established in 1890, No. 2 in 1889, their respective ages when measured being 14 and 15 years. In both cases the ground was put in a thorough state of cultivation immediately before the trees were planted. One-year-old stock was used, spaced 4 by 4 feet. The plantations were cultivated like corn the first two years, since when no further care has been given them, except that a few acres were pruned several years ago.

The general health and appearance of the trees are good, and the plantations on the whole are thrifty. There is some decay noticeable,

caused by fungus entering where the dead limbs have persisted. The plantations have always been protected against fire and live stock, and every opportunity has been afforded, therefore, for the building up of forest conditions. The crown cover, save for an opening here and there, is quite complete, and demonstrates that catalpa can be depended upon to form a canopy sufficiently dense to shut out weeds and grass.

The owner has kept a strict account of all expenses incurred in establishing and maintaining these plantations, and the figures given on the cost are taken from his records. The cost is assumed to be the same for both plantations.

Plantation No. 1.

COST (ACTUAL).	RETURNS.
Plants, 2,722, at \$1.15 per M.. \$3 13	First-class posts, 647, at 14 cents \$90 58
Preparation of the ground, cultivation, and pruning.. 18 46	Second-class posts, 1,363, at 9 cents..... 122 67
Total.....\$21 59	
Interest on \$21.59 for fourteen years, at 5 per cent, compounded 21 16	
Total cost at the end of fourteen years .....\$42 75	Value at the end of fourteen years.....\$213 25

Deducting the cost, \$42.75, from the value, \$213.25, leaves \$170.50 as the net income at the end of fourteen years, which is equivalent to an annual income at 5 per cent compound interest of \$8.69 per acre.

Plantation No. 2.

COST (ACTUAL).	RETURNS.
Plants, 2,722, at \$1.15 per M.. \$3 13	First-class posts, 18 at 14 cents \$2 52
Preparation of the ground, cultivation, and pruning... 18 46	Second-class posts, 510, at 9 cents 45 90
Total.....\$21 59	
Interest on \$21.59 for fifteen years at 5 per cent compound interest..... 23 29	
Total cost at the end of fifteen years.....\$44 88	Value at the end of fifteen years.....\$48 42

Deducting the cost, \$44.88, from the gross returns, \$48.42, leaves \$3.54 as the net income at the end of fifteen years, which is equivalent to an annual net income at 5 per cent compound interest of 16 cents per year.

This plantation would make a much better showing if measured in three or four years. Because of the impoverished condition of the soil, the trees are only just reaching post size. Most of them are sound and thrifty and will make fence posts in a few years.

These two plantations make it clear that catalpa requires a good

soil for its best development, and emphasizes the fact that with trees as with other crops the highest returns are realized from the best soils.

GREEN ASH.

Next to cottonwood, green ash has been the most widely planted tree in eastern Nebraska. Its range for planting comprises the entire region, except portions of the sand-hills. It succeeds best on low land, yet no other tree, except possibly honey locust, is so well adapted to dry upland planting. In the sand-hills it cannot be planted on the upland, but does tolerably well in the valleys.

In general, the timber of green ash is only slightly inferior to that of white ash, and the tree is much hardier. It should be planted mainly for posts and fuel. Its fuel value is relatively high, and under favorable conditions a yield of at least 1 cord per year per acre may be realized. As a post timber green ash is not among the best, but is widely used. When cut in the fall or winter and thoroughly seasoned the posts are fully twice as serviceable as when set green. Its diameter growth is somewhat lower than that of catalpa. In good soil it will attain post size in from twelve to fifteen years, but since its heartwood does not develop early, posts cut from young trees are not very durable.

TABLE 6.—Yield of green ash.

No. of Plantation	COUNTY	Area of Grove		Age of Grove		Dominant Trees		Yield Per Acre							
		Acres	Yrs	Average Diameter	Breasthigh	Number of Trees Per Acre	Total		Posts			Average Annual Posts			Fuel Wood
									1st	2d	Total	1st	2d	Total	
1	Jefferson...	1.30	17	3.1	540	275	3.2	.....	25	35	.....	2.1	2.1	0.2
*2	Washington...	2.50	17	4.7	1083	1326	15.4	310	430	740	18.2	25.3	43.5	.9	
3	Nemaha...	1.00	18	3.7	1054	1582	18.4	442	494	936	24.6	27.4	52.0	1.0	
4	Polk.....	.92	19	4.2	965	840	9.8	130	365	495	6.8	19.2	26.0	.5	
5	Colfax.....	1.50	19	2.9	844	523	5.1	28	172	200	1.5	9.1	10.5	.3	
6	Hall.....	2.50	20	2.4	1304	722	6.4	20	38	48	1.0	1.4	2.4	.4	
7	Clay.....	3.43	20	4.2	1446	963	11.2	30	232	262	1.5	11.6	13.1	.6	
8	Otoe.....	3.00	21	4.5	744	1014	11.8	290	464	754	13.8	22.1	35.9	.6	
9	Hamilton...	2.50	21	4.2	932	1011	11.8	167	312	488	8.4	14.9	23.2	.6	
10	York.....	7.00	21	4.2	714	1004	11.7	288	502	790	13.7	23.9	37.6	.6	
11	Fillmore...	.99	21	3.7	928	973	11.3	218	294	512	10.4	14.0	24.4	.5	
12	Polk.....	1.20	21	4.9	725	1263	14.7	300	317	617	14.3	15.1	29.4	.7	
13	Kearney...	1.04	21	6.2	805	1611	18.7	702	504	1206	33.4	24.0	57.4	.9	
14	Richardson	.80	21	4.3	1192	2063	24.0	1072	584	1656	51.1	27.8	78.8	1.1	
15	Johnson...	.95	22	5.1	492	640	7.4	228	312	540	10.4	14.2	21.5	.3	
16	Saunders...	1.56	22	4.8	446	648	7.5	138	188	328	6.3	8.5	14.8	.3	
17	Hamilton...	1.10	23	5.3	496	1339	15.6	294	280	574	12.8	12.2	25.0	.7	
18	York.....	1.70	23	4.7	835	1492	17.3	425	410	835	18.5	17.8	36.3	.8	
19	Webster...	6.60	25	3.8	517	843	4.0	51	155	206	2.1	6.2	8.3	.2	
20	Fillmore...	4.24	25	5.7	345	1067	12.4	190	111	301	7.6	4.4	12.0	.5	
21	Lancaster...	.48	25	5.3	497	1269	14.8	327	240	567	13.1	9.6	22.7	.6	
22	Clay.....	3.10	27	6.2	309	1001	11.6	441	208	649	16.3	7.7	24.0	.4	
23	*Butler...	.38	29	4.9	950	1735	20.1	490	480	970	16.9	16.6	33.4	.7	
24	Clay.....	5.30	30	5.8	352	860	10.0	246	184	430	8.2	6.1	14.3	.3	
25	Saunders...	1.50	30	6.1	368	1662	19.3	1068	370	1438	35.6	12.3	47.9	.9	
26	Saunders...	1.10	30	7.4	236	2273	26.4	1162	486	1648	38.7	16.2	54.9	.6	
27	Saunders...	1.50	32	4.6	553	1106	12.9	343	330	673	10.7	10.3	21.0	.4	
28	Cuming...	.25	33	4.6	530	1272	14.8	465	420	885	14.1	12.7	26.8	.5	
29	Saunders...	3.10	33	7.0	383	1623	18.9	1040	429	1640	31.5	12.7	44.2	.6	

* Bottom land.

Plantation No. 13.—This plantation is situated on rolling upland, though it is cut by a small draw. The soil is a deep, fertile, sandy loam. In the draw it is covered by humus to a depth of several feet. On the tops of the knolls it is lighter in color, and humus is lacking.

The trees were planted in 1883, one-year-old seedlings about 8 inches high being used. These were small and inferior in quality. Before planting the ground was plowed and subsoiled to a depth of 18 inches, and afterwards thoroughly harrowed. The spacing was 6 by 8 feet, requiring 908 trees per acre. Cultivation was given for the first seven years. The trees were pruned six or seven years ago to a height of 8 feet. The grove has always been protected from live stock.

Forty dollars' worth of posts, poles, and fuel per acre have been cut from the plantation.

The trees are tall and straight, with bushy crowns. The old wounds caused by pruning are completely healed over. All the trees will furnish posts, some as many as six.

The success of this plantation is remarkable, since it is located within a few miles of the ninety-ninth meridian, where the conditions are semi-arid. It is probable that this success is due to the deep plowing given the ground before it was planted, and the subsequent cultivation given the plantation until the trees were large enough to take possession of the soil.

The cost of establishing and maintaining this plantation is given in the owner's record. The prices assigned the posts are considerably lower than those which the owner says he can obtain.

COST (ACTUAL).	RETURNS.
Preparation of the ground.. \$3 50	First-class posts, 702, at 10 cents
Plants, 908, at \$2 per M.... 1 81	Second-class posts, 504, at 7½ cents.....
Planting	Posts, poles, and fuel cut in the past.....
..... 75	..... 40 00
Cultivation, seven years..... 5 00	
Pruning	
..... 2 00	
Fencing	
..... 1 00	
Total.....	
.....\$14 06	
Interest on \$14.06 for twenty-one years, at 5 per cent, compound interest.....	
..... 25 11	
Total cost at the end of twenty-one years.....	Value at the end of twenty-one years.....
.....\$39 17	.....\$148 00

Deducting the cost, \$39.17, from the value, \$148, leaves \$108.83 as the net income at the end of twenty-one years, which is equivalent to a net annual income, at 5 per cent compound interest, of \$3.05 per acre. Anyone who knows the conditions that have prevailed in this part of the state and the reverses that farming has suffered for the period included in the life of the plantation knows that this would be a splendid showing for any sort of crop. Adding to the returns the value of the plantation as a windbreak to the farmstead, it has yielded the owner handsome

profits on his investment, besides enhancing the value of the farm of which it forms a part. With the same careful management green ash would give better returns farther east in the state. Several other plantations included in the yield table for this species show a yield in fence posts per year not far behind this one, and for No. 14 the returns are considerably better.

In view of the showing made by green ash, particularly in the more unfavorable western counties, it is obvious that it should have a prominent place in future planting.

BLACK WALNUT.

Black walnut requires a rich soil for its best development. It is especially adapted to the river valleys, where the soil is fertile, moist, and well drained. It will succeed fairly well on the upland in the eastern counties, but it should be planted commercially only on the bottomlands. Its growth in diameter is nearly equal to that of catalpa, and under favorable conditions it will reach post size in from ten to twelve years. Young timber, however, because of its large percentage of sapwood, does not make a first-class fence post, and the rotation should in consequence be not less than twenty-five years.

Walnut makes good fuel, but its timber is too valuable to be used for this purpose. The greatest returns will be realized from this species when it is planted for lumber. The time required for the production of saw logs, however, is from seventy to eighty years, which is a longer rotation than the average planter could afford to adopt.

Black walnut cannot be depended upon to form a complete crown cover. It is very intolerant under Nebraska conditions, and shades itself out before it has formed a canopy anything like dense enough to shut out weeds and grass. The species therefore should be planted in mixture with some more heavily foliated tree. For bottom soils a mixture of walnut and hardy catalpa, in the proportion of 1 to 3, according to the following diagram, is suggested:

(4 feet by 4 feet.)

```

W  C  W  C
  C  C  C  C
W  C  W  C
  C  C  C  C

```

W—black walnut; C—hardy catalpa.

Number of trees required per acre.

Black walnut	680
Hardy catalpa	2,040
Total	2,720

The walnut should be planted two years in advance of the catalpa, since, if the two are planted at the same time, there is danger that the

walnut will be overtopped. A field crop, such as potatoes, could be grown with the walnut for the first two years. The catalpa should be planted in the spring of the third year. After eight or ten years it may be gradually thinned out, and by the time the plantation is 25 years old three-fourths of the catalpa and all defective walnut trees should have been removed. This will leave most of the walnut trees, but only the best specimens of the catalpa, and at this time the stand will probably not exceed 700 to 800 trees per acre of both species. By the fortieth year the remaining catalpa should have been harvested as well as all defective specimens of the walnut, leaving a probable stand of 400 trees, which by this time will have attained sufficient size to take care of themselves. It is likely that in the openings a certain percentage of the catalpa stumps will sprout, and this sprout growth will still further assist the walnut.

TABLE 7.—Yield of black walnut.
BOTTOMLAND.

No. of Plantation	COUNTY	Area of Grove		Age of Grove		Dominant Trees		Yield Per Acre								
		Acres	Yrs	Average Diameter	Breasthigh	Number of Trees Per Acre	Total	Saw Logs	Posts			Average Annual Posts			Fuel Wood—Cords	
									1st	2d	Total	1st	2d	Total		
1	Dixon	5.00	15	6.6	228	817	9.5	894	154	548	26.3	10.3	36.5	0.6		
2	Washingt'n	2.17	30	6.7	690	2319	27.0	.....	.....	.....	.....	.....	.....	.....
3	Burt	4.70	32	9.0	244	2558	29.7	320	1192	284	1476	37.3	8.9	46.1	.9	
4	John-son	.50	32	8.2	328	2382	27.7	.....	1240	368	1608	88.8	11.5	50.3	.9
5	Douglas	.74	33	12.1	97	2628	30.5	1500	.....	.....	.....	.....	.....	.....	.9
6	Otoe	.50	34	7.9	300	1564	18.2	.....	1596	666	2262	46.9	19.6	66.5	.5
7	Burt	12.50	34	8.4	316	3045	35.5	.....	1862	316	2178	54.8	9.3	64.1	1.1

UPLAND.

8	Richards'n	0.70	18	4.3	901	1803	21.0	.....	734	535	1269	40.8	29.7	70.5	1.2
9	Stanton	.50	19	5.2	532	1117	13.0	.....	488	358	846	25.7	18.8	44.5	.7
10	Cass	1.40	23	5.7	510	1140	13.3	.....	740	494	1234	32.2	21.5	53.7	.6
11	Johnson	1.50	30	7.2	264	1060	12.3	.....	806	72	878	26.0	2.4	29.3	.4
12	Saunders	.....	31	6.7	266	1631	19.0	.....	950	218	1168	30.7	7.0	37.8	.7
13	Cass	8.00	42	11.2	209	3688	42.9	1720	1637	282	1919	89.0	6.7	45.7	1.0

Plantation No. 7.—This plantation is situated on the Missouri river bottom. The soil is a rich black loam, 5 to 6 feet deep. It is fresh, porous, and exceedingly fertile. The site is traversed by a small stream, which occasionally overflows and courses out through the grove, inundating a good part of it. Water does not stand on the surface more than a day or so.

The plantation was grown direct from the seed. Cultivation had been given the land for two years previous to planting. The nuts were planted in the fall of 1869. After the ground had been plowed and harrowed as for corn, single rows, 4 feet apart, were marked off with a

common marker. Furrows were then run 8 feet apart at right angles to the marks. The nuts were dropped at the intersection of the furrows with the marks, thus giving a spacing of 4 feet by 8 feet. One nut was planted at a place, making 1,360 nuts per acre. It required 25 bushels ("shucks" on) to plant the $12\frac{1}{2}$ acres. They were purchased from the Indians at 25 cents per bushel. After the nuts were dropped, they were covered by filling the furrows with a harrow. This covered them rather too deep, so that only two-thirds of the number came up the first year.

In the spring of 1870 corn was planted in every other row, thus giving nearly a half stand. Both the corn and the trees were thoroughly cultivated and a good half crop of corn was raised that year. In the spring of 1871 the land was sowed to oats and an excellent crop was raised. The oats were harvested with a scythe. The ground was left in the stubble and the plantation has received no further cultivation.

In the spring of 1872, and again in 1875, the trees were pruned, at a total cost of \$2 per acre. No further expense has ever been incurred in the care of the plantation. The practice has been to cut the suppressed or otherwise inferior trees. These have furnished about 1,000 fence posts, or 80 posts per acre, and the additional firewood has paid for the cost of harvesting the posts. The plantation has been moderately pastured to hogs since the third year of its life.

There is only a trace of humus. The litter consists of leaves and twigs and is from one-fourth to one-half an inch deep. Bluegrass and weeds cover the entire surface though the sod is nowhere dense. An occasional clump of elderberry and a few gooseberry bushes constitute the only underbrush.

The trees were pruned early and there is a large percentage of clear, straight boles. A few would make small saw logs. They have made an excellent height growth and are in a healthy, thrifty condition. The practice of making gradual thinnings to favor the best trees leaves the present stand comparatively free from disease or defects of any kind.

The statement of the cost of this plantation is taken from the owner's record. The two field crops raised in the plantation paid for its entire cost, which is, therefore, not considered in calculating the final returns.

COST (ACTUAL).	RETURNS.
Plowing the ground .....\$0.75	First-class posts, 1,862, at
Harrowing and marking .... .25	$12\frac{1}{2}$ cents .....\$232.75
Nuts, 2 bushels, at 25 cents . .50	Second-class posts, 316, at
Planting ..... .40	8 cents 25.28
Pruning 2.00	Posts sold in the past 80.00
	Value at the end of
	thirty-four years ...338.03
Total .....\$3.90	

Three hundred and thirty-eight dollars and three cents as the net income at the end of thirty-four years is equivalent to an annual net

income at 5 per cent compound interest of \$3.97. It is estimated that the rental value of the land as a hog pasture has been at least \$1 per acre, which added to \$3.97 gives nearly \$5 as the total annual net income per acre above 5 per cent compound interest.

HONEY LOCUST.

Honey locust is an exceedingly valuable tree for planting in Nebraska. It is hardy, enduring extremes of both heat and cold, is drought resistant, and fairly free from insect attacks and fungous diseases. Like green ash, it thrives best on well-drained bottomland soils, but it is unusually well adapted for upland planting in the dry sections. It should be widely planted in the western counties.

The economic uses of the timber of honey locust are chiefly for fuel and fence posts. It will produce about one cord of fuel yearly per acre. Its rate of growth in diameter is somewhat more rapid than that of green ash, and it reaches post size earlier. Yield Table 8 shows that one plantation near Grand Island has produced 2,141 posts in twenty-nine years, or 73 posts per year; while another near Verdon, in Richardson County, gave a yield in thirty-five years of 2,644 posts, or an average of 76 posts per year. The timber to be durable in contact with the ground must be well seasoned.

TABLE 8.—Yield of honey locust and Osage orange.

HONEY LOCUST.

No. of Plantation	COUNTY	Area of Grove		Age of Grove		Dominant Trees		Yield Per Acre								
		Acr's	Yrs	Average Di- ameter	Breasthigh Number of Trees Per Acre	Total		Posts			Average Annual Posts			Fuel Wood— Cords		
								Cu. Ft.	C'rds	No.	No.	No.	No.		No.	No.
1	Adams	0.72	18	3.6	600	506	5.9	110	197	307	6.1	10.9	17.1	0.3		
2	Adams	1.70	23	4.2	1052	1109	12.9	102	280	382	4.4	12.2	16.6	.6		
3	Johnson	1.29	28	4.7	895	1313	15.6	420	405	825	15.0	14.5	29.5	.6		
4	Hall .....	.82	29	6.0	1028	2941	34.1	1314	827	2141	45.3	28.5	73.8	1.2	
5	Richardson ..	2.25	35	6.5	474	4094	47.6	2196	448	2644	62.7	12.8	75.5	1.4		

OSAGE ORANGE.

1	Nemaha. ...	2.17	32	6.3	453	2046	23.8	760	522	1283	23.8	16.3	40.1	0.7
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Plantation No. 4.—This plantation is situated in the Platte River Valley, and its relative altitude is only a few feet above the river. The absolute altitude is about 1,860 feet.

The soil is a sandy loam, dark gray to blackish in color. It is deep, fresh, mellow, porous, and exceedingly fertile. The subsoil is a light-colored, porous, loamy sand, intermixed with small gravel.

Only very meagre data could be obtained on the history of this plan-

tation. The original stand was 1,418 trees per acre, making the spacing a little less than 4 by 8 feet. The present stand is 1,028 trees per acre. The loss is mainly due to natural thinning, since little cutting has been done. About 40 per cent of the present stand has become suppressed, and many of these trees are dying. There should be an improvement cutting made, which would remove the deteriorating trees. The grove has been used as a hog pasture for many years.

COST (ESTIMATED).		RETURNS.	
Preparation of the ground..	\$2.50	First-class posts, 1,314, at 10	
Plants, 1,400, at \$3 per		cents	\$131.40
thousand	4.20	Second-class posts, 827, at	
Planting	3.00	7½ cents.....	62.03
Cultivation, three years	5.00		
Total	\$14.70		
Interest on \$14.70 for twenty-			
nine years, at five per cent			
compounded	45.80		
Total cost at end of		Value at end of twenty-	
twenty-nine years....	\$60.50	nine years	\$193.43

Deducting the cost, \$60.50, from the gross returns, \$193.43, leaves \$132.93 as the net income at the end of twenty-nine years, which is equivalent to an annual net income with 5 per cent compound interest of \$2.13 per acre, disregarding the thinnings. To this there should be added the rental value of the land for pasture, since it has been used for this purpose. Furthermore, the plantation forms part of an extensive shelterbelt, which completely surrounds the farm buildings and thus assumes a value as a protection, though it is impossible to express this in dollars and cents.

OSAGE ORANGE.

When the state was first settled, Osage orange was planted extensively for hedge fences, especially in the southeastern counties, though but few such fences have been planted in recent years. This species has never been widely planted in groves. Only two or three plantations were noted in the course of the study. Osage orange is one of the valuable trees for forest planting, and should be more extensively used for this purpose. It is hardy south of the Platte River, but should be planted sparingly north of it since it is likely to winter kill.

To succeed commercially, Osage orange requires a moderately rich soil. It is fairly drought resistant, but unless moisture conditions are favorable its growth is slow. Planting will be most profitable in the river valleys, where the soil is fertile and moist. On uplands, especially in poor soils, it fails. A notable example of such failure is a 17-acre plantation in Pawnee County established in 1889. The site is typical prairie upland, and the soil was old and worn when planted. The trees

have done very poorly. They are short, often not over 5 feet high, and very branchy, and will never be of much value. It is true that no tree could have made its best growth on this site, but if the ground had been planted to hardy catalpa the results would have been much better, as is evidenced by the fact that where catalpa and Osage orange are planted side by side on this tract the former is from 6 to 10 feet the taller, and is a much superior tree in every way.

With the introduction of barb-wire fences, Osage orange as a fence material has gone out of favor, and its use for this purpose in Nebraska is probably a thing of the past. As a post timber, however, it is unexcelled, and it is chiefly for this that it is recommended for commercial planting. Under favorable conditions it will reach post size in from twelve to fifteen years. Because of the well-known durability of Osage orange in contact with the ground and its great strength, it always commands good prices. The fuel value of the tree is very high, and the cordwood from a plantation gives it an added value. For farm repairs, too, such as whiffletrees, plow beams, etc., it is exceedingly valuable.

The windbreak value of Osage orange must not be overlooked. Its low-branching habit and ability to grow in close stands make it one of the most valuable of the broadleaf trees for this purpose.

Plantation No. 1.—This plantation is situated on a prairie upland farm. The site is low and slopes gently to a ravine along the west side. The soil is a rich black loam, fresh, well drained and deep. The subsoil is a clay, underlaid with limestone at a depth of from 10 to 12 feet.

The ground was used first as a seedbed for growing Osage orange plants for the market when this species was being planted so extensively as a hedge fence. When hedge fences went out of favor the demand for plants ceased and the seed bed was abandoned. The last crop of plants was sold in the spring of 1871, and the present stand has sprung up from the culls that were left at that time. The young plants were twice turned over in an effort to destroy them, but each time they came up from the roots again. The plan was then tried of grubbing them out but even this heroic treatment was a failure. It was then decided to allow the plantation to stand. It has never had care of any sort. On the contrary it has been very severely pastured by all kinds of live stock. Despite these adverse conditions it is a valuable plantation, as its products will show.

The owner has sold 100 telegraph poles per acre from the plantation in the past two years. The poles ran from 16 to 20 feet in height, and would average 18 feet. It is estimated that 700 first-class and 500 second-class posts per acre have been cut from these groves in the past. This estimate is believed to be conservative, since the owner states that the plantation has furnished a considerable part of the posts required in keeping his 450-acre farm fenced for twenty years. He has also cut more or less material, such as wagon reaches, tongues, whiffletrees, and

windmill posts. This material, together with the additional fuel wood, it is estimated would meet the cost of cutting the posts.

The heavy pasturing of the plantation for many years has prevented the development of forest conditions. There is only a trace of humus, and a very small amount of litter. Ground cover and underbrush are almost completely shut out by the live stock and shade. Reproduction is prevented for the same reasons.

With but few exceptions the trees are sound. A few have been scarred by the rubbing of stock, and there is some decay where limbs have been broken off. The trees tend to be branchy and rather crooked.

Since the plantation sprang up voluntarily and has never received cultivation or other care there was no expense in establishing and maintaining it. However, the estimated cost of establishing such a plantation at the present time is taken into account in calculating the net income, in order that the computation of returns may be of greater practical benefit to prospective planters.

COST (ESTIMATED).		RETURNS.	
Preparation of the ground ...	\$2.50	First-class posts, 760, at 15 cents	\$114.00
Plants, 2,722, at \$2 per thousand	5.44	Second-class posts, 522, at 10 cents	52.20
Planting	6.00	Poles cut in past, 100, at 60 cents	60.00
Cultivation, three years	5.00	First-class posts cut in the past, 700, at 15 cents	105.00
Total	\$18.94	Second-class posts cut in the past, 500 at 10 cents	50.00
Interest on \$18.94 for thirty-two years at 5 per cent compounded	71.31	Net income at the end of thirty-two years.....	\$381.20
Total cost at end of thirty-two years	\$90.25		

Deducting the cost, \$90.25, from the present value, \$381.20, leaves \$290.95 as the net value, which is equivalent to an annual net income with 5 per cent compound interest of \$5.06 per acre. This may be regarded as net profit, since the plantation has always been used to its full capacity as a part of the farm stock yards. It has afforded also ideal shade and shelter for stock for many years, though the abuse from this cause has reduced materially the returns from the project. Had this plantation always been under good management it would have made a still better showing in the value of the returns.

TABLE 9.—*Yields of other species.*

WHITE WILLOW.

Number of Plantation	COUNTY	Area of Grove	Age of Grove	Dominant Trees		Yield Per Acre		
				Average Diameter Breast-high	Number Trees Per Acre	Total		Average Annual
		Acres	Years	Inches		Cu. F.	Cords	Cords
1	Washington.....	1.20	16	5.5	826	3967	46.1	2.9
2	Dodge.....	1.60	22	8.2	384	4339	50.5	2.3

SILVER MAPLE.

1	Otoe.....	1.00	14	4.6	340	949	11.0	0.8
2	Jefferson.....	2.70	16	2.9	1668	1879	21.8	1.4
3	Richardson.....	.65	18	4.2	1418	3120	36.3	2.0
4	Dodge.....	7.50	25	6.9	437	3321	38.6	1.5
5	Cass.....	1.50	27	7.0	403	2546	29.6	1.1
6	Saunders.....	2.09	30	8.6	238	2246	26.1	.9
7	Cass.....	.81	32	8.4	518	3628	42.2	1.3
8	Saunders.....	2.10	33	7.9	303	2639	30.7	.9
9	Dodge.....	10.00	31	9.9	221	2055	49.6	1.5

BOXELDER.

1	Lancaster.....	2.50	18	2.9	798	500	5.8	0.3
2	Lancaster.....	1.00	24	6.8	333	1519	17.7	.7
3	Platte.....	.30	24	5.9	666	3218	37.3	1.6
4	York.....	1.50	25	8.7	302	3443	40.0	1.6

WHITE PINE.

1	Otoe.....	1.80	12	4.6	916	1489	17.3	1.4
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WHITE WILLOW.

In mentioning the trees suitable for planting in eastern Nebraska white willow must not be omitted. It is hardy throughout this region. It has been widely planted as a wind-break, for which purpose its quick growth, profuse branching habit, and hardiness especially commend it. Its fuel value is somewhat greater than that of cottonwood, though in plantations it does not grow quite so rapidly. Like the cottonwood, it is a moisture-loving tree, and on this account does not do well on dry upland. It is especially adapted for planting on low, marshy ground bordering the streams and ravines. White willow has been used to some extent for fence posts, and for this it is somewhat more durable than cottonwood. Its tendency to produce a crooked stem makes it difficult to grow a large percentage of straight trees per acre.

Plantation No. 2.—This plantation is situated on the first bottom of the Platte River. The altitude is about 1,200 feet. The soil is a rich sandy loam. The plantation was established by planting 1-year-old seedlings in rows 8 feet apart, and 2 feet apart in the row, thus requiring 2,722 trees per acre. It evidently has had very little care of any sort, and always has been used as a hog pasture. Heavy thinnings have furnished fuel for years.

Since the fuel value of white willow is about 15 per cent higher than that of cottonwood, it is worth at least 25 cents more per cord. The fuel wood from this plantation is being consumed at home, and hence is given a farm value.

COST (ESTIMATED).		RETURNS.	
Preparation of ground.....	\$2.50	50.5 cords, at \$2.75 stumpage	
Trees, 2,722, at \$2.50 per		(farm value)	\$138.88
thousand	6.81	Cut in the past 15 cords, at	
Planting	6.00	\$2.75	41.25
Cultivation, two years	3.00		
<hr/>			
Total	\$18.31		
Interest on \$18.31 for twenty-two years at 5 per cent compounded	35.25		
<hr/>			
Total cost at the end of twenty-two years.....	\$53.56	Value at the end of twenty-two years	\$180.13

Deducting the cost, \$35.6, from the present value, \$180.13, leaves \$126.57 as the net value, which is equivalent to an annual net income of \$3.29 per acre, not to mention the rental value of the land as a hog pasture. It will be noted that the annual yield of Plantation No. 1 is higher than that of No. 2.

SILVER MAPLE.

Silver maple ranks fourth in abundance among the planted trees in eastern Nebraska. It is hardy throughout the region, though it attains its best development on the lowlands. It is, in fact, not well adapted for upland planting, but it succeeds there somewhat better than either cottonwood or willow.

Silver maple should be planted mainly for shelter and firewood. There are better trees, however, for both purposes. Its fuel value is considerably higher than that of cottonwood or willow, but its yield is much less than either.

BOXELDER.

Among the planted trees, boxelder ranks third in abundance, yet its place in economic planting is more limited than that of silver maple. Usually, wherever it will succeed, some more valuable tree could be grown. It has been used for fence posts, and farmers and ranchmen say it is somewhat more durable in contact with the soil than either cottonwood or willow. However, on account of its branchy habit and tendency to crookedness, only a small percentage of the trees can be expected to make posts. Its fuel value is somewhat higher than that of cottonwood and not as high as that of willow, but its yield per acre in a given time is considerably less than either. Perhaps the chief economic value of this species is for use as a nurse for some of the better trees, such as walnut, or for shelter and shade. Its rapid growth and branchy form are in its favor for windbreak planting, and as a shade tree it has commendable qualities. It is very hardy and easily propagated.

RUSSIAN MULBERRY.

Russian mulberry has a limited value in forest planting, especially on the dry uplands in the southwestern counties. It can not be planted with

safety far north of the Platte River. On account of its low-branching habit it is one of the best of trees for windbreaks, either in belts or in single rows. Many orchardists prefer it, for the birds feed upon its fruit instead of the fruit of the orchard.

As a post timber Russian mulberry is excellent, since the wood is exceedingly durable in contact with the soil. Its profuse branching habits, however, make it difficult to secure a large yield of posts. Its fuel value is relatively high but the cordwood yield is low.

WHITE ELM.

White elm, though one of the hardiest trees native to the state, does not have a very large place in economic planting, but in the ornamental planting should have first rank.

The chief value of elm in economic planting is as a filler with such more useful trees as black walnut, catalpa, ash, honey locust, etc.

LOMBARDY POPLAR.

A large amount of Lombardy poplar has been planted in Cache Creek Valley to prove up timber claims. Frequently also it has been set out in single rows. The tree succeeds unusually well in this region, making a good growth and showing no inclination to become stagheaded, as in the plains states. It should be planted guardedly, however, since it is quite generally a failure elsewhere in Nebraska.

BLACK LOCUST.

On account of insect enemies, black locust is an absolute failure in the territory covered by this investigation. Not one successful plantation was noted, although the species has been planted to some extent in most of the region, especially in the southern counties. On account of the ease with which it may be propagated, its rapid growth, and its great durability in the ground, it is one of the most valuable of trees for forest planting wherever it will succeed, but at present it can be recommended in eastern Nebraska. In parts of western Nebraska it succeeds fairly well. Near Paxton, in Keith county, are two splendid young plantations that were put out about 1891.

OTHER BROADLEAF TREES.

Hackberry, basswood, and bur oak are other species that are hardy for eastern Nebraska. The first two are rapidly coming into favor as street trees. Bur oak has high value both for posts and fuel, but on account of its slow growth its use in economic planting is limited. Wild black cherry may prove to be a useful tree for the region. It has made an unusually rapid growth on the station grounds at Lincoln in the eight or nine years it has been tried there, but whether it will be long lived is problematic. Coffeetree is a valuable species which may be planted with safety. Russian golden willow is proving hardy under Nebraska conditions. For windbreaks it is one of the best trees that can be planted. It is also very ornamental.

WHITE PINE.

White pine succeeds fairly well on the hard soils in the eastern counties, where it has been planted sparingly. Its range for planting is not determined. It will thrive for a number of years in any part of the territory, with the possible exception of the sand hills.

Plantation No. 1.—This plantation is situated on upland. The soil is a fertile prairie loam with a clay subsoil. The ground was thoroughly prepared, and the young trees were planted in pure sand, 4 feet by 4 feet. Two or three open spots were left to give the grove a natural appearance. The trees were cultivated until they became large enough to form a ground cover. Later they were pruned, and still more recently two-thirds of the stand were thinned out, so that there are at present 916 trees per acre. No other attention has been given them. Further thinning will soon be required, however, since the stand is becoming crowded.

Excellent forest conditions for so young a grove have already been formed. The surface layer of humus is about one inch deep, and this is overlaid by a layer of litter two inches in depth, formed from the pine needles, twigs, and cones. There is no ground cover or underbrush within the body of the plantation.

The trees have grown remarkably, both in height and diameter. The sample dominant tree was 23.5 feet high, and the diameter, breast high, 4.6 inches. There are 68 trees per acre 6 inches in diameter, two 7 inches, and two 8 inches, and some are nearly 30 feet high. A height growth of three feet in a year is not uncommon.

AUSTRIAN PINE.

Austrian pine has been planted only to a limited extent in eastern Nebraska, though probably as much as any other conifer except red cedar. Its use has been almost entirely as a lawn tree, and its success makes it safe to recommend it for this purpose.

JACK PINE.

Jack pine is adapted especially to planting in the sand hills. It is being successfully grown on the Dismal River Forest Reserve and by a number of ranchmen in widely scattered localities in the hills.

Experience shows that planting on north slopes gives the best results. South and southwest slopes are hotter, and the moisture conditions are not so good. Very dense sod should also be avoided. The different exposures that may be planted are, in order of suitability, the north, northeast, northwest, east, west, and southeast exposures, and, finally, the more level situations, such as valleys and crests of hills. The plan should be to plant blocks or belts of trees as windbreaks around the ranch house, barns, and yards.

WESTERN YELLOW PINE.

Western yellow (bull) pine and its variety, rock pine, are also being extensively planted on the Dismal River Reserve. They doubtless will

be important factors in restocking the sand hills. Both do well on hard soils, and may be planted with safety throughout the region.

SCOTCH PINE.

Scotch pine is hardy on the heavy soils in eastern Nebraska. It has been planted mainly for ornament, and can be planted with safety for this purpose.

NORWAY SPRUCE.

Norway spruce has a limited use in ornamental planting, and for this it can be recommended.

EUROPEAN LARCH.

One of the most promising conifers for economic planting is European larch. It has not been tested in Nebraska, but its success in Illinois, Iowa, Minnesota, and the Dakotas, where it has been given a thorough trial, warrants its use.

RED CEDAR.

Red cedar is native to the region and has been planted rather more extensively than other conifer, but has been chiefly for protection and ornament. No tree makes a more effective windbreak when planted as a single row. It grows fairly rapidly, is hardy and long lived, and is as effective in winter, when protection is most needed, as at any other time. Branching is low, very dense, and persistent.

CONCLUSIONS.

No attempt has been made to exhaust the list of trees suitable for planting in eastern Nebraska. Of those named, hardy catalpa, Osage orange, black walnut, cottonwood, white willow, green ash, and honey locust can be grown with profit, as the history of a specific plantation for each species shows. Hardy catalpa, Osage orange, green ash, and honey locust should be planted chiefly for fence posts, white willow for fuel, black walnut for lumber, and cottonwood for fuel and lumber. All attain their best development in rich, well-drained valleys. Cottonwood, white willow, and black walnut are essentially bottomland trees. Osage orange should be planted on upland only in fertile soils in the southeastern counties. The range of hardy catalpa in upland planting is considerably wider, but it must have good soil. Green ash and honey locust are especially adapted for dry upland planting in the more western and southwestern counties.

Doubtless experience will disclose other trees that may be planted with profit. European larch, for example, is deserving of a thorough trial. In the sand-hills some of the conifers, such as western yellow pine and jack pine, undoubtedly may be planted with profit, since land values are certain to remain low.

DISCUSSION.

Question: I wanted to ask you a question in regard to the cottonwood; if that grove had been growing twenty-five years, say seven years

from the eighteen, making it twenty-five years old, could it not be used for lumber to any advantage to the grower?

Professor Miller: There is quite a matter regarding the lumber proposition to come out in our papers. We measured all the plantations for lumber as far as we could get at it, and we fixed the stumpage value of cottonwood at ten dollars a thousand. I am told that in many places it sells for eighteen and twenty dollars and sometimes as high as twenty-two. Figuring the average cost of the raw material and the freight on the finished product, we arrived at this conclusion, and our figures will bear it out: That unless you can get ten dollars a thousand at least for your lumber, you had better sell it, or just as well sell it, for cordwood at two dollars a cord. In other words, we did this: Say you take a twenty-five or thirty-year plantation, it will total a certain number thousand board feet—I do not remember exactly now, but we will suppose it is thirty thousand. We figure that at ten dollars a thousand; then we also determine the number of cords of wood in that thirty thousand board feet, and we figure that at two dollars a cord, and they total pretty nearly the same thing. There is only a few dollars difference. These figures include all the plantations, some being thirty-five and even up to forty-six years old.

A Member: You stated that you think it would have been better to have planted some of the plantations thicker, twice the number of trees?

Professor Miller: Yes, I think it would have been.

Question: That would have doubled the income, would it not?

Professor Miller: I do not know it would have doubled it, but it would have increased it very materially. It would be better to start them close together and then thin them out when they commenced to crowd and fight one another; then you would get some good out of the material.

A Member: In a catalpa grove you referred to, I wanted to ask if anything was taken out for the first thirteen or fourteen years?

Professor Miller: No, but it would have been better if he had taken some out.

Question: Then that plantation is good for future years?

Professor Miller: Yes, he has harvested it and it is growing right up again. He writes me that it has made a splendid growth the last summer, and he will go in this year and cut out the sprouts from the stumps, all but one or two, leaving one or two sprouts to each stump. It will grow much faster from the stump than it did from the seed and in ten years he can cut as much as he did in seventeen from the seed.

Question: And he will get a better product in ten years from the stump than he did from the seed, will he not?

Professor Miller: Yes, I think that is true, because he will get a larger percentage of good posts.

Question: Don't catalpa posts mature in ten years?

Professor Miller: I am glad you brought that up. You know it has a very small percentage of sapwood right in the edge. It is remarkable that the catalpa has about the same percentage of heartwood at five years old as it has at fifty.

Question: When you dry it, doesn't the sapwood turn into hard wood and become as durable as the other?

Professor Miller: No, it is not as durable; only the last two or three limbs of the catalpa are very sappy—it is practically all hard wood. You can lose all the sapwood and still have plenty of material left. The heartwood is exceedingly durable. You know it is a soft wood and doesn't check like black locust or Osage orange. You can always get staples or nails into it. When you consider these qualities, taken together with its rapid growth, you have an exceedingly valuable tree. It is moreover unusually free from insects and fungus troubles—in fact, in this respect, it compares favorably with red cedar. I would say it is fully as good.

Question: Does it make any difference which variety?

Professor Miller: That is an important question. It is worse than time wasted to plant anything else than the hardy catalpa—*Catalpa speciosa*. As a matter of fact, so many others have been planted in Nebraska that the whole catalpa name has been brought into disrepute. You go over the state and you will find trees that never amounted to anything; those trees are not the right kind of catalpa, but if you get a genuine hardy catalpa grove, that has had any chance at all, you will find good material.

Question: Do you mean to say that *Catalpa speciosa* will do well along the north line of the state?

Professor Miller: My faith in the catalpa is growing all the time as to its range. When we first put out a report of it we did not recommend it very much north of the Platte river. We stated it would probably do farther north, and I believe it will. There is a plantation in North Dakota, and they also raise it in Minnesota. I believe if it is planted in sheltered places, and you get the genuine hardy catalpa, it will grow anywhere in Eastern Nebraska on good soil. As to the western range—say as far west as Grand Island, and a little farther. I think it is safe also.

Question: How is it for a shade and ornamental tree?

Professor Miller: It is not so good.

A Member: There is a beautiful grove of catalpa in southeastern Holt county, eighteen years old, bearing seed every year.

Professor Miller: I am glad to know of it. I had not discovered any plantations that far north in this state.

I want to say this: If you want to grow a tree for commercial returns, it must have good soil. For instance, some of these plantations show a splendid growth. We made calculations for two different plantations, and while one on average soil only gave returns of a few cents

per acre, the other one gave returns something like these I have stated here. You must have good soil, if you expect good returns.

Question: How about valley land?

Professor Miller: Valley land is better, though these grew upon the upland. I could give you one or two groves that did some better than these, but I take these because it represents what can be done under average conditions in Southeastern Nebraska.

Question: What did you learn as to its usefulness for ties?

Professor Miller: I don't know as to that. I have not very much faith in the catalpa for ties. I don't think it would do. That is, I don't think you would get a large enough percentage of tie timber to make it pay. I think, with the demand for posts, it is a better proposition. It is essentially a post timber.

Question: Have you tested its endurance for a post timber?

Professor Miller: Yes, it has been thoroughly tested.

Question: What does your record show in that respect?

Professor Miller: I have no specific record—perhaps more than twenty to twenty-five years though. I have no specific example in mind now, but as matters go, twenty to twenty-five years would not be out of the way. Perhaps Mr. Scott can give us some information on the subject.

Mr. Scott: The only record I can give you regarding catalpa posts is where I saw some in Southeastern Kansas in the region of Hutchinson, where there is an extensive plantation; they have over twelve hundred acres there. I saw catalpa posts there that had been in use in a fence for eighteen years and only the sapwood was decayed. They were posts that measured, perhaps, three and a half inches at the top.

Question: How can you distinguish the hardy catalpa from the other?

Professor Miller: I am awfully sorry to hear that question. I was afraid it was coming, and I meant to get up early this morning and look up that question.

Mr. Harrison: Perhaps I can help you with a word. The best distinguishing feature I know of is, when in Northeastern Nebraska, at a place where you find a catalpa grove doing well, and making a good growth, you will know that it is the hardy catalpa, and if you collect seed from that grove and plant you will get a tree that will stay with you.

A Voice: I have seen them growing in Missouri and in Indiana, where they grow catalpas as large as balloons. If you plant these you are pretty sure to get a soft catalpa.

Professor Miller: This I think will possibly answer the question. I do not believe it is hardly possible to distinguish them absolutely.

Mr. C. S. Harrison: We make this distinction. There are two classes even of the speciosa. You will find the Catalpa bignonioides very seldom in this state. You will find it in Kansas, and it is marked so you can tell it. If you will take seed from the northern belt you will get very

hardy trees, but if you take them from the south, even of the *speciosa*, you will get something very tender, and not so good for our northern planting here in Nebraska. You go over Nebraska and you will find about half of the *speciosa* are killed, while the other half are hardy. That is a very good way to distinguish them. I have noticed that some are very readily killed, even of the *speciosa*, while others are hardy. I would make that distinction. It makes a difference where the trees are raised. There are very few *bignonioides* in this state.

Question: Before you sit down, can you tell us how to distinguish it?

Answer: There is a difference in the foliage. It is as much marked as a good many other distinguishing sorts. The seed is much smaller and the pod is much smaller. I received a letter from a Mr. Keyes saying that his hybrid catalpa was growing successfully farther south. Another distinguishing feature is, that it is of a much more rapid growth than the other, but it is not hardy. Down in Kansas and Texas it makes a good shade.

Question: Which seed is the smaller?

Answer: The hybrid has a much longer seed. The other has a small, fine seed.

A Member: I will say this, there is a difference both in the size of the pod and possibly in the size of the seed. The pods are about the same length, but in the hardy catalpa they are a trifle wider. They are a coarser pod, and the same is true of the seed.

Mr. Emerson: I was given something to look up this morning. The *bignonioides* is of an ill-scenting character, while the *Catalpa speciosa* is scentless. There is a difference in the foliage, and there is a difference in the size of the tree, too. I do not quite agree with Mr. Harrison that there are two varieties of the *Catalpa speciosa*. I think the non-hardy form that you mention is not the *speciosa*. I believe it is a hybrid. If it is true that there are two varieties of the *speciosa*, as you mention, then we had better get to work and make another species.

A Member: The *speciosa* never has over three or four pods hanging together. That is the usual way to tell. They are large, coarse pods. In the other, you can find fifteen to twenty pods hanging in a bunch and they are also much finer and more slender.

Mr. Brown: I was just going to say that fifteen or twenty years ago I heard Mr. Douglas, perhaps the best posted man in the United States, make practically the same statement as Mr. Harrison, I think, in Chicago. His idea was that the particularly hardy variety of the *speciosa* came from the northern belt, while the semi-hardy came from the southern belt. That was the designation he fixed at that time.

Mr. Harrison: That is what I desire to emphasize. You take the cottonwood from this section, and it is never as hardy as it is further north, say in Manitoba, or further north. And take the red cedar from

Illinois; it is not worth much here; and so it is with the catalpa. I have watched that thing closely, and there is no difference except in the degree of hardiness.

Mr. Emerson: I was going to make a remark something along the same line as Mr. Harrison. Although there may be no specific difference in the form of the tree or the leaf, still there is a difference in the hardiness of the catalpa. Take the black walnut over the various states; you cannot tell them apart by any technical markings, yet some winter kill, while others stand the winters; some are hardy and some are tender, and the difference is due to the region from whence they came.

A Member: Just a word in regard to the hybrid catalpa—I don't suppose we should bring it in here because it is not a forest tree. It is a pretty fair ornamental tree. Here in Lincoln it is hardy. Take any hybrid, which is a hybrid between equally hardy species—take them from the same belt, and they are hardy, but if you take a hybrid, even of the same species, from the southern belt, or warmer climate, they are more tender, even though they are the same species. We have seedling hybrids in the nursery, and some are hardy and some are absolutely tender.

A Member: I had some experience about twenty years ago with catalpa. I planted a number of trees in Sherman county. I bought those trees of a nurseryman and he guaranteed them to be hardy catalpa; they killed down in the winter and finally died out. Now, I would like to know what kind of protection a planter has got in buying catalpas from the nursery.

Mr. Harrison: How far west do you live?

Answer: Sherman county.

Mr. Harrison: Well, that is a trifle too far west. The catalpa is not a dry weather tree. I noticed one grove I put in eight feet apart and was well cultivated, that was alive, but you cannot grow catalpa too far west in a dry season; if you have three or four years of drought you will lose them. I think it is the drought more than the winter that kills them. They cannot endure dry heat.

The President: While this is a valuable discussion, and I am very much pleased to hear you discuss it so thoroughly, as that is one of my standbys—I like to see discussions in print, but I wish you would confine your discussion closely to the subject, as we have so much to do, and do it in just such a time. We have Mr. Emerson to hear from. Mr. Emerson has been crowded out of our meetings the last year. I would like to hear from him this time.

Mr. Harrison: That is all. I understand it is the difference in the character of the tree. I certainly agree with the idea that seed should be brought from as far north as possible. And I would like to make a suggestion, that we catalpa growers in Nebraska ought, if possible, to collect our seed in Nebraska, and get them from groves that you know to be thoroughly hardy, where the trees are well formed, then you know you will have trees, if you plant them within reasonable range.

A Member: There has not been much said about the catalpa as a street tree. I do not recommend it as a street tree, but those I referred to were planted twenty-six years ago and they are about twenty inches in diameter and they are something beautiful when in bloom. They are a sight to see. If the catalpa is to be grown, perhaps it is worth something to plant the tree for that purpose, but after all, when the frosts strike it, the tree is not very beautiful; its beauty is gone. But these catalpas never suffered from any of our winters. That is twenty-five miles from the Missouri river, about forty-three miles north-east of Council Bluffs.

A Member: I understand at Council Bluffs there are some old trees that were planted 'way back in '56 upon the old H. G. Raymond place, and they are there yet.

A Member: To my mind the hardy catalpa is the best tree for Southeastern Nebraska.

Mr. Harrison: I would like to ask you if honey locust sold for posts?

Professor Miller: Yes.

Mr. Harrison: Were they honey locust or black locust?

Professor Miller: They were honey locust.

The President: I am sorry to have to end this valuable paper and discussion, but it will appear in our report in full. It seems almost a shame to cut down a valuable paper like this, but we have only so much time. We will now hear from Professor Emerson on the "Planting of Shrubs and Roses."

Mr. Emerson: I wish this discussion might go on, and I would be glad even yet to yield the floor and give you a chance to discuss the forest tree matters more. I will state to the secretary that I have my paper, so there is no need of the stenographer taking what I have to say.

PLANTING SHRUBS AND ROSES.

BY R. A. EMERSON, PROFESSOR OF HORTICULTURE, UNIVERSITY OF NEBRASKA.

THE VALUE OF SHRUBS.

Shrubs for ornamental planting are not appreciated by Western planters as they should be. The hardy shrubs are not only easily grown, but they are among the most effective things that can be used. Of course, trees should form the background of any large planting, but in some places there is room for no more than a few trees at best. No home ground, unless it be covered entirely by the house, is too small for shrubs and the larger the place the more shrubs there should be. When I say that we of the West do not really appreciate shrubs, I speak advisedly. Many of us like flowering shrubs, that is, we enjoy the flowers that the shrubs produce, but we care little for the shrubs themselves. Most shrubs are more attractive when in flower than when out of bloom to be sure, but we must remember that the flowers last but a short time at best, while the foliage lasts all the season. If I

could have only one or shrubs, I should certainly choose only those with the most attractive flowers. But who is there who cannot have an abundance of shrubs if he will? Plant many instead of few shrubs then, and choose them for the variety of their foliage effects as well as for their flowers. Not long ago a prominent professional man of Lincoln was bemoaning the fact that we could not have in the West the foliage effects, the luxuriant masses of light and shade seen in the parks and home grounds in the East. But we can have them if we want them. It is merely a matter of choosing the kinds of shrubs adapted to our conditions, of planting lots of them, of arranging them properly and of tending them with some care. So long as we are satisfied with one Van Houtii spirea, one snowball, one Persian lilac and one mock orange, better shrubs than which there are none for our state, and so long as we are content to set these in little holes in the sod in the middle of the front yard, and so long as we let them take care of themselves, we should not expect too much either in flower or foliage effects.

WHAT SHALL WE PLANT?

First plant the hardy things, the things that can't help growing. Don't be afraid of the wild things. You do not think you would like sumac in front of the house? You wouldn't plant the elderberry by the front walk? You think wild currant and wild gooseberry and buffalo berry are too scraggy for the lawn? You think choke cherry and coral berry (buck brush) and the rest of the wild things would sprout up and take the whole front yard? Well, maybe they would. I would not plant them myself—not in the front yard. I wouldn't plant anything there, in fact, but grass. As a matter of fact, I have all of these things and more like them in my own yard and they have not spoiled it either. They make the best sort of screen for the chicken yard and they hide the vegetable garden and protect it from the wind. They do well under the big apple tree near the back end of the house. How much better the spireas, mock oranges, hydrangeas and hardy roses, to say nothing of the phloxes and peonies and columbines and larkspurs and iris and Shasta daisies—how much better and brighter all these things look in front of this vigorous, hardy background of wild things than they would standing out singly in the front yard and wishing that the owner of the place would keep the sod away from them so that they could grow.

I need not give a list of the things to plant. Look up the list recommended by our society. That is what it is for. Get the shrubs from home nurseries or from your neighbors. If you cannot afford to buy many of a kind, get a few and increase them by layers, by bending the limbs down and covering them part way with earth. If they do not root well, break them a little below ground or notch them or girdle them. They can't help rooting then. You can grow most of the hardy shrubs from cuttings, but you have to watch cuttings closer. Get lots

of shrubs some way. Then go out and dig up some of the wild things and bring them in. They will look entirely different when they are domesticated.

WHERE SHALL WE PLANT THE SHRUBS?

First, don't plant them all through the front lawn. You cannot have good shrubs and a good sod in the same spot any more than you can have a good orchard and a good meadow on the same piece of ground. Plant the shrubs at the sides and rear of the lawn. If you have a very large place, plant them in groups in front of the trees, which are themselves for the most part along the sides and back of the lawn. If you have no room for trees, put the shrubs at the side and back anyway. A few specimen shrubs, some especially choice kinds standing out in front of the larger masses are in place, but keep the center and front of the place open. Grass looks better there than shrubs or flowers. Plant a few choice shrubs by the jog in the wall of the house, some good climbers, the Crimson Rambler rose, the small-flowered white clematis (*Paniculata*) on the side of the house or on the pillars of the porch, a few other vines, the honeysuckle, Virginia Creeper, wild grape, trumpet vine and the like to cover the unsightly objects that the shrubs do not hide and you are done. That is, you are done with the lawn planting. You will still need some roses for cut flowers. Put them in the garden along with the sweet peas or gladiolus and other beautiful things that have no place in the general lawn planting, or prepare a special bed for them in some out of the way place. You can care for them better there than in the lawn and few roses except *Rugosa*, *Madam Plantier*, the hardy climbers and perhaps the yellow briars look well in the lawn anyway. In the garden or in a special bed by themselves they can be fertilized and pruned and coddled and the flowers can be picked without hurting the looks of the place.

HOW TO PLANT AND CARE FOR SHRUBS.

Use the same care in planting shrubs as in planting trees. Prepare the ground well. Do not dig a small hole in the sod, but plow or spade up the whole area that is to be set in shrubs. This does not spoil the lawn. That is out in front; the shrubs are at the side and rear of the place. Give each plant all the room it needs to develop naturally if you do not care for quick effects. If you are in a hurry, plant closer or fill in with annuals at first. If you plant close for quick effect, you should thin out half the shrubs in three or four years. Your neighbors will be glad to have all you dig out if you do not tell them that half the plants you are giving them are common, wild things that grow all around.

Dig a hole for each plant. Set it a little deeper than it stood in the nursery. Keep the roots moist all the time. Work moist soil in about the roots and press it down firmly. Packing it with the feet won't hurt if it isn't too wet. Leave the soil loose on top. If you

must plant in wet weather, be careful not to pack the muddy soil and don't be surprised if it bakes hard when it dries. If dry at planting time, water the plants. First pack the dirt firmly about the roots, leaving a basin-like depression about the shrub, then pour in enough water to wet the ground down below the lowest root. A dipperful of water won't do that. A half pailful won't. Pour a pailful or two about the shrub, let it all soak away and then fill up the basin with loose, dry dirt. Watering during summer should be done in the same way. It will not be needed often. Watering every few days is worse than no water, because you will not do it right if you water so often.

Cultivate the shrubs until they are large enough to shade the ground. Cultivate all the ground. Do not let the grass get in. Do the work with the hoe if necessary. If you do not have time for cultivation, mulch the ground with straw, hay or coarse stable litter. This doesn't look as good as grass at first, but the extra growth and beauty of the shrubs will more than compensate for a year or two of bare ground or unsightly mulch. Besides, you can grow some low annuals or herbaceous perennials in front of the shrubs to hide the bareness at first.

Prune shrubs when they are planted, cutting off a considerable part of the top. Pruning in after years will consist in cutting out the older and weaker parts of the bushes. As a rule, do not cut back the shoots much and do not keep the shrubs sheared, but let them follow their own inclinations as to habit of growth. Just keep them vigorous by judicious thinning. Of course, some things must be pruned more severely. Hydrangeas and the more tender roses should be pruned back severely in spring or fall. Even althea and snowball are sometimes benefited by severe pruning.

All shrubs, even the wild things, will be better for some fertilizer. Mulch the ground with stable litter in the fall and in the spring remove the coarser part of the mulch and work the rest into the ground. The mulch in winter will help many of the more tender shrubs and it will not injure the hardy ones. It will be well to apply some well-decayed stable manure also.

If you do not like shrubs now, try the things suggested here and you will change your mind.

DISCUSSION.

The President We will give five minutes to the discussion of this valuable paper. It is a subject we ought to know more about.

A Member: You stated something about cutting off bushes of the different kinds of shrubs within six inches of the ground; do you then cover them up until spring?

Professor Emerson: We have had altheas go through the winter at the farm without any protection the last three or four years. Some of the altheas, single flower, will grow in this part of the state without any protection. You will find at Milford, this state, some large bushes

very hardy. The double-flowering altheas will probably need some protection; but anything that is even hardy will go through much better if they are mulched, so the plant will take up moisture during the winter. I cannot be sure that the althea is hardy enough to stand all winters of all kinds, but it has stood it upon our farms.

Mr. C. S. Harrison: I think here in Nebraska we neglect our native shrubs. Take the Wahoo or Euonymus; it is covered with brilliant red berries in the fall as soon as the leaves fall, and makes a pretty sight, with its gorgeous berries; then we have the Symphoricarpos vulgaris, or buckberry, which grows in the Republican valley; it grows to a height of three feet and is covered with an immense number of purple berries, making it very ornamental. Then we have the black haw, which is a very showy thing in the fall; it is full of foliage and well worthy of our attention.

There is the Spirea aguta; it blooms the first thing in the spring and is the last thing to lose its leaves. The leaves hang on until January. It is a perfect flower garden of itself with its mass of colored leaves.

I want to say a word for the althea. I think the close planting makes the better appearance; if you cut it within six inches of the ground they will come up and give you a dense mass of foliage and bloom just at a time when you most want it.

Mr. Brown: Those remarks I can verify. I recollect something along this line that came under my observation at St. Louis; they cut the altheas there, and they came up and made the prettiest plantation of altheas I ever saw.

Mr. Marshall: I notice we have with us this morning Mr. Swayger, the superintendent of parks of the Union Pacific railroad. We would be glad to hear from him.

Mr. Swayger: You will have to excuse me.

The President: Don't be bashful, Mr. Swayger, we know you can tell us something and we want you to. I know Mr. Swayger feels as if he were a stranger here, but we would like him to feel at home.

The President: The time has arrived for the election of officers as set by the Constitution.

Mr. Green: I have the report of the Secretary and Treasurer.

The President: I guess we will have to give way to that.

Mr. Green: Your committee have carefully examined and audited the reports of the Secretary and Treasurer and find them correct.

The President: You have heard the report of the committee; what will you do with the report?

On motion the report was accepted.

The President: We will now take up the election of officers. The first is the election of a President.

Nominations were called for, and resulted in the election of H. S. Harrison, of York, for President; Charles G. Saunders, of Omaha, First

Vice-President; C. H. Green, of Fremont, Second Vice-President; Peter Youngers, of Geneva, Treasurer. On motion the rules were suspended and the Secretary was instructed to cast the vote of the membership for the above named candidates, and they were declared by the President duly elected.

The President: The next in order is the election of a director for a term of three years. Our constitution was changed last year and we do not elect but one this year. Who will you have for your director?

A Voice: I announce the name of J. A. Yager, of Fremont, for director.

A Voice: I name Geo. A. Marshall for director.

Mr. Marshall: I have been upon this board for fourteen years, and if there is any honor in it I have gotten it, and if there is any work in it I have had that, too. I withdraw in favor of Mr. Yager.

On motion the Secretary was instructed to cast the ballot of the society for J. A. Yager, of Fremont, and he was by the President declared elected director for three years.

The President: There is another matter I wish to take up. Our by-laws provide that we shall elect at each winter meeting nine district directors, one from each horticultural district of the state. I have been criticised this year, and very justly criticised upon the work our standing committees have done. I am one of them myself. I do not know whether I appointed myself or not, but owing to one circumstance or another, I am there, and I have not done my duty, but I will charge this to our standing committees, for as far as I have asked, they have promised to give us the reports. I think we will get out of it that way, but I would like you to place in nomination for the different districts, men as directors.

Mr. Russell: Before going any farther, I would like to say a word. You know our state originally had nine fruit districts and now it has nineteen in place of nine.

A Voice: Is this matter such that we cannot go farther—is it a matter of the Constitution or the by-laws?

The President: It is a matter of the by-laws.

Question: Can't we have these directors for the districts appointed by the directors, when we can take time to consider and find out who will serve?

I will read to you No. 7 of the by-laws: "These by-laws may be amended at any general meeting of the society by a majority of the members present."

Mr. Christy: That will be for any general meeting.

A Member: Have not these directors usually been appointed by the Board?

Mr. Christy: That is not according to our by-laws. We have it distinctly stated how they were elected. In order to bring this before the society, I move that the by-laws be amended so that the district

directors may be appointed by the Board instead of being elected by the society.

Second that motion.

A Member: I favor that motion very much, from the fact that I want the Board to have something to do.

The President: I will put the question. All in favor say "aye." Aye. All opposed "no." No, no.

I think there is a majority, so that lets me out of something I desired.

A Voice: Do I understand you to say the by-laws require this society to elect the standing committees.

The President: Article V of the by-laws says: "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." Also article VII, which reads as follows: "These by-laws may be amended at any general meeting of the society by a majority of the members present."

A Voice: I move that we amend those by-laws so those standing committees can be appointed by the President. He knows absolutely who is able to serve.

Motion seconded and carried unanimously.

The President: During the last year we have lost from our midst one of our workers, the Hon. Doctor Link, of Millard. I will appoint as an obituary committee Mr. A. J. Brown of Geneva, Mr. Geo. A. Marshall of Arlington, and Mr. L. Henderson of Omaha. There are a number of us would like to go to the state capitol. I move we adjourn to meet at 2 o'clock. Carried.

AFTERNOON SESSION.

WEDNESDAY, January 16, 1907.

The President: The time has arrived for our afternoon session. First I wish to make some announcements.

The Committee on Revision of Premium List is as follows:

Pomology—Peter Youngers, of Geneva; A. J. Brown, of Geneva; G. A. Marshall, of Arlington.

Committee on Floriculture—L. Henderson, of Omaha; C. H. Green, of Fremont; Paul Floth, of Omaha; Erwin Frey, of Lincoln; Ed Williams, of Grand Island.

I have a letter also from an old-time member and still a member, which I received with great pleasure. It came to me just after adjournment this morning. As I feel it will interest some of you, I will read it. It is from W. J. Hesser.

A motion prevailed that the Secretary be instructed to telegraph congratulations to Mr. Hesser, and extend the greetings of this society.

Mr. Russell: I have a communication from Congressman Pollard, which I wish to read.

HOUSE OF REPRESENTATIVES,

WASHINGTON, Jan 11, 1907.

*Mr. L. M. Russell, Secretary of the Nebraska State Horticultural Society,
Lincoln, Nebraska.*

MY DEAR MR. RUSSELL: I regret very much that it will be impossible for me to attend the mid-winter meeting of the Nebraska State Horticultural Society. Of course, my duties here are such that it will be impossible for me to leave. There is one matter, however, that I wish to take up with you, as secretary, and I hope that you will bring it before the society. I think that I have a right to assume that the Legislature now in session will clothe the new railroad commission, recently created by the adoption of the constitutional amendment providing for the election by the people of three railroad commissioners, with power to regulate railroad rates within the state. Both parties are pledged to do this and it seems to me that there is no question but what they will redeem their pledges to the people. Assuming that this will be done, I would respectfully suggest that the society appoint three or five of its members as a committee to take up with the commission, as soon as the new law is passed, the question of securing more equitable railroad and express rates on fruit to points within the state. It is a notorious fact that the fruit growers of Michigan, New York and Colorado can ship their fruit into Western Nebraska fully as cheap, and in many instances cheaper, than the fruit-growers of Eastern Nebraska can send their own products to the same points. The Nebraska market justly and properly belongs to the local fruit-growers so long as they can produce fruit of superior quality, and in so far as they are able to supply the demand. We are fully entitled to at least as good rates as our competitors who have to ship their fruit from two to ten times as far.

This session of Congress terminates March 4th. I expect to be home within a few days after adjournment. I will be very glad to render this committee any assistance within my power.

Trusting that you will convey to the members my solicitude for the continued success of the Society and my best wishes for a happy and prosperous new year for you all, I remain,

Very truly yours,

ERNEST M. POLLARD.

A Member: I move we extend the greetings of this society to Mr. Pollard.

A Member: I move that the letter of Mr. Pollard be referred to the Legislative Committee. It seems that would be the only standing committee having jurisdiction. Seconded.

A Voice: I would like to amend that motion by saying that we have a committee on railroads; we carried that over until this meeting, and I would like to amend that by saying that this same railroad committee, of which Mr. Pollard is one, be extended through the next year.

The President: If that committee is not discharged, it is still in action.

A Voice: It was continued just for one year. It is expired now.

The President: Don't you think the Legislative Committee is the place for that communication to go?

Answer: Yes, sir.

The President: Our Legislative Committee will be in continuance all day.

A Voice: I understand the Legislative Committee is composed especially of lobbyists. They will lobby as much on the railroad commission as on the legislative.

A Voice: That committee has one hundred dollars appropriated for its expenses; we appropriated it last year. Inasmuch as we have a railroad committee, Mr. Youngers, Mr. Marshall and Mr. Parker, I think that is the committee, inasmuch as we have an appropriation for their expenses. I think it would be better to turn that over to that committee.

The President: I am somewhat ignorant about this, and would like a little light. What do you think, Mr. Harrison?

Mr. Harrison: It is new to me.

A Voice: I like Mr. Swan's idea and I will accept Mr. Swan's suggestion. I suppose it will be understood if there is an especial committee the chair should reappoint it.

The President: You have heard the discussion and the motion. I cannot state it, but you have heard it. All in favor of this motion say aye. Carried.

Motion prevailed that the Secretary be instructed to telegraph the greetings of this society to Mr. Pollard.

The President: We will now listen to Mr. Harrison's paper, "Planting Perennials."

PLANTING PERENNIALS.

C. S. HARRISON, YORK.

The West in springtime lies exactly at the busy end of the world. As soon as the frost is out of the ground every energy must be directed to preparation for sowing and planting. Yet all this time there is a growing demand for ornamentation, and the home beautiful is not altogether a far-away dream. But home adornment must not conflict with the pressing work of the farm. So we want things that will stay planted and be ready for business without any fussing or coddling. So, of course, preference is given to hardy perennials. These require but little care. They resist the hot sun and scorching winds much better than annuals. They root deeper, and are more desirable every way. We can arrange them so that there will be a constant procession of beauty passing in full dress parade before us from early spring till the hard frosts of autumn. First we mention

THE AQUILEGIA OR COLUMBINE.

There are some fifty native species of this glorious flower. This family are prodigal of color, for they use up all the rainbow—not a tint or shading left out. Here let me mention one thing—the penuriousness and stinginess of people when it comes to beautifying the grounds. They will depend on a lone flower or two to liven up the whole farm. In the house money is lavishly spent, but the moment a man goes out of doors the purse strings are pulled so tight a dime would have to struggle and wiggle to get out to do any business.

We should be generous with the front yard. The flower beds should match the parlor decorations. A fine house with a cheap yard is like a thousand-dollar picture in a ten-cent frame. To get the full benefit of flowers we need to plant in masses. At our experiment station we have about fifty kinds of columbines, planted by the thousand in one glorious blend of loveliness. These are on hand for Decoration Day, when we gather bouquets of red, white and blue for the soldiers' graves.

PLANTING.—These can be raised readily from seeds, which may be planted in the fall or very early in the spring. Some seeds or perennials cannot survive the winter, and must be kept till spring; others do best sown in the fall. Care must be taken that seeds do not dry while germinating. If you do not have screens, use burlap. Cover the beds with it and water the burlap every night, if need be. As soon as the plants begin to come up take the burlap off at night, so they will be accustomed to the air before the sun rises. Taken off in the morning, they might be sunburned unless it was cloudy. October is a good time to transplant. Put them a little deeper than they were in the seed-bed. They can be rooted somewhat before winter. It is well to throw some coarse manure or mulching over them. If left till spring they should be planted as early as possible—just as soon as the frost is out.

It is hard to describe the beauty of these flowers. Some are double and quilled like a dahlia; some are single with very long spurs. They vary in color from snowy white to deepest blue. The *Coenelia* from the Rockies seems a photograph of the intense blue of the sky and the fleecy clouds. The *Chrysantha* of the Yellowstone Park is intense yellow with long spurs. The former crosses readily with other sorts, but the latter is so much later than the others it does not hybridize as readily.

LILIES.

Before the columbines are through blooming the earliest kinds of lilies are in flower. After having a dozen kinds, we think the *Elyans* are superior to most of the bulbulous sorts. It is early, hardy and a marvelous bloomer, and it multiplies rapidly.

Most lilies are not planted right. They should be in rich ground, well spaded, and planted about a foot deep, with sand or light earth thrown on them, so there will be no trouble in the young sprouts coming

up. The reason for deep planting is that the roots are very much injured by freezing and thawing. The delicate *Cornifolia* is from Siberia, where the ground is covered with snow, which is the best mulching ever yet devised; but, while hardy there in those native conditions, it is not hardy on a bleak prairie, as usually planted. The *Hemeroculis* family is more hardy than the other. There are many varieties, some early, some late. Many of them are remarkably beautiful.

The best time to plant is in the fall or early spring. The *Candidum* should be planted while in its dormant condition, and that is the first of September. This lily is not entirely satisfactory. It does not multiply like the others and seems to lack vitality. The *Auratum* from Japan is also short lived, while the *Rubrum* is quite satisfactory.

Many kinds have miniature lilies which look some like blackberries attached to the stems. If you wish to multiply them cut these stems and plant them just as they are. Put them about two inches deep. The little bulbs seem to feed on the parent stem, and you have fine plants of unusual vigor the next year.

PEONIES.

In these flowers we reach the triumph of floriculture. Having on several occasions visited both state and national exhibitions I am convinced that the peony for beauty, hardiness, fragrance and easiness of propagation is absolutely peerless. These are propagated from seeds, by root divisions, by grafting, and by buds. Gather the seeds and plant them where you wish them to stand. Don't wait for them to dry; pick and plant just as they are turning brown. You may think it will do to keep them in moist sand, but when you go to plant them out late in the fall, you will find some of them badly sprouted. Planted before ripe, many of them will come up next spring. If you let them wait till thoroughly dry, it will take two or three years for them to germinate. One fall we planted fifty pounds of ripe seed and the next spring not one of them came up, while we had a fair stand of those planted before they were fully ripe—just as they begin to turn brown is the best time.

PLANTING DIVIDED ROOTS.

September is the best time for them. The plant (though the tops may be green) is in a dormant condition. The bud formed for the next year is short and tough and not liable to break. Planted at this time little rootlets immediately grow, and late in November you will find them perhaps six inches long. Roots should be planted so the bud will be two to three inches under ground. The best way is to make a hole with the spade to fit the root, then insert it and press the earth firmly around it. Peonies can be planted till the ground freezes, but you will lose some root growth, and you will find the bud is growing more and more and consequently it is more liable to be broken. You will have the same trouble if you wait till spring. The bud will become very brittle and you must handle

it with great care. We have planted thousands in the spring and cut flowers from them in six weeks.

Grafting is seldom practiced. A bud is taken from a costly variety and inserted in a root of a common sort, but the process is a little difficult.

In planting buds alone, you must first get the buds. This is done by taking a box eighteen inches deep. Knock off the top and bottom and then place what is left of it around the plant and fill with earth. The plant will force itself through, and as it is ambitious to move the plant up into the light it will throw out buds on the stems. These you cut off with a portion of the stem and plant in moist earth in a cellar till well rooted, then plant in the open.

PLATYCODONS.

These are very fine; brought to us from Japan. We have the white and the blue. You can grow them from seeds planted early in the spring or plant the roots in the fall or early spring. These are much like turnips, increasing their size as they grow older.

THE BOCCONIA.

This is one of the most imposing of our perennials. It grows to the height of eight or ten feet. It should be placed in the back-ground. It is a grayish green. The leaves are lobed and notched and very large, giving the plant a semi-tropical appearance. It is a decided acquisition. It is grown from seeds like other perennials, and from root divisions.

PHLOXES.

Here we are in a land of delight. We have reached a point now when advancement is certain. It is easy to originate new and glorious forms. If your plants are well bred, plant seeds in the fall. No matter how severe the winter or stormy the spring—the slushier and sloppier the better—the tiny plants will buffet snow and ice and rather enjoy it.

By planting seeds you can get new sorts. You propagate the old sorts by root division. I find to get good, strong, vigorous roots it is much better to divide and transplant every year. It is better to do this in October, giving the plants a chance to root. If deferred till spring it should be done early. Plant so the bud will be two inches below the surface.

THE YORK EXPERIMENT STATION.

When we review the work which has been accomplished the last few years we are really proud of ourselves. When we take up an eastern paper and read glowing accounts of the famous Nebraska wizard we are somewhat at a loss, as we seem surrounded with a sort of halo of impossible things no man can produce, but as we emerge from the glamour and the mist and begin to find ourselves, we find we have some cause for self-congratulation.

Our station has one of the finest peony collections on earth, and added to this we have about 50,000 seedlings on the way, and every year we are adding things of merit. Our new peony, Sunbeam, seems to equal any of the choice imported ones. Very soon our new plants will unfold surprises of loveliness. We were the first on earth to publish a peony manual.

The first edition of 2,000 is exhausted and we have a new edition now in press. No sooner was the first published than we commenced gathering material for the present edition, which has been almost entirely rewritten.

From our station was also issued the first phlox manual, and we found the key by which to originate new kinds of rare beauty, and we have developed many fine new sorts.

We want a new race for the west. Many which will do well in the moister air of the east cannot endure the drying winds and hot suns of Nebraska, so we want flowers that will be hardy, with full and symmetrical crowns, with superior beauty, those that will multiply rapidly and will be adapted every way to our western conditions. Our Diana is a rich, large pink, continues a long time in bloom, endures the heat and multiplies so fast we have commenced selling them.

There is a great differences in phloxes. Some seem never to have studied the multiplication table. They do not increase. You give them good cultivation, but instead of half a dozen stems you have only one, and from a commercial point of view that does not pay. We have developed some fine sorts which give us six to nine divisions in a year.

The whole process of reproduction is given in the phlox manual.

IN THE MATTER OF EVERGREENS

We have struck it rich, especially with the Bull or Ponderosa pine. That sturdy, rugged tree resents any coddling. For years I tried to raise it under screen like other evergreens. It was all wrong; you want to raise them out in the open. You can raise them as easily as you please. Any boy or girl, man or woman can raise them for just the cost of the seed. To those who wish we will give the whole process in detail.

SOME NEW THINGS.

In Minnesota we heard of the Norway poplar (*Populus nigra*). We got some cuttings. We were not much impressed with them the first year, but the next they made a tremendous growth. This year it was very dry and yet we had some grow ten feet from cuttings the size of a lead pencil. In Minnesota they have a record of seventeen inches through and fifty-five feet high in fifteen years. We have named it the "sudden sawlog." It promises to be to the north what the Eucalyptus is for the south. Some who received cuttings last year claim they were cheated, that they were only the Carolina poplar. They do resemble them the first year. But there is a difference. The Carolina is the

male of a type of Southern cottonwood and cannot seed or shed cotton. The Norway has seeds like the trembling aspen, without the cotton. Ultimately the Norway has a much larger leaf. It does not waste itself in side branches, but retains its size better than any tree I know of, which makes it valuable for lumber. It splits readily, and while it might not do for weather boards, yet for framing and sheeting it will be as good as pine. We deem ourselves fortunate in finding this tree.

THE NIOBE WILLOW.

This is the Russian golden weeping willow introduced by that indefatigable explorer, Professor Hanson, who ransacks the world for the best things. They are rapid growers, the hardiest willow on earth and in form and habit much like the Wisconsin weeping willow.

LILACS.

We have gathered fifty kinds and have commenced growing from seeds, and hope to originate some new and choice varieties. While in Manitoba we noted a hedge of Charles the Tenth seedlings, and they varied much, and the superintendent said that among them were many of rare beauty. In Massachusetts last year we noticed a wide variation in seedlings of the *Villosa*.

We are planting the broad-leaved and late-blooming sorts, the *Villosa*, Dr. Bretschneider, the *Emode* and the *Jaseicae*, near together and not far from the June-blooming tree lilacs, and we are confident we will have some fine new sorts if we are spared long enough to see the results. Some are trying for new things by planting seeds of the old *Vulgaris*, but as like produces like all such attempts are useless.

We have the Japan and Chinese tree lilacs, which grow nearly as fast and large as our native green ash. I knew there was another of the tree form which I had been hunting for for years, and found it among one hundred and fifty other sorts in the Boston arboretum, and have the promise of it. It is called the *Amaurensis*.

We have listed ten kinds of *Tamarisks*, but find the Russian superior to them all, and the demand for it for hedges every year exhausts the supply. This is called the Russian, the Silver, the *Amaurensis* and the *Odessiana*. They are all one and the same thing.

PERENNIALS.

We are gathering material for a manual of these hardy flowers, and every year we add to the list. We want something of exceptional hardiness for our trying climate.

Among other things, we have a splendid collection of the iris and are more than pleased with their wonderful beauty, hardiness and readiness of propagation. We were fortunate in securing the very finest of the German family, the *Pallida delmatica*, one that is very robust in habit, a glorious flower and very fragrant. It is quite rare. In a trip to the

east we had a good chance to hunt up some of the rarest and most beautiful plants.

There are two new kinds of Siberian iris. One is of the most intense and clearest blue. The other is snowy white. Both do well in Nebraska and multiply rapidly.

The Baltonias are very robust, rapid-growing plants, covered with masses of bloom for two months. *Baltonia asteroides* is white, something like the Shasta daisy. The *Latisquama* is pink, touched with lavender. Both are very fine.

Next year we hope to use the society's appropriation for new perennial plants and seeds and find out what is best adapted to our trying climate.

DISCUSSION.

The President: You have heard Mr. Harrison's paper. I will give a few minutes for discussion or remarks. I would like to ask Mr. Harrison if he has thrown overboard the Thurlow willow?

Mr. Harrison: No, sir; it grew ten feet for me.

The President: It kills back for me.

Mr. Harrison: It is tender in some localities, but it is more the dry weather that kills it than the winters.

The President: Mine did not suffer from drouth.

A Voice: In general planting across the river in Council Bluffs it kills back.

A Lincoln Man: It kills back in Lincoln two or three feet from the top, but I have seen it growing in Western Nebraska and I have seen it growing in Massachusetts. The first winter it killed, and the next it lived. I think it is a rather tender plant. We have had some entirely killed out in the early part of November.

Question: You did not make any mention of the Persian Lilac.

Mr. Harrison: There are two kinds of the Persian; the white kind and the pinkish-white; then there is a purple Persian. It originated in Europe, a cross between the *Vulgaris* and the Persian; they look much alike, only the Persian is larger leaved. All four are extremely hardy.

Question: Don't you think they are more desirable than the American?

Answer: The common variety is called the *Vulgaris*; in Europe there may be great changes. The *Vulgaris* lilac has two entire distinct systems of roots. I am propagating from roots. You take a lateral system of roots, roots under the ground, they are about like snakes. You can graft your true lilac upon the other and you will not get things mixed. You can cross the Persian family upon sprouts. Other systems of roots of the *Vulgaris* are hard and solid and you can graft upon them without any trouble.

Question: Have you tried propagating by cuttings?

Answer: Yes, I have tried it. A man told me that he had raised cuttings without any trouble.

Mr. Crawford: I am just a new member, but I would like to inquire something about the Norway poplar. I know that tree pretty well, but I know it only on paper; I have read and heard a great deal about it. In traveling in the eastern part of this state a short time ago, I learned from several different parties that it happened to be the yellow cottonwood; I don't know whether that is true and I wanted to trace it up, and I went to see what the yellow cottonwood was. It is a tree that grows faster than the common cottonwood and it makes better timber, and I was wondering if it was the Norway poplar—that is, if the yellow cottonwood and the Norway poplar were one and the same. I would like to know something about this coming saw log if any of you know anything about it.

Mr. Harrison: I don't think there is any relation between the two. The cottonwood sheds cotton. The Norway does not. It has seeds like a trembling ash (or asp); its growth is different. It has been growing in Minnesota for twenty years. In fifteen years it grew to be seventeen inches through and fifty-five feet tall. They vary sometimes in the size of leaves. A year ago my leaves were of enormous size, but not so large this year; the first year they look very much like Carolina poplar, which by itself is a symmetrical tree; it also throws side branches out, while the other does not. It grows branches straight up, and makes very valuable lumber. It is extremely hardy. In Minnesota it has been growing for years right where the Lombardy poplar died out, and the Carolina died also, but this kept growing right along. I got a cutting from Colorado of a poplar growing there called the Diamond poplar; that is an Aspen-leaf poplar; the leaf is as large as the cottonwood and it seems to grow very quickly.

Mr. Crawford: This yellow poplar, as I understand it, has a very large leaf, larger than the other. The reason I bring this up is I knew Mr. Harrison could answer this. I would like to ask him if he will have any of the leaves of the Norway poplar to show us tomorrow?

Mr. Harrison: No, I have no leaves.

A Voice: I would like to tell this gentleman that before the advent of barbed wire fences, when this country was the great American desert, we used to get our cottonwood down on the river; we had to fence our farms with three-rail fences, and we could take a yellow cottonwood and slab it off and make rails two inches thick and four inches wide. We have about exhausted the yellow cottonwood on the river. The white cottonwood splits about like a buckeye; at least that is my experience.

The President: We are past the hour set for our special business; if there is anything more concerning Mr. Harrison's paper, let us get down to it.

A Member: I would like to give my experience in planting perennials. We have had a great deal of trouble to get something that would look pleasant the whole year. Mr. Harrison's peonies are fine; they rival the rose very closely, but they are an unsightly shrub all during the summer;

there is only about two weeks that there is anything beautiful about them; they grow up an unsightly mass of foliage; we have planted phlox between, then when the peonies were through blooming the phlox come out and they stay in bloom all summer and make a fine combination; then carrying the idea still farther, we plant lilacs in between them on the same ground and so we have a fine succession of flowers on the same ground; it does away with the bad appearance of the foliage. In planting flowers along a walk, we plant tulips, then peonies and leave a little space between to put in the phlox.

Mr. Harrison: Our new annual speaks of that; the idea is to have a succession of bloom right from early spring down to frost. Sometimes you can plant lilies, then put in phlox, and then for a background you can put in something else. By such planting, you can do away with the unsightly appearance you complain of. I think one of the most beautiful sights is to see a great field of phlox coming up in the spring. Of course, when they pass away their work is done.

Question: Do you find anything better for a growing shrub than the althea?

Mr. Harrison: That is very good, but you can control phlox so they will be in bloom. I have a picture back here, if any of you would like to see it.

The President: We will now have to take up the special business. The first is a resolution by Mr. Beltzer. The Secretary will read it. Motion read.

"I move you to amend article 4 of the constitution, by striking out in line five the words, 'with the exception of secretary.' Also strike out in lines six and seven, 'shall be elected by the Executive Board.'"

Mr. Brown: I move that action on this motion be postponed indefinitely, Mr. Beltzer's motion not having been seconded. Second.

After considerable spirited discussion, Mr. Brown withdrew his motion, and vote was taken on Mr. Beltzer's motion as originally put, and motion was lost.

The President: Will you read the other resolution, Mr. Secretary?

Secretary: "*Resolved*, That Article 4 of the constitution be amended by striking out the word 'eight' in the third line and inserting in place thereof the word 'seven.' Second, by inserting the words 'excepting the secretary' in the fourth line between the words 'article' and 'and,' making the section to read as follows: 'The officers of this society shall be a president, first and second vice-president, secretary and treasurer and a board of directors of seven members; said board consisting of the officers enumerated in this article excepting the secretary and three additional members.' (Signed) A. J. Brown."

On motion the resolution was adopted.

Secretary: I have another resolution here.

The President: You may read it, please.

Secretary: "Proposed amendment to constitution to extend the right

of voting to associate members: *Resolved*, That the final clause of article 3 of the constitution of this society be amended so as to read: 'Which privileges shall belong exclusively to active members and to associate members who have paid their second consecutive annual membership fees.' L. O. Williams."

After considerable discussion the resolution was amended to read: "*Resolved*, That the final clause of article 3 to the constitution of this society be amended so as to read: 'Which privileges shall belong exclusively to active members and to associate members who have been members of the society for twelve months and who shall have paid their second annual dues.' L. O. Williams."

On motion, the resolution as amended was adopted.

The President: Have we anything else, Mr. Russell?

Mr. Russell: There is nothing before us now but the regular program.

The President: We will now hear from Mr. C. H. Green on the planting of bulbs.

Mr. Green: Mr. President, Ladies and Gentlemen, it is a matter of some regret to me that the subject which I have to present will probably not be of as general interest to the members assembled here as the other papers that have been presented, but for the benefit of the florists in particular I will trespass on your time to this extent.

PLANTING BULBS.

C. H. GREEN, FREMONT.

In taking up the subject of bulb planting, I am going to use the word bulb in the broad sense in which it is used by the average amateur planter. That is, I will take up a number of the easily-grown varieties of plants that are produced from fleshy, underground roots or stems and commonly called bulbs. So accustomed is the florist to being asked for dahlia, gladiolus, canna, crocus or lily-of-the-valley bulbs that he very seldom or never bothers to even think that none of these are bulbs, properly speaking. For convenience the bulbous plants might be divided into three classes. Those for greenhouse forcing, tender outdoor sorts, and hardy ones.

In greenhouse bulbs for forcing, the Roman hyacinth and paper white narcissus are used most extensively for forcing for cut flowers, and the methods used are so simple and well understood by all florists, and of little interest to others, that I will pass them by.

The *Lilium Harrissi* and *Longiflorum*, commonly called Easter lilies, are not so easy to handle. Owing to the fact that they require a comparatively long season of growth and must be had at a certain season to be valuable, skillful handling and good judgment are required to produce the desired results. A few years ago we heard much complaint regarding a strange, incurable disease called lily blight. The leaves of

the growing plants would become covered with brown spots, the new growth would become deformed and unhealthy, and if any blooms came at all, they were malformed and worthless. While this so-called blight is still with us, the principal cause has been removed to a large extent. This was the digging of the bulbs in an unripened, immature condition. The Bermuda and Japanese growers, urged on by the dealers, were so anxious to get their stock into the market ahead of the other fellow that they dug long before the bulbs were ready for digging. The bulbs then being rushed into the hands of the florist, and by him immediately urged into action, were not capable of strong, healthy growth. Hence blight.

While the folly of this premature digging is now generally recognized and avoided, a little precaution on the part of the florist will not come amiss. We used to figure on a goodly per cent of our lilies being a failure under the old-fashioned method of starting them in six-inch pots, plunging them in a frame and covering with litter and leaving them out of doors until root action was under way and top growth starting.

Here is the way we handle them now, and we do not have one poor one out of a hundred nor have we since growing them this way:

Immediately upon arrival, the bulbs are potted in as small pots as possible. Sixes to sevens and sevens to nines in four-inch pots, these being the sizes we use altogether. We do not plunge the pots, but simply stand them under a bench in a greenhouse. We keep them well on the dry side after one good watering, and they sometimes stand for several weeks without making a move. As they do start they are gone over every few days and those that are growing are put on the bench. When the pots are comfortably filled with roots, they are shifted into larger ones. Sixes are what we use. In repotting, we plant deep so that the bulb is a couple of inches below the surface of the soil. This not only does away with the necessity for an ugly stake in all but the tallest plants but it also produces a bloom of heavier texture and consequently more lasting. The principal point in view with the average florist is to get his lilies in bloom just at Easter. We have always found it much easier to hold them back than to hurry them up, so we keep them growing right along until we can see the buds. About seven weeks in a rose house temperature after the buds show is what we allow for blooming.

If you see that they are not going to make it, water every morning with water as hot as you can hold your hand in. If they are too early, move into a cooler place, or for the last week they will stand it in a cool cellar or shed, not necessarily light.

Other lilies that we have found valuable for greenhouse culture are the Auratum, and Speciosums, Album and Rubrum. We plant these in the spring, handling just as we do the Harrissi, and find them very good property along in August and September.

The florist with a modest area of glass will find the *Allium Neapolitan* a very handy thing. The little bulbs can be put in between the carnations, or along the edge of a convenient bed anywhere.

By planting a lot every week or ten days a constant succession of the useful trusses may be had. As they belong to same species as the leek, garlic, and onion, the odor is pronounced. This may be overcome, however, by placing the flowers in water for forty-eight hours before they are used. The bulbs multiply and will bloom freely year after year. We always leave them in the soil until we throw out the bench and then save the bulbs in sand until they are wanted for planting.

There are a number of other things I would like to discuss in the line of greenhouse bulbs, among them being *Callas*, *Freesias*, *Dutch Hyacinths*, but as it would make an article of wearisome length to take them all up in detail, I will mention only one more. That is the *Amaryllis Johnsonii*. We find this a very good thing to have, being bright and showy, and a favorite with our customers. We get the bulbs in the fall and always have them in bloom for Easter. Our method of cultivation is simply to pot them and keep them growing. They like a warm spot and are easily held back. Such bulbs as are not sold out are as good or better the next year. After the blooming season is over we put them under a bench and leave them dry till wanted for starting.

There are a number of hardy bulbs that will be found not only very acceptable to the florist when lined out, but also when planted in a bed or border for decorating the home grounds. The best of these are the *Liliums Auratum*, *Speciosum Rubrum* and *Album*, and the old, original Easter lily, the *Candidum*. These should all be planted in the fall in light soil and put down six inches below the surface. Tulips and hyacinths are fine for bedding out on the home grounds, but as the time of flowering cannot be governed and the texture of the blooms not so good as those grown under glass, they are not grown in this manner extensively by florists. Among the most popular of the tender out-door plants are the cannas and dahlias. These are both produced from tubers, or may be grown from seed. The tubers should be lifted and stored under a bench in a cool greenhouse or in a cellar after a good frost in the fall. Along in February they should be divided into sections of two to three eyes and potted. Or the cannas may be planted in boxes or flats of sand and placed under a bench in a warm situation until growth is started, when they may be potted or planted into the beds out of doors.

Gladiolus may be either grown in the greenhouse or out of doors in the garden. For greenhouse culture the corms may be planted in flats or at intervals between the rows in a carnation bed. The smaller-growing sorts are best adapted for this method of forcing. The robust, rank-growing varieties are very desirable for cut flowers when planted in the open ground, and though the plants are rather unsightly after the blooms are gone they require but little room and may be planted

among other things, or in an inconspicuous corner. By planting at different times, commencing after danger of hard frost is over in the spring, a succession of bloom may be had. After the flowering season is over and the bulbs have ripened, they should be dug and stored in a cellar until spring. It would be impossible to give a detailed explanation of the methods you should use in growing these or the many other beautiful bulbous plants which are well worthy a trial in your garden. The season, the soil, the location, must be considered in almost every individual case. I will say to those who enjoy working in their flower gardens, however, you will find pleasure in cultivating bulbs.

DISCUSSION.

The President: Are there any questions you would like to ask Mr. Green, or any explanations you desire him to make?

A Member: I would like to ask Mr. Green how far apart to plant bulbs—lilies, hyacinths say—to make a good effect?

Mr. Green: We put them in very generally about eight inches apart; they may be put closer with good results; we plant on rather good, rich soil.

A Voice: I planted mine about four inches.

Mr. Green: That is all right, you get a solid bank of flowers then.

Question: Is there any danger of getting them out too early?

Mr. Green: There is very little danger of planting bulbs too early; we generally plant along in September and October, clear up to November. The point is to have a good root action before winter closes up.

Question: Do you leave them out all winter?

Mr. Green: Well, I have raised tulips which had been out for five years and they have been fine every year. They can be left or taken up, as you desire. If taken up, they should be left as long as possible. If you want to plant something else in their place, I would take them up and put them in sand and leave the tops on, and they will be practically as good as ever; small bulbs are not sure to bloom the first year, but the second or third year they are just as good as older.

Question: Do you find the double varieties do well the second and third year after planting?

Mr. Green: I have not noticed it. We plant for our customers the choicest bulbs and get them in early; when we think they have all they want we take what is left and we have about as good results as ever.

Mr. Brown: I would like to know about the narcissus, that is if they are hardy and will stand year after year; what varieties of narcissus will stand outdoor planting like tulips and hyacinths do?

Mr. Green: I do not believe any of the narcissus are iron-clad, as tulips and hyacinths are. A great many will stand with protection, but they want to be in well-sheltered places and more attention must

be paid to mulching. I would not recommend any varieties for planting without they had good, intelligent care.

Question: I would like to ask if it is possible by systematic mulching and care to put in narcissus so they can be used Decoration Day. What do you know about handling them?

Mr. Green: It would be entirely guess-work with me. I always dislike to recommend anything I do not know about. My customers are practically my personal friends also, and if I tell them anything else, they come back at me and say, "Here, Green, you lied to me about so and so," so I have to be very careful about recommending anything unless I know I am right.

Question: I would like, if you can, to tell us how we can get cannas through the winter?

Mr. Green: Put them in the cellar. Leave them out in the fall until they are killed down by the frost—not until they are clear frozen, but after the tops are well frozen off, cut them off about a foot, about like you would corn. We always take them up by putting a spade under them, leaving a ball of earth, as much as will cling to them, attached; we let them lie out for two days; if the weather is damp, we leave them until they are dried out, then we put them in earth and put them in the cellar, where the temperature is about forty, or in the greenhouse; for the average planter the cellar will do and will keep perfectly.

Question: I have tried it and they don't do.

Mr. Green: Let the earth dry right on them until you go to shake them out in the spring. If your cellar is too dry, sprinkle them occasionally. The ordinary cellar is all right if not too dry. Furnace heat in a cellar is dryer than the ordinary cellar without heat and they will need watering.

Question: Would a cellar having a cement bottom be too dry?

Mr. Green: I do not think so. Right upon the floor would be a good place for them. If the furnace causes a dry condition of the air, you will have to water.

Question: What time toward spring would you advise taking the cannas up and putting them out. How soon should we get them out?

Mr. Green: Speaking from the standpoint of the florist?

Question: For the general planter.

Mr. Green: I would say, if you have got a place to start them, I would put them in in March. We start them in February; we have to have good big plants to make a showing when they are put out, but for the average planter I would say in March. Take them up and break them up into one or two healthy eyes and put them in sand, or put them in half sand and half soil, then you can leave them there until all danger of frost is over, then put them in the bed.

Question: Can you start them exclusively in a dark cellar or in a dark place?

Mr. Green: No, I would not recommend storing them in the dark;

after they begin to make root growth they want plenty of light. Our seasons are rather short and we lose so much valuable time, and I would advise to get them along as far as you can before putting them out; they get frozen plenty early enough before we have enjoyed them as long as we want anyway; the quicker you get them to blooming the better.

A Member: I would like to tell the rough-road method I have taken for planting cannas. Excavate your pit and put in a foot or eighteen inches of stable manure and then put your soil back. Put your bulbs in there, and after a while thoroughly wet them. The bulbs will then take up with the conditions around them and you can get good results. I know, as I practiced on the beds of floriculture at the exposition, and I had good results.

Mr. Green: I would like to say about the narcissus again: A gentleman asked me if he could get flowers by Decoration Day. I will say, if you will use cold storage bulbs and as soon as spring opens plant the bulbs, and thirty-five days from that you will get flowers.

Question: I would like to know why it is we have to send to the old country for our bulbs?

A Voice: Because we do not want to work in the summer for five cents a day; you can buy them cheaper.

Question: I would like to ask the gentleman why he sends to the old country for his apple seed. I grow mine. I understand as a general rule he sends to the old country for his apple seed. Is it worth more?

Mr. Russell: Answering the gentleman as to why they send to Europe for apple seed, it is worth more than the American seed. That is, a bushel of European seed is worth more than a bushel of American seed. Labor is cheaper over there and they wash out the pumice. The French seed is cleaner and comes to us in better shape. Some prefer one kind and some another, but the supply in this country is not equal to the demand, therefore they have to send over there for some of their apple seed.

Question: I would like to ask the Secretary if he believes the French apple seed will produce and stand the climate of northeast Nebraska as well as our native apple seed.

Mr. Russell: We are getting a little bit off the program, but I can answer in part by saying that we made a test of it in an apple seedling orchard in this state. You may plant American seed or you may plant the French seed, but you do not know that you are always getting good hardy stock in planting the seed. Some is hardy and some is not. As far as I can determine, one seed will ordinarily bring as good results as the other to propagate from. People have different ideas on the subject. The nurserymen have used both kinds of seed for years. Sometimes a customer gets an idea for American stock, and another will want French stock. For myself, I cannot say that one is better than the other. Still, I say that one bushel of the French seed is better than a bushel of the American because it produces more stocks.

DISCUSSION ON "ORNAMENTAL HEDGES."

J. H. HADKINSON, BENSON.

Question: Do you plant in a straight row for a hedge?

Mr. Hadkinson: I would alternate them.

Question: Don't it make an irregular appearance?

Mr. Hadkinson: It does not. It has the appearance of a hedge when grown up. It is a good method.

Question: How far apart do you plant?

Mr. Hadkinson: About eighteen inches.

Question: Do you use different colors, green and purple, etc?

Mr. Hadkinson: You can do as you please about that; that is a matter of choice. You could alternate the plants and it would make you a very pretty hedge.

Question: How deep do you plant privet?

Mr. Hadkinson: Privet I would put in two or three inches below the green or where the root begins, then I trim down pretty close to the ground. If you have good soil, you have a better chance to get a good strong hedge.

Question: What size plants do you recommend of privet? How large a plant?

Mr. Hadkinson: Anything you feel like buying, from a cutting up to a bush. For general planting, I recommend one or two-year-old plants.

Question: How wide through would you have a hedge?

Mr. Hadkinson: Approximately from eighteen inches to two feet. Hedges in Europe do nicely, and I have seen miles of them not thicker than twelve inches, but you could not get through if you tried.

Question: How often would you prune?

Mr. Hadkinson: Probably two or three times during the summer. Whenever they commence to grow out and get unsightly.

Question: Would you treat an arbor vitæ hedge like that?

Mr. Hadkinson: Yes I would rather keep an arbor vitæ hedge pretty close.

Question: Will spruce stand that trimming?

Mr. Hadkinson: The Black Hills spruce will stand cutting back if you start with them when they are young; plant, and cut them back with a knife. I would not favor pruning the Black Hills spruce unless it is done early in the season.

Mr. Crawford: What is the best plant for the hedge? I think it is arbor vitæ.

Mr. Hadkinson: I would like to say to this gentlemen, and for the benefit of any others here, it depends upon the section of the state you are planting it and the ground it goes in. In planting a hedge, look around the district where you are living, and if you can see a hedge that is doing well, plant that same kind. Don't transport plants from miles

away, but plant the kind of hedge that is doing well in that vicinity. Arbor vitae is doing well in the southeastern portion of the state, but I have in mind one planted in Weeping Water, in the cemetery there, that is not doing well.

Mr. Crawford: One I have in mind is at Fairfield, Ia., and it is doing fine.

Mr. Hadkinson: Where are you located?

Mr. Crawford: I am not located.

Mr. Hadkinson: The reason I asked you is so that the reporter will get the locality that is asked or talked about.

A Member: I would like to speak of our arbor vitae experience in western Iowa. When it was an open prairie, wind swept country, hedges planted then did not live. If you will plant an arbor vitae in some well protected place and give it proper care, you will succeed in getting a hedge. A great deal depends upon the care you give an arbor vitae the first two years; dig a little trench along side of it, and have plenty of loose subsoil under your plants when planted. The first fall brush your hedge; lay brush almost completely over it and shade it from the sun. Do that the second year, and I think it is well to do it the third year. If you leave it without protection in a wind swept country, it is a great mistake; you will find it hard to succeed with plants that way.

Question: Don't you find the privet winter kills occasionally?

Mr. Hadkinson: I am sorry to say, yes. I have a hedge I have had for three years. I cut it down every spring. The reason I grow it in preference to any other is, it is such a nice hedge in the fall; it is so nice and green in the fall and sometimes lasts as long as January.

Question: Why do you cut it down?

Answer: Because it will die down anyway, so just as well cut it.

A Member: If one wants a hedge in sod, you will find the Black Hills spruce will do well; they will stand lots of sun, but the Black Hills spruce in shade will not do well; they want sunshine.

Mr. Hadkinson: I wanted to state regarding the privet. I can show you in Dundee one of the prettiest hedges that grows, either in Europe or any other country. It is not the California privet, and I don't think it is the Amaurense. It is either the Amaurense or the *Vulgaris*; the Amaurense is the same as the Polish, or is very closely allied. I have tried the Amaurense at home, or at least it looks like it so much that I have convinced myself that it is the Amaurense, but I have been contradicted in it so much and told it is the *Vulgaris*, that I don't know. Anyhow it is a fine hedge.

A Member: I would like to say, as far as hedges are concerned, I have had a good deal of experience in Nebraska. I live at Osceola. I have a very pretty hedge of berberry, purple and green. I am rather surprised not to hear any mention made of the Osage Orange or Bodark. I would not have a honey locust, I will take the Osage every time. In regard to the privet hedge, I wish to say that I have only about three

rods on my place, but it is the prettiest hedge I ever saw and is as thick as can be. I never had any trouble about it dying out. I don't know what I would give to have it around all my ground. It is the purple. It is not as strong and vigorous looking as the green, but it looks very beautiful. I trim my hedges four or five times a year. I simply take a scythe and walk along the hedge and trim it myself, walking slowly; I trim often. I suppose my privet hedge is more than two feet over.

A Member: Speaking of privet hedges. In Omaha there is quite a number of good hedges and they seem to thrive pretty well there.

A Member: For a hedge to look good all the year round, there is nothing that will exceed arbor vitæ. I have one that has been planted for about fifteen years; the calves have broken it down, and it has had a great deal of bad luck, but it grows right up every time. I think much of that hedge and I think it is fully as hardy as any evergreen. I don't think there is anything that will excel the arbor vitæ. I am sure I have had enough experience to know that it is perfectly hardy.

Mr. Roberts: Will the gentleman state where he belongs?

Answer: From Fillmore county.

Mr. Roberts: In the North Platte country the arbor vitæ is a failure; our customers say so all through the North Platte country and I have noticed myself that the arbor vitæ hedge has gone down and out. I would not recommend the arbor vitæ for the North Platte country. It is all right where it is wet, though a man in Boone county tried to put it in with water, and failed. I would put in the Black spruce.

Mr. Moore: I have been listening to the discussion about the arbor vitæ hedge. I live in Richardson county, and I believe we can grow almost anything there that is grown in the state, but you will not get a permanent hedge with arbor vitæ. You may get one for a few years but it will eventually die out. When you talk of a hedge of evergreen, I want something that will not die out. If you plant arbor vitæ it will look pretty well for three or four years, then it will blow out—

Mr. Hadkinson: I beg leave to differ with the gentleman. For four or five years I did not see an arbor vitæ hedge in Arlington, then I had an opportunity of seeing it, and it is better than ever, and is in good shape today. What happens to an arbor vitæ about blowing out, might happen to the Black Hills spruce, it might blow out too. It happened with me this summer with the Black Hills spruce. It will blow out in spite of you. But what will you do? I will fill it in and try to make it grow. That is one thing I would like to impress on you, you have got to stick to your hedges if you want to get them in shape.

A Member: I do not want to make any mistake. My plans are pretty well made for putting in about six rods of privet, six of berberry and six of Russian mulberry, and I don't want to make any mistakes; I want to know what size plants to put in and how close to plant them. This is a request for information for Lancaster county.

Mr. Yager: In Dodge county, north of the Platte river, my observa-

tion has been in accordance with that of Mr. Roberts. This question is always coming back to us, as to locality, and it is sometimes misleading. When we talk about the advisability of planting arbor vitæ, somebody in the western part of the state is liable to say that the Horticultural Society is recommending arbor vitæ, so it must be all right, and it all comes back to a question of where it shall be planted. Some years ago when I was about to make my home in our county, my wife called my attention to a beautiful arbor vitæ hedge there. We thought there was nothing like it, so we planted one because we thought it so beautiful, and we have one just like it, but when it comes to planting them in all localities it is a different matter; it is very difficult to keep these hedges in our country in proper condition; they die year after year and eventually we get discouraged and cut them down. I have had a great deal of experience in trimming Dakota spruce; they stand trimming as well as the other—as well as red cedar and they make a fine hedge and I feel sure they will stand the climate; some of you may be discouraged, but I tell you that you can tie to the Dakota spruce in our country, but this country is not all good for arbor vitæ. When I speak of Dakota, I mean the Black Hills spruce.

Mr. Hadkinson: This brings me back to my previous talk, where I spoke of your particular locality, to look around and see what is doing well, and I desire to emphasize that. I am a stickler for a person to stay with something that is doing well in their part of the state—the part of the state they live in. I do not want to recommend arbor vitæ for a part of the state where it will not do. However, I want to set my heel down on the Black Hills spruce, because I do not take to it myself; that is one of the hedges that you can make that I do not take to.

Question: Don't the arbor vitæ do better with a clay subsoil?

Mr. Hadkinson: I don't think where I saw the hedge at Arlington it had a clay subsoil close to the top. It may have deeper down.

Mr. Williams: I wanted to call your attention to one of the shrubs that has not been mentioned yet I believe, and that is the spirea. We have three varieties useful for hedges. A doctor and his wife came to my place last fall and looked over my ground for something suitable for a hedge. I showed them the privet, the Russian mulberry, tamarack, berberry, and among others three varieties of spirea. They were very much attracted to the spirea. At the time they were there it was October and it still held its foliage and looked well. I know the foliage of the privet is better than that, especially the nursery privet, but the spiræas are beautiful very late in the season. Take the Hawkeye, it is of a fine form and makes a very symmetrical plant; also the *Primerifolia* and the *Van Houtti*; these three are very desirable varieties.

Mr. Hadkinson: I mentioned spirea in my list, but we have not discussed it. I wanted to speak of another thing, that is as hardy as a burr oak, and that is an upright honeysuckle, and it makes a very pretty hedge, and it can be trimmed; it gets somewhat ragged as it grows up; it makes a fine mass of healthy foliage in the early fall.

Question: Do you trim the Black Hills spruce for a hedge?

Answer: Certainly, if you are to make anything out of it.

Question: Doesn't the honey locust make any sort of a hedge?

Answer: It makes a very good hedge. I have no use for honey locust, I thought you said black locust.

Question: Will not the black locust sprout all over the farm?

Answer: It might sprout if you mutilate the roots, but if a man goes in for planting hedges and fixing up a place he must expect to work; you cannot plant them and let them go; you have to care for them; they must be kept in shape.

Question: I wanted to ask about the distance to plant privet?

Mr. Hadkinson: I have planted privet from eight to twelve inches. I prefer eight myself.

Question: Do you plant the arbor vitæ in a double row?

Mr. Hadkinson: No, I would plant the arbor vitæ in a single row.

Question: How far apart do you plant arbor vitæ?

Mr. Hadkinson: I planted one hedge once twenty inches—between eighteen and twenty inches. I would like to state that there is another plant or evergreen that makes a very nice, compact hedge, and that is the Siberian arbor vitæ; but that is tramping on ground where I may get into trouble. It does well in certain localities; some of you may be able to tell where they do well.

Question: Do you think the arbor vitæ is safe to plant as an ornamental shrub in the yard?

Mr. Hadkinson: Sure, if you are not too far west.

Question: All over the state?

Mr. Hadkinson: No, I would not recommend it all over the state. We have recommended many evergreens in our guide, by consulting that you will see the varieties. A person that reads that ought to be properly guided. I have seen arbor vitæ doing nicely in different places in the state just for a yard shrub.

Mr. Crawford: What is the prettiest hedge? If you had to hold up your hand and express an opinion, would you not have to acknowledge that the arbor vitæ is the prettiest hedge that grows?

Mr. Hadkinson: I would acknowledge things ten or twenty years back that I would not right now.

Mr. Crawford: You are not answering my question.

Mr. Hadkinson: That depends entirely upon a man's taste.

Mr. Crawford: Well, I ask your taste. Is not the arbor vitæ the prettiest hedge that grows?

Mr. Hadkinson resumes the chair.

Mr. Hadkinson, President: We have our question box.

The Secretary: Here is a question from Mr. Stephens of Crete: "Would like a report on work of our Horticultural Department, State Farm, investigation of codling moth and scab. What did the U. S. do along this line? How often to spray and what with? E. F. Stephens."

The President: It occurs to me that Mr. Emerson can write that up and answer it in the record.

The President: Perhaps we can take this up in the morning.

A Member: I move that our professor of horticulture, Mr. Emerson, be asked to prepare a bulletin on this subject as soon as possible and place it in the hands of the secretary, and that a copy be sent to all the members, regardless of life members—let it go to all, and that it be given as wide publicity as possible, urging him to have it ready for the spring's work.

Mr. Emerson: It will be in time for the spring spraying; it will go to a good many more people than the members of this society; it will probably go to twenty-five thousand people.

Motion seconded and carried.

Meeting adjourned to meet at 9 o'clock tomorrow morning.

THIRD DAY.

THURSDAY, January 17, 9 a. m.

Meeting called to order by the president.

Mr. J. Y. Craig, president of the Park Board, Omaha, read the following paper:

PLANTING VINES.

BY J. Y. CRAIG, PRESIDENT OF PARK BOARD, OMAHA.

Mr. President, Ladies and Gentlemen of the State Horticultural Society:

Your honorable committee has assigned to me a subject, to present to you a few thoughts on ornamental vines which would appear at first glance as one of small importance, but when we look at the works of nature we see many uses the vine can be put to in beautifying our homes. It is astonishing what a change a few vines will make in the exterior appearance of a house; they can be trained so easily, up the side of a house, all around the doors and windows, and formed into any shape you can imagine, with a little care every week or ten days, while they are making their growth. What is more beautiful than a neat, cozy-looking home, let the dimensions be what they may? It is just as important on the small cottage as the more pretentious castle. Any porch ought to be festooned with vines. Fences, and in many instances, outbuildings, can be much improved by a little vine training, and where it is desirable to obstruct some certain view, build a trellis and plant vines. You may cut off the view in this way at once, until you can grow something of a more permanent nature, in the shape of trees and shrubs.

In training vines we would recommend the use of galvanized wire netting, fastened to the building by galvanized iron eye-pins some four inches long, so as to leave an air space between the building and vines

of about three inches. This will be much better for the buildings and also the vines. Where the grounds are of large or medium proportions many opportunities present themselves. When a quiet nook is suitable for a summer house or arbor, it would form an artistic feature covered with vines.

Ornamental vines are very much used in Europe, trained up as standards to any desired height, then trained to form heads of whatever shape you may desire. They make beautiful single specimens on the lawn.

A list of vines that have proved hardy in this section of the country are: *Ampelopsis*, or American Ivy of varieties; *Quincefolia*, of the dwarf varieties, so perfectly hardy, rapid grower and in the autumn, the foliage takes on all the colors, varying from bronze to a brilliant scarlet. There are other varieties, mostly of Japanese or Chinese origin, which are more compact growers and very beautiful, but not satisfactory in the middle west. The variety known as the Boston Ivy is probably the best.

Laricera or Honeysuckle family, *Caprifolium*, or Carol. Honeysuckle is one of the hardiest beautiful pink carrol trusses of flowers, glossy green foliage, rapid grower, very desirable.

Ciliata. Same habit of growth, with yellow flowers. *Glauca*, *Hirsuta*, *Sempervirens*, *Holliana*, *Aurea*.

I have mentioned a few of the hardiest out of thirty or more varieties which are grown further east or south.

Bignonia Grandiflora, or Trumpet vine. Rapid grower; blooms toward fall with beautiful large trusses of orange and scarlet flowers.

Radicans is probably the hardiest of the family. Very desirable vine for outbuildings, fences, etc.

Clematis of many varieties. *Paniculata*, pure white; one of the most attractive vines cultivated. *Jackmanii*, purple, large beautiful purple flowers. *Queen Victoria*, large flowering variety; white; very select. There are some varieties of *Clematis Virginica*, natives of this state, which are very attractive and worthy of a place. There are forty or more varieties of *Clematis*, but many are tender here.

Hedera Canadensis, known as English Ivy, which is one of the most beautiful evergreen vines in cultivation, while hardy in our eastern state will not succeed in this dry atmosphere of Nebraska.

Wistaria Sinensis.—*Purpurea* and *Alba*, purple and white, very beautiful vines of rapid growth. This vine ought to be planted on the south of some building or in some partially sheltered position.

I have mentioned here only a few of those that are perfectly hardy in this state or the eastern or southern portions at least; all are worthy of cultivation and many others.

There are many vines which are perfectly beautiful, that are of annual duration, which may be raised to a good advantage where immediate effect is desired, until more permanent vines can be grown. Sweet peas of varieties, nasturtiums, passifloras, *Coeleus Scandens*, Madeira vines, German and Kenilworth Ivy, *Lothispermum Scandens*, etc.

The cultivation of vines is very similar to ornamental trees and shrubs. I find that if the soil is thoroughly pulverized to a depth of from one to two feet, it is sufficiently rich to grow any of them. A liberal mulching each year is very beneficial, as it protects the plants, retains moisture and furnishes nutriment to the vines.

In conclusion, ladies and gentlemen, I believe that the ornamental vine was placed here by the wise Creator of all things for the purpose of putting the finishing touches on our efforts in the decoration of our homes, pleasure grounds and public parks.

DISCUSSION

Mr. Bombarger: I want to ask about the Japan bean vine. It is used a great deal in the east and around Germantown, Pa. It is a feature of the landscape there. I want to ask if anyone here knows anything about it?

Mr. Williams: Last year I got three roots of that vine and planted them with all possible care and they failed to sprout, either one of them. That is all I know about them.

Mr. Bombarger: I understand they will cover forty feet in a year; that if they freeze down they will come up and cover forty feet the next year.

Prof. Emerson: I think this is the same thing I got from Teys' Nursery and it crowded out everything for four or five feet on each side in the nursery, and nearly took the nursery.

Mr. Bombarger: Please describe it.

Prof. Emerson: I can't give a very good description of it. I can't tell whether it is hardy. It came through last winter without injury, but whether it was killed back I couldn't say. It wasn't entirely killed because it came out again this year. We had to keep cutting it off and cutting it off, as it got in the way so much of other things. I am not positive this is the same thing, but I think it is.

Mr. Crawford: I want to name some edging plants that might come in here all right. There is the *Yucca Filamentosa*. You can put it along the edge of a walk, and it grows about four or five feet high and has a spike of white flowers; and the foliage is green all winter. Then there is another kind of grass that grows out all over the west, the Spanish Bayonet. If any of you want that, I can dig that for about one dollar a bushel or I can gather the seed for about twenty-five cents a quart, all the edging plants you want. They will grow anywhere in the United States.

Professor Emerson: Do you recognize two forms of that in the west, one broader leaved than the other?

Mr. Crawford: No; the Spanish Bayonet is wild. The other never grows wild.

The other is just as good. I engaged about a bushel of seed at Halsey, and we are going to plant a lot of them, and you can get five hundred

thousand plants if you want them. A lot of people think they can't raise the *Yucca Filamentosa* from the seed, but they can. It is easy enough to do that.

Mr. Williams: I want to call attention to another form of this *quinquefolia*, or ivy, which has a file shaped leaf that clings to stone walls. In my opinion it is far above the old form, which requires a trellis, and I do not see any use in planting the other form any more. This propagates easier and is just as good and is worthy of planting instead of the old kind. Kearney has planted some at the new Normal building, and it is being planted in other places, and the interest seems to be just awakening concerning it and it ought to be generally substituted for the old form.

President: I desire to concur in the remarks of Mr. Williams. I have been much interested in that variety, the *Ampelopsis Englemanii*.

Question: Is it not sometimes called the Boston ivy?

President: No; it has a very small leaf. The one that clings to the wall I think is *Englemanii*. I bought it in the east, and I think it is the same thing.

Mr. Brown: Quite a number of us were at West Baden Springs two years ago, and we wandered out back of the hotel and we found this same thing growing there wild on the hills in southern Indiana. We have the same thing here around the state farm buildings, and I have seen it in a number of places here, *quinquefolia*, *Ampelopsis*, Virginia creeper, American ivy, these are all names for it. I think it is all the same thing.

Professor Emerson: This *quinquefolia* I got in part from plants at Mr. Pollard's place at Nehawka, and in part it was taken from dwelling houses in this city, cuttings. I sent last year to Storrs & Harrison for *Englemanii* and got the same thing, so I have since that been calling it *Englemanii*. From the fact that the form we have does not shed its leaves as early as the common kind with tendrils, I am led to believe that it may not be as hardy in the extreme North, but it is hardy here. It holds its leaves longer. Over porches I think I would prefer the other kind, as it is more vigorous in growth; but for stone or brick or concrete I would prefer this.

Mr. Brown: I think this has the prettier foliage. The foliage of the other form is rather dull, but this is bright and shiny and I think preferable to the other in that respect also.

Mr. Crawford: You are talking as though it was hard to get, and scarce. That is all nonsense. It is growing all over in the state of Iowa.

President: What do you refer to?

Mr. Crawford: The Virginia creeper. But there are two kinds of Virginia creeper, and you want to be careful and don't meddle with the three-leaved kind, but when you find the five-leaved you are all right, and you find it everywhere in the woods in Iowa.

Mr. Green: I was born and raised in Iowa and spent all the time I could in the woods all my life; but I never saw the *Ampelopsis Veitchii* growing wild in Iowa. There is plenty of Virginia creeper, that is com-

mon, but the dwarf sort, that we call Veitchii, is not common in the woods of Iowa.

Mr. Bombarger: We are about twenty-five miles from the river out where I live, and for about fifteen years we were afraid to plant the Virginia creeper, but finally some took courage to plant it and it stood the test; it did freeze down, but came out again in the spring, and we have a court house there, a \$90,000 building, and it is a sight; the vine is all over it. It killed down once, but it is now a most beautiful thing. We also tried it on the north side of buildings in different parts of the town and it has not gone down on the north side. But I would get some good strong humus when starting the plant. This is the Veitchii, not the Boston ivy.

President: Speaking of the *Ampelopsis Englemanii*, or the adhesive variety being wild here, there is another thing in this, the Virginia. If you go as far south as the central portion of eastern Missouri, you will find that the Virginia creeper is there along the Mississippi river, acres of it, hanging over the bluffs there. That does not say that this clinging variety we have here may be *Ampelopsis Englemanii*, and I don't say that it is. But Professor Clements is in the room, and he has had a little experience on the same line I have had. I sent east for a little of it and got some here and took care of it and protected it and it didn't flourish. I want to say right here, that lots of our plants have been originally wild, indigenous to some section. But undoubtedly this vine that clings, be it *Ampelopsis Englemanii* or be it whatever it may, it is a splendid vine.

Mr. Williams: When we arranged the grounds around our court house at Grand Island we wanted some vines planted there, and I planted *Ampelopsis Veitchii* and it is doing finely. Three years ago it made a growth of nine or ten feet, and we wouldn't ask for anything prettier.

President: I will ask Professor Clements to give the definition of the poison ivy.

Professor Clements: The poison ivy, *Rhus radicans*, is the climbing three-leaved form. The poison kind, which is even more common, is a low shrub two or three feet high called *Rhus toxicodendron*. But neither has anything to do with the Virginia creeper.

The following paper was then presented by J. W. Murphy:

PICKING AND MARKETING FRUIT.

BY J. W. MURPHY.

Mr. President and Gentlemen of the Nebraska State Horticultural Society:

When I received a program from Secretary Russell and saw what subject the committee on program had given me, I wondered what I had done to make them think I could give them any information on so important a subject. This is, with one exception, the most important point in fruit growing. The other is to grow fruit "fit" for market. Then your troubles

are practically over. The market will come to you. But, coming back to the subject, handling apples, I have some ideas of my own. In picking apples, I use the round half-bushel basket, the kind which has no hoop on the inside. Line the basket with light burlap, covering the top edge of the basket so as to prevent the apples from striking the bare basket. The apples should always be laid in the basket; letting them fall not only bruises them, but coming in contact with the stems, often breaks the skin which will make a starting place for decay. Even long finger-nails are often injurious in apple picking. It is almost impossible to pick apples with long finger-nails without cutting the skin. A piece of wire, stout enough to hold the basket full of apples, should be used as a hook. This is very simple. By using a double coil around the handle of the basket, and making a hook of the other end, the basket can be hung on the ladder or limb of the tree to suit the convenience of the picker.

Bushel crates are the handiest thing to use in handling when the apples are to be hauled to the packing plant. In putting the apples from the basket into the crates, tip the crate to one side at an angle of fifty degrees, and lower the basket in the crate with the bottom of the basket on the lower edge of the crate; tip the crate back, at the same time turn the basket over. In this way, there will be no apples bruised in pouring from the basket to the crate, which is often the case; and at the same time, there is no time lost, as it is done in a few seconds.

As for ladders, every fruit-grower has his own ideas about them. I use two styles. One is a three-legged ladder with the third leg fastened at the top with a bolt where the sides of the ladder come to a point, so the third leg works loose and can be used on the hillside, as well as the level, with perfect safety and not interfere with the tree. This ladder can be made of heavy undressed 1x4 lumber, and not over twelve or fourteen feet high. The other is made to come to a point at the top with the sides nailed to a piece of 2x4 extending four feet above the top step of the ladder. This 2x4 should be tapered to a sharp point and dressed smooth so the ladder can be shoved up through the limbs without knocking off the fruit or doing damage to the tree, which is often done in using the old style ladder which is wide at the top. A low truck platform wagon is the thing to haul apples on. I use a low truck wagon with a platform seven feet wide and fourteen feet long with a solid floor made of one inch lumber with a narrow strip one inch thick nailed around the outer edge of the floor to prevent crates from slipping in hauling. In piling the apples on the ground, use some kind of straw or hay or grass of any kind to pile the apples on. I prefer long heaps instead of piles, as it is much easier to make a long pile than a round one with less damage to the apples in pouring from the crates. The piles should not be more than three feet high and not over six or seven feet wide. The packers like this way of piling, as it gives them ample room on one side to put the culls out of the way while the other side is being used for packing. When you have your apples piled in this way, they are ready for the buyer, and if you

have apples that will average forty per cent of number ones and thirty-five per cent of number twos, the buyers will hunt you up; and you will have no trouble in selling your apples at a price that will pay better than you can do to market them yourself. This was my method last year and before I was done picking, a buyer came to my place and made me an offer of \$1.50 per barrel for Jonathans and \$1.00 for York Imperial, and 75c for Ben Davis and other varieties, the packer to furnish the barrels on the ground, and also furnish all his help and board same at his expense, taking all my hands at \$1.50 per day and taking all the apples that were fit for market, which was about eighty-five per cent of them. I hauled the apples to the depot two miles distant. Now, it did not take me long to tell him that he had bought my apples at his own price.

As a rule you will find where the grower takes care of his orchard and raises good apples, he will have no trouble to find buyers and will get all his apples are worth, provided he keeps posted on the market, so as to know what price to hold them at. Now a word for the majority of the growers, to the man who writes those nice little articles for the fruit journals, telling how he turned the sheep in his orchard, and how nice they cleaned out all the weeds and grass, and what a nice little job it was to put a strip of screen wire around each tree to keep the sheep from peeling the trees. And how much better job they do than can be done with a sprayer; as they are supposed to eat all the wormy apples as they fall from the trees, at the same time capturing the worm so he could not climb the tree again and continue his work of destruction. This kind of treatment is a failure; yet three-fourths of the growers are ready to take up with just such ideas. For those fellows I have little sympathy and no advice to offer as to how they should market their apples.

In conclusion, will say in my opinion, there is only one way to make a success of growing apples that are fit for the market. The orchard should be pruned annually, and thoroughly cultivated. No crop of any kind on the ground. Spray as often as necessary, not less than five or six times and sometimes more owing to the season on account of the rain. Do with your orchard as you would your cornfield when you expect to get a good large crop of corn. In this way, you will have a paying crop of apples every year, and at the same time, the dealers all over the country know what you are doing with your orchard and will be ready to take them off your hands as soon as they are picked, and at your own price too. I have a neighbor that has partly followed these instructions and has had six paying crops in the last six years. The trees are sixteen years old now, and on fifteen acres last year he had five car loads that would average from sixty to seventy-five per cent number ones.

DISCUSSION.

Mr. Swan: I would like to ask Mr. Murphy if he generally cares for his apple trees till they are twenty or thirty years old.

Mr. Murphy: Part of my orchard I have cultivated nearly all the time

ever since it was set out twenty-two or twenty-three years ago, and with a few exceptions have had fairly good crops, and in the part not cultivated I have got practically nothing. That is the experience of every man in the community with a few exceptions. I think last season nearly everybody that had apple trees had a good crop. Some that had practically had no care gave as good a crop as those that had been cared for, but this might not happen again for many years. The only sure plan is to go at it right and then you get paid for what you do.

Mr. Swan: Tell us more about the sheep business.

Mr. Murphy: I think I have said all that is necessary in regard to the sheep. That is not my method of spraying an orchard, and it is not my way of cultivating or mowing the weeds or grass, and it looks as though it was just as misleading as lots of articles that get into the annual reports, where a man doesn't come to the meetings and get the benefit of the arguments he gets misled by those having so many different ideas of different apparatus. I would use the plow and spraying machine and a pruning knife every year. That is the only sure plan. That is what they do where they raise apples and nothing else for the market. One trouble with us here is we have too many resources. We ought to have some way of compelling people to do certain things, especially with fruit, or not allow them to have it on their lands. And we ought to come to that as soon as possible, because if a man is surrounded by poor orchards and tries to take care of his orchards he has to fight all his neighbor's insects. I could tell some very unreasonable experiences about spraying, but it might not be well, because the people would say it was a little broad. But every man must cultivate and prune, and must do it every year and do it systematically. And systematically means that he must use his own judgment, owing to the season. You can't say "I will spray four times a season." The coming season you might spray four times and make a failure, or three or four times more and make a grand success. There must be a good deal of judgment used in regard to these matters. Some seasons more cultivation and sometimes less cultivation will do, and sometimes you must use some kind of a cover crop as it is called, or if you have cultivated several years, you might put your orchard in clover for a year or two with the understanding that you are not to take the hay off the ground. Turnips is the best thing to use in an orchard if you leave them there and plow them under in the spring. They make the best fertilizer in the world. When you get to this way of taking care of an orchard you will raise apples; but when you try the sheep, and the calf, and the cow or two or three crops of grass method, you are bound to fail. We didn't use to have the difficulties we have now, but we have to take things as they are.

Mr. Crawford: How old are your oldest apple trees and are they sound yet?

Mr. Murphy: Yes, sir; just as sound as possible and they will be as long as I can take care of them. I have got pippins twenty-two years old and as good as when they were put out.

Mr. Swan: Did you advertise to get these men to come to your orchard?

Mr. Murphy: No, they knew what I was doing as well as I did. They knew I was raising apples and they came out to see about the crop.

Professor Emerson: What do you consider a number one apple, in grading. I would like to know just what a number one apple is.

Mr. Murphy: I thought all fruit-growers knew what a number one apple is. It is simply a perfect and true apple. A true type of the variety it represents, and an average size. In grading apples it is very easy to catch on to a number one, or in buying apples. I was in a store here last night where they were selling Jonathans three for a dime, they were of medium size, but strictly number ones. The man said he paid \$2 a box for them, but he sold them more readily and more of them than the home grown Ben Davis. We can raise number one apples easier than Colorado can; with one-half the care than Oregon gives, where they raise the finest apples in the world. They are compelled to do certain things there or they can't accomplish anything. If a man knows the variety of an apple he can pretty nearly tell what shape it ought to be, and he can tell whether there is a worm hole or a scab on it or anything of that kind, and of course the number one can't take all the perfect apples on the tree because there must be a limit to the size, they may be perfect in everything except size, and you may have to put them in number two if you come right down to the true method of grading apples. We ship in barrels. We haven't enough apples fit for boxing to fool with boxes.

A Member: What material do you use for an insecticide?

Mr. Murphy: There are a good many different things: Arsenate of lead, white arsenic, soda, Paris green; and Paris green is just as safe and as good as anything else. It will not do to let it stand, because it will settle, but if you thoroughly mix until ready to spray and you continue to spray until you get the receptacle empty, all right; but if it settles it is hard to get loose again. But I have had the best of luck with Paris green, and it is cheaper. Not that we want to figure on cheap work, but if a thing is just as good, it is all right.

Mr. Williams: I would like to ask if the orchardists around your country are planting clover in their orchards or adopting clean culture.

Mr. Murphy: You remember the Laramie orchard which had six crops in six years? That was plowed three to five inches deep five times and no harrow run in it. It was left so the water would have plenty of room to settle before it would create a wash. But in a good many cases now the spreading disc is coming into use more or less as it is easy to get under trees that are low. You can spread it sixteen feet and throw the dirt all around the trees, and I think it will come into use so as to prevent so much plowing of the orchards.

Mr. Williams: Should you prune high?

Mr. Murphy: Yes, sir, you should prune high enough for a team to go under the trees.

Mr. Williams: I have never considered thorough cultivation practical for any great length of time.

Mr. Murphy: Some people argue that in plowing with a breaking plow you cut the large feeders and fibers that come to the top of the soil, and they claim by cutting these you will sooner or later injure the trees. But I am satisfied that is a mistake. I am satisfied it is necessary once in a while to cut them off. Others will take their places so quickly you don't know how they have done it. You will never strike any large roots in cultivating within reason.

Mr. Davidson: How small an apple would you pack?

Mr. Murphy: That would depend on the variety. Take a Ben Davis that was too small to go into a number one barrel of that variety, it would be large enough to go into a number one Jonathan, because the Jonathan is a smaller apple.

Mr. Davidson: What is your rule on Ben Davis?

Mr. Murphy: Some seasons they are larger than other seasons. You have to be governed by that. As near a uniform size as you can get makes a better grade of selling number one apples. The evenner they are in size the better sellers.

Mr. Davidson: I supposed pickers had rules to go by.

Mr. Murphy: They do have rules, but they are governed by the season. Probably a two and one-half inch Jonathan would be the smallest that would go into a number one barrel in a usual year.

Mr. Davidson: Nebraska packers seem to use a different rule in the middle of the barrel than they do at the top.

Mr. Murphy: Ordinarily of course it is natural to use the best to face with, all even in size and color, but your face should represent what the barrel contains, and when you do that you can get the top market price, with practically no more expense in packing. If you have apples that run right, they might grade forty or fifty per cent number one; that would be very high. Forty per cent is high for number one.

Mr. Davidson: A two and one-half inch is the common rule for Ben Davis, isn't it?

Mr. Murphy: Yes, and a two inch for Winesap. The Winesaps you have to get a little less for. They are a very small apple. If you stop at a two inch, you will have very few number one. You have to go to one and three-fourths on a Winesap or Jenet. You have to learn it. A man ought to have an idea what the market demands, and that is what he ought to get. What will fill the bill.

A Member: If number one sells for \$1.50 a barrel, what will number two sell for?

Mr. Murphy: It depends on the season. A number two now would bring about double what number one did a few weeks ago. Usually number one is about twice what number two is. A few years ago I had a fair crop of Jonathans, really better than this last summer. And a firm in Chicago, Hewhall & Sons, fancy dealers in all kinds of fruit, the leaders

of the Chicago fruit market you might say, sent a man up to my place early in the season to make inquiry as to what the prospects were, and later they sent men out to buy and pack apples. They got me away from my duties and had me help them for five or six weeks, part of the time, as much as I could spare, and we went around looking for apples over the country, and we bought just the kind of apples we wanted, mostly Jonathans. We didn't want anything else, but sometimes we had to take a few of other kinds in order to get the Jonathans. That season apples run as high as \$2.75 a barrel and we took everything that was sound on the trees, the growers picked and piled the apples on the ground as we packed them, ones, twos and threes. What was lower than that we threw away. Number threes were shipped to Chicago and sold on the market for \$2 a barrel when they cost in the orchard \$2.75. That looked to me like throwing money away and some of the growers found what they were doing with number threes and thought they would be the losers in the long run, and after the holidays, a premium had been offered to the packers out around the country, the man making the best pack would get a premium, and there was quite a strife; and I wrote to Chicago after the holidays were over and asked how our pack stood up with the others over the country, and he said we were on top except for one eighty-acre orchard in Missouri which had been thoroughly sprayed and the apples were in fine condition. Our number twos were then selling at \$6 a barrel and number ones at \$12. That explains why the threes should be sold, or could be sold at \$2 a barrel, as quick as they could be gotten out of sight.

President: In the high heading of trees our people in the western part of the state cannot all agree. Mr. Murphy is at Glenwood and this would refer to that section around there. In the western part of the state we can't afford to do that. This is not said with any idea of criticism at all, but simply to correct the reading of this when it comes out.

WHAT IS WINTER-KILLING?

BY FREDERICK E. CLEMENTS.

It is commonly thought that winter injures trees and other woody plants because of low temperatures. Bud scales are supposed to protect the tender parts from cold, or against the sudden changes in freezing and thawing. The bark is likewise thought to protect the young twigs and the delicate cambium which enables trees to grow in thickness from year to year. From these views has arisen the common opinion that the winter-killing of buds, twigs, and roots is due to cold alone. Some trees, like people, are said to be hardier than others, because they have a constitution that is more resistant to cold. It is this feeling that plants are like animals, that their greatest foes are heat and cold, which has so long made us overlook the real danger of winter to the plant. Every plant-grower knows that water is the greatest need of the plant. The tree is constantly taking up water at its roots and losing it from its leaves and

twigs. Though it is less active, this process continues throughout the winter. Fortunately, the water loss is greatly diminished by the fall of the leaves, but the water supply at the roots is also greatly reduced by the freezing of the soil. Where the freezing of the soil is deep and long continued, it often happens that the amount of water lost from the twigs is greater than the amount that the roots can absorb. The result is that the younger twigs shrivel and die just as they would during a summer's drouth.

The effect of winter dryness naturally differs for different varieties and species of woody plants. Native trees are not "winter-killed" more frequently than they die by drouth in the summer, which is a rare occurrence indeed. They have adapted themselves so thoroughly to certain general conditions, by extending the root system, thickening the bark, increasing the number of bud scales, etc., that they pass through the windiest and coldest of winters without drying out. Fruit and shade trees will show this resistance to winter-killing in just as far as they have extended or deepened the root system to get more water, or have protected the branches and shoots against water loss. In connection with the last, the most important factor is the time of ripening of the new growth. This fact is one so well known to practical men since Professor Emerson's investigation of the subject that I need to dwell on it only to point out that the thickening of the bark and the maturing of the wood are both protections against the harmful loss of water during the winter.

The winter-killing of trees and shrubs has been studied by Nelson in Wyoming (1893), by Goff in Wisconsin (1899), and by Emerson in Nebraska (1903, 1906). Nelson was the first to point out that dryness was the principal cause of winter-killing. The causes of winter dryness are especially marked in Wyoming, but they are also more marked in Nebraska than in the states to the north and east. In the first place, the soil as a rule contains less water, and the usual absence of a snow cover permits constant evaporation from it. There is more wind and sunshine to increase the loss of water from the twigs and branches. The drying effect of the wind is greatest during our "northers," the very time when the soil water is frozen to the greatest depth. The increasing altitude to the westward results in a decreased air pressure and a corresponding increase in water loss. Goff, studying the effects of the severe freeze of 1899, regards cold as the cause of winter-killing. The results upon which he bases his conclusion can be more easily explained by the view that winter-killing is due to dryness. Where there was a snow-cover or cover-crop, the damage was slight. This was especially true in all areas where an earlier snow-fall had drifted and, melting, had increased the amount of water in the soil.

Emerson has obtained excellent results by studying the causes which control the ripening of the new growth. His work is especially valuable for its thoroughness and for the preventive measures which he indicates. He has demonstrated the close connection between winter-killing and ma-

turity, and has tried various methods of orchard treatment for the control of maturity. Methods which hasten the ripening of the wood cause it to enter the winter with better protection against dryness. At the same time they increase the water in the soil, and make it possible for the plant to lose much more water without being seriously damaged.

Combining the observation and conclusions of Nelson and Emerson with my own, which have been drawn from native plants, the following summary is obtained:

1. The winter injury or winter-killing of woody plants is caused by dryness. It is most frequent in dry soils, and in those most deeply frozen, because the water supply is low, and in regions with a dry windy climate, because the water loss is great. Where both conditions prevail, as on the Great Plains, unusual precautions must be taken against winter-killing.

2. Winter-killing is greatly influenced by the time of maturity. Native trees stop their growth and mature early as the result of long-continued adjustment to winter conditions. Cultivated species are found to resist winter dryness in direct proportion to the rapidity with which they mature in the fall. Critical selection of resistant individuals and the use for grafting of trees with extensive and deep root systems will do much to hasten maturity and hence to diminish winter-killing.

3. Winter-killing may be prevented or at least decreased by methods which will increase or preserve the water supply in the soil, by methods for hastening the ripening of the wood or by methods of decreasing the water loss from twigs and branches. The methods suggested by Emerson for hastening maturing serve also to increase and preserve the water content of the soil. Thorough cultivation and in many cases the formation of a dust mulch, offers the most feasible method of controlling the water. The use of a fall cover-crop of short duration will force early maturity and at the same time will not have a harmful effect in drying out the soil for winter. If the cover is not cut or is cut and allowed to remain as a mulch, the soil will be even better protected against drought. If it could be made as practicable, the same results could doubtless be obtained by using a mulch during the summer, raking this up in the fall to force maturity, and spreading it again at the approach of winter as a cover. Little can be done to decrease water loss from branches and twigs, except by individual treatment, which is out of the question in commercial orchards. Maturity can be hastened, however, by the choice of upland. North slopes seem to be preferable to south slopes, though this is an advantage due to late starting in the spring rather than to a difference of amount of exposure during the winter.

DISCUSSION.

Mr. Davidson: I think that is a royal good paper, but I have come to the conclusion that in Hamilton county we must be very careful about trimming or pruning during the winter. If we make a cut on a tree during a bright, sunshiny day it will go right into the heart unless it is

painted at once and it will dry the sap out of the tree. I have not been able to trim grapevines in the fall without having them die unless I lay them right down and cover them with dirt, especially during a dry spell of weather.

Mr. Crawford: Four hundred miles west of here young trees are very apt to dry out if we have a dry winter. The altitude and the winds dry them out unless they are protected in some way. Four years ago we had a winter that the last rain was in September and perhaps three inches of snow sometime early in December, and that is all the moisture we had early in May, and the young trees had a hard time.

REPORTS OF EXPERIMENT STATIONS.

CHAMBERS EXPERIMENT STATION.

J. L. COPPOC, CHAMBERS.

Mr. President, and Gentlemen of the Nebraska State Horticultural Society: I beg leave to submit my report as director of the Chambers Experiment Station for the year 1906. The weather conditions during the summer and fall of 1905 were favorable for the development of fruit buds, and while there were late frosts so that most of the kinds of apples were not in full bloom until the 14th of May, yet there was a large crop of all the kinds of fruit that do well in this part of the state. There were eighty-six plates of apples on exhibition at our local fair. About forty varieties of very fine fruit, besides pears, peaches and plums.

COMPARISON OF VARIETIES.

Apples.—The Roman Stem has proven the most prolific of all the kinds of apples we have in bearing at this station in 1906, with the Whitney Crab and the Maiden's Blush closely following. The Ben Davis was a little shy in bearing this year.

Plums.—The Wolf plum still stands at the head of all the kinds we have tested at this station, all things considered. One tree eight years from the nursery yielded four bushels of very excellent fruit.

Cherries.—The Early Richmond and Montmorency are almost equally desirable on this sandy land. All the varieties (eight), of sour cherries except the Terry are doing quite well. We have two kinds of sweet cherries but they are unworthy a place in the orchard.

Small fruit of all kinds that we have tried, with one or two exceptions, is paying well for the space it occupies and the care we give it.

Shade and Ornamental Trees and Shrubs.—Of the deciduous trees we are testing, the Russian Olive gives the best satisfaction. The Thurlow Willow is the most rapid growing tree we have, but it does not do to force the growth too much, as, if we do, it winter-kills.

Evergreens.—We find that the Scotch pine is best adapted to the level and rather moist soil, while the Austrian and Bull pine are best suited to the high and dry land. Of the spruces we only have the Colorado Blue and the Black Hills. They are both doing well and are beautiful trees.

THE NEW SETTINGS.

We added to our experimental stock in 1906, 111 apples, thirteen kinds; twenty plum trees, five kinds, and two varieties of cherries, three of each. Of the apples we lost none. There are only two of the cherries alive and four of the plums died. I was also presented with two hemlock trees, one of which is living and it looks as though it might continue to do so.

FIGHT WITH THE WORMS.

We succeeded in saving only sixty-seven per cent of our apples from the worms in 1906, while in 1905 we saved ninety-five per cent. Space forbids giving a detailed account of our spraying operations. The probable reason for the increase of wormy apples in 1906 over those of 1905 was a failure to supplement the spray with other methods of fighting the pests, such as gathering up the fallen apples and using the disk at the proper time. Another cause for the increase was that the curculio was reinforced largely by the codling moth in 1906, whereas in 1905 there were but very few of the latter insect. Another mistake I think was we only sprayed three times, the last time about the middle of June. We should have added two or three more sprayings at intervals of about fifteen days.

CONCLUSION.

In conclusion, I would say that I am adding to my experimental grounds a piece of land at the village of Chambers where the soil contains more clay than is found on the old station. This will give the advantage of testing the question as to what varieties will thrive the best in clay and which are best suited for sandy land.

All of which is very respectfully submitted,

J. L. COPPOC, *Director.*

SANDOZ EXPERIMENT STATION.

JULES A. SANDOZ, HAY SPRINGS.

PLUMS FOR THE NORTHWEST.

This experiment station is situated in Sheridan county, 4,000 feet above sea, and about 2,000 feet higher than most of the Dakotas.

The first plums planted here were from Professor Budd, about twenty kinds, and although they were all hardy and came to bearing, the most failed to ripen before the heavy September frosts, De Soto and Wyant ripening only about half the time. I found an early and vigorous wild plum here now sold by nurserymen under the name of Sandoz, which ripens five weeks before De Soto, and which ought to be used also to graft thereon other kinds by northern nurserymen on account of its vigor and hardiness. European plums grafted on it are hardy here, while they winter-kill on usual nursery roots; it is entirely curculio proof.

About five years ago I sowed seeds of De Soto fertilized by Sandoz and about twenty trees have come to bearing. Out of these five are much superior in tree, size and quality, and earliness than De Soto or Wyant.

Sandoz No. 1 is an upright grower, plums large, clear yellow, short

stem, hang on twigs like peaches and look like apricots. Two weeks earlier than De Soto.

Sandoz No. 2 is a spreading tree, with large, red, oblong plums, with blue bloom; quality best; two weeks earlier than De Soto.

Sandoz No. 3 is about size of De Soto, softer, better grower and four weeks earlier and the best plum to eat off the tree I have.

Sandoz No. 4 is a heavy grower, yellow wood, and large, nice, pink colored plum. Three weeks earlier than De Soto.

Sandoz No. 5. Tree like Sandoz, but plum larger and pointed. Two weeks earlier than De Soto.

All these seedlings are better than any plums now sold by nurserymen or sent out to me for trial by Professor Budd. I will send scions free as much as I can, to anyone who will try them. Of the Sandoz I have quantities, but of the Nos. 1, 2, 3, 4, 5 I have only one tree of each.

These plums will prove O. K. in the Dakotas, Wyoming, eastern Montana, and perhaps part of Canada. They are all better growers and better plums than any ever tried here and about curculio proof and can be grown where De Soto and Wyant fail to ripen.

For planting in that territory I recommend Sandoz, Bixby, Sandoz 1, 2, 3, 4, 5, and Wyant, and of course also for northwest Nebraska, and all these plums would be earliest further south where they will succeed.

JULES A. SANDOZ, *Director.*

VALENTINE EXPERIMENT STATION.

C. M. VAN METER, VALENTINE.

To the Members of the State Horticultural Society: We have had another good year and grains and fruits did well. This is seven good years in succession since the crop failure by drouth in 1899. The only cultivation given the orchard the past season was with the mowing machine in July, and yet there was a fine crop of plums, half a crop of cherries, lots of crab apples and some apples. The Wealthy was second only to Longfield this year; and there were peaches and strawberries. The fungus reported last year has about finished the gooseberries, and the dark juiced cherries are fast closing their record.

I visited heavy-laden winter apples, and the heaviest-laden Florence Crab apples I ever saw were forty miles north of here on Butte Creek on the Sioux Reservation in South Dakota. This is Mr. C. P. Jordan's orchard. This section of the country is fast building up on agriculture and horticulture and will some day grow lots of fruit.

REPORT OF COMMITTEE ON SYNONYMS.

RECOMMENDATIONS OF THE COMMITTEE ON MR. CAMP AND MR. ALEXANDER'S SEEDLING GRAPES.

We, your committee to investigate the seedling grapes of Mr. C. B. Camp, of Cheney, would recommend that the society adopt the names as given, of his two most promising varieties, namely, (B-11) Camp's Early, (F-10) Rival, and recommend them for further consideration. Also,

We further recommend the following three varieties of Mr. Alexander, of Julian, namely, Dewey, Comfort, and Utility, as named and exhibited at the September meeting, 1906, for further consideration.

A. J. BROWN,
GEO. A. MARSHALL,
C. H. BARNARD,
Committee on Synonyms.

It was moved, seconded and carried that the five varieties of grapes named be removed from the seedling class and made varieties for dissemination.

On motion the report of the committee on synonyms was adopted.

REPORT OF OBITUARY COMMITTEE.

To the Hon. President and Members of the Nebraska State Horticultural Society:

GENTLEMEN: We your committee appointed to adopt resolutions on the death of Harvey Link, of Millard, beg to offer these resolutions:

WHEREAS, It has pleased Almighty God to remove by death from our midst Harvey Link, this society shares with the bereaved family in their sorrow.

Resolved, That we extend to the bereaved family our sincere sympathy.
Also

Resolved, That a copy of these resolutions be spread on our minutes, also sent to the afflicted family.

GEO. A. MARSHALL,
LEWIS HENDERSON,
A. J. BROWN,
Committee.

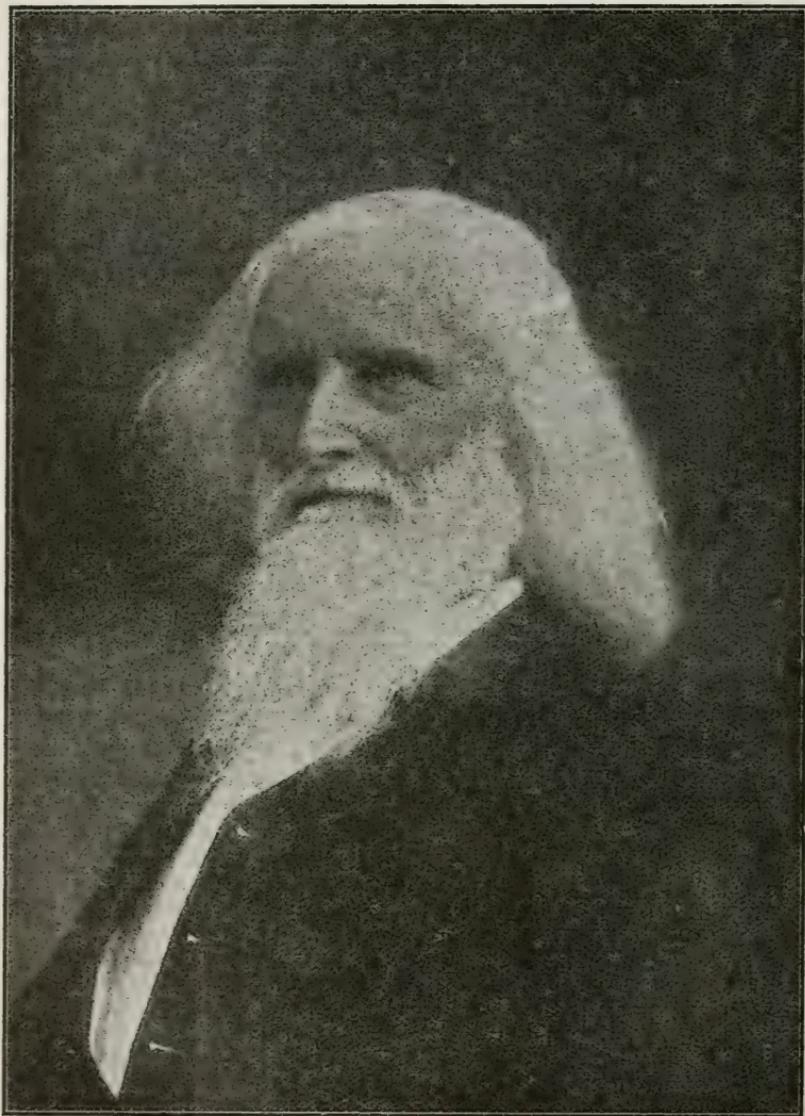
Dr. Harvey Link was born February 4, 1824, in Greenville, Tenn. Died at Millard, Neb., September 11, 1906, at the age of 82 years.

Upon the banks of the Big Pappio, near the little village of Millard, lived in full enjoyment of an active life spent in ministering to the wants of others, Dr. Harvey Link, the veteran horticulturist of Nebraska, the pioneer man of medicine of Douglas county and a member of the territorial legislature.

In 1850 he graduated from the Louisville College of Medicine. In 1855 he was married in New Albany to Miss Mary E. Loyd, who came west with him and together they established their beautiful home at Millard in 1856.

Dr. Link was an ardent lover of nature and fully approved of the poet who said that nature never did betray the heart that loved her.

Dr. Link was born and raised on a farm. When he found that he must change his place of habitation, he decided to come to Nebraska. Just before he left Indiana, where he had been raised, he went out in the forest and gathered a quantity of cottonwood and soft maple seeds to



DR. HARVEY LINK.

Born February 4, 1824, in Greenville, Tenn.

Died at Millard, Neb., September 11, 1906.

bring along. His friends laughed at him when he told them that he was going to plant a forest. "You are foolish," said a prominent man in Omaha, "to plant a forest out here where you have taken up your land. It will be 100 years at least before the country is settled over ten miles west of the Missouri river, and you will never live to see the trees grow anyway, as nothing can be raised out there except buffalo grass and coyotes." That was fifty years ago, and he has had the satisfaction of seeing and having perhaps the oldest artificial forest in this section of the country. So large have the maples grown that he had cut many of them for the market and for his personal use that have measured from eighteen to fifty-two inches in diameter. Many is the carload of wood that he shipped to Omaha to burn the brick that Omaha is built of, and yet the supply from his thirty-two acre forest has not been diminished; it is replenishing itself continuously.

Dr. Link is survived by his three sons and three daughters, Mrs. P. L. Hall, wife of Dr. Hall, of Lincoln; Mrs. Alice E. Sharp, of Grand Junction, Colo.; Mrs. Emma Crawford, of Millard; Harvey Link, of Springfield; Emanuel H. Link, of Hillrose, Colo.; and Lon Link, of Coleridge.

Mr. Henderson: The committee on revision of the premium list is ready to report. We went over the premium list very carefully and cut down all first class prizes and made fourth, and even fifth prizes in order to encourage the different parties to come and exhibit and we tried to make up as good a premium list as possible to suit all, in order that all may stand some show to get a prize, and we have been working hard, in order to try to get at the next state fair the best exhibit we have ever had. We tried to be as economical as possible in making out the list, and we were instructed to cut the premiums down, and we did so. We will do the very best we can to make a fine show for our winter meeting. Our secretary will read the report and premiums we decided upon if you wish to hear them.

The report of this committee was read by Mr. Williams, and referred to the Board of Directors.

REPORT OF DELEGATE TO THE MEETING OF THE MINNESOTA HORTICULTURAL SOCIETY.

BY R. A. EMERSON.

The fortieth annual meeting of the Minnesota Horticultural Society was held in Minneapolis, December 4 to 7, inclusive. A full four days' session was held and every minute of the time was filled up with papers, discussions and important business. There were just fifty papers on the program, besides addresses by the officers of the society and delegates from other states, reports of committees, question box, etc.

Without the aid of a very efficient presiding officer, it would have been impossible to finish the program though the session held from 9:30 to 6, with only an hour and a half intermission at noon. The attendance was

good, from 150 to 200 being present at each session. This, of course, cannot be considered a large attendance when it is remembered that the membership of the society now numbers over 2,000. The classes in horticulture from the agricultural school swelled the attendance very materially at the first session.

The fruit display was large and attractive; the standard hardy sort of apples, of course, predominated in this, but there was a very good collection of seedling apples as there always is at the Minnesota meetings. The production of seedling fruits is one of the most important lines of work being carried on by the society and it is safe to say that the Minnesota society leads all horticultural organizations of the country in this work.

One of the sessions of the society was devoted to nursery topics, one to reports from superintendents of trial stations and reports from various fruit districts, another to papers dealing with the treatment of fruit, flower and vegetable gardens during July and August. One afternoon was spent in joint session with the Forestry Association and another afternoon session was conducted by the Plant Breeders' Auxiliary. Some of the sessions were devoted to miscellaneous topics.

One of the most interesting and instructive papers of the whole program was "The Storage of Orchard Fruits," by Prof. J. C. Blair, of the Illinois Agricultural Experiment Station. The advantage of some means of storing apples in the fall until the glut in the market is over was shown in a very convincing way; discussions and illustrations by means of charts were given of several storage houses adapted to farm conditions. In the better of these houses it was found possible to hold the temperature at 33° F. with ice refrigeration; a thing not thought possible before. This was accomplished by thorough insulation. Professor Blair reported the results of some rather unique experiments to show the relative value of various insulated materials used to keep out heat from the storage houses. The best insulator was found to be a dead air space, next best, paper, and next wood. Concrete and the like was of little value. The Nebraska Horticultural Society could not do better than to secure Professor Blair for our next winter's meeting.

The Plant Breeders' Auxiliary and its work deserve special attention. This society is a branch of the Horticultural Society and the requirements for membership in it are membership in the parent society and a promise to do some actual work in the breeding of fruits, flowers or other plants, whether this be on a large or small scale, whether by hybridization or by simply growing seedlings. Of the seventy members of the Auxiliary thirty are now growing apple seedlings to secure better varieties, five are growing crab apple seedlings, eight plum, two grape, two raspberries, one strawberries, one rose, one phlox, and two peony; twelve members have set trees for natural crossing and four have been crossing fruits by hand during the past season. This record speaks well for the public spirit of the horticulturists of Minnesota since it is, of course, recognized by all that there is little hope of reward for such work aside from the satisfac-

tion of doing something to better the conditions of one's fellow men. It is interesting to note that the apple is receiving more attention than all other fruits and flowers together. The main interest centers in the production of an apple of good quality and long keeping ability. Early apples of sufficient hardiness have already been secured. The problem now is, the production of late winter apples of the same degree of hardiness as the best summer kinds.

The seedling apples offered for premiums at the winter fruit display are not passed upon finally at the time of the meeting but are kept by the committee under ordinary cellar conditions and their keeping quality noted. Last year the Horticultural society bought a barrel or two of "Malinda" apples, took the seeds from them and distributed the seeds to members who promised to plant them and care for the seedlings. Professor Green of the Experiment Station, reported that he had grown at the Station 6,260 of these seedlings. In order to carry out this work a movement has been started to buy a fruit breeding farm of eighty acres for the Horticultural Department of the Experiment Station. The present legislature of Minnesota is being asked to provide \$15,000 for the purchase of the farm and \$2,000 annually for its maintenance. The interest taken by the Minnesota horticulturists in the production of new fruits and the work they are doing along that line can scarcely fail to produce results of the utmost importance to northwestern pomology.

I cannot leave this topic without calling your attention to the importance of doing the same sort of work in Nebraska. We of Nebraska have not felt the need of this kind of work as it has been felt in Minnesota because in the southeastern part of the state we already have a large list of varieties that succeed well, and in the northwestern part of the state the people have been all too ready to believe that nothing in the fruit line can succeed, and that therefore there is no use trying. We know, however, that some fruits can be grown in northwestern Nebraska, and we know further that the list of things that succeed there is small. As northwestern Nebraska develops, the need for more varieties that are hardy is going to be just as great as it has ever been in any part of Minnesota. The production of hardier and more drouth-resistant varieties of fruits would be of greatest importance to a considerable part of Nebraska. There is a chance for a lot of this work done in southeastern Nebraska also. All of us know that many of the peaches grown there are seedlings and some of us might admit, if cornered, that those seedlings sometimes fruit when the budded varieties do not. Of course the budded varieties have a longer season of fruiting, some coming early and some late, and they are usually of better quality. The fact, however, that we sometimes have seedling fruit in seasons when many budded trees are not in fruiting indicates simply that many of our budded varieties are not hardy enough for our conditions. All of our varieties were seedlings once, seedlings that were selected out from the great mass of their kind because of some valuable characteristics like size, flavor, earliness, etc. A special

effort ought to be made in Nebraska to hunt out the most promising of our seedling peaches.

It is true we have a few men in the state who are producing many new kinds of fruits; men like Theo. Williams, for instance. These men are doing this work for the good of the state. They may hope to receive some fitting financial reward for their work from the sales of valuable new varieties, but if they succeed in this they will be an exception to an almost universal rule. The breeding of new fruits, in other words, is not a paying undertaking. Even Burbank has to have outside help to continue his work. Cannot the Horticultural society of Nebraska do something to encourage its own members who are trying to produce better varieties of fruits for Nebraska?

On motion this report was adopted.

The following communication from G. W. Alexander was read by the secretary:

PERU, NEB., January 7, 1907.

I appeal to the members of the Nebraska State Horticultural Society as being interested in the improvement of our fruits, flowers and plants. I therefore would suggest the formation or organization of a society for the promotion and dissemination of knowledge leading to the improvement of our fruits, flowers and cereals. This would not only be useful to the state at large, but would be a kind of auxiliary to the State Horticultural Society. I believe this to be the opportune time to act, and organize a Plant Breeders' Association. Much could be said in favor of this kind of an organization, but space forbids.

Yours truly,

G. W. ALEXANDER.

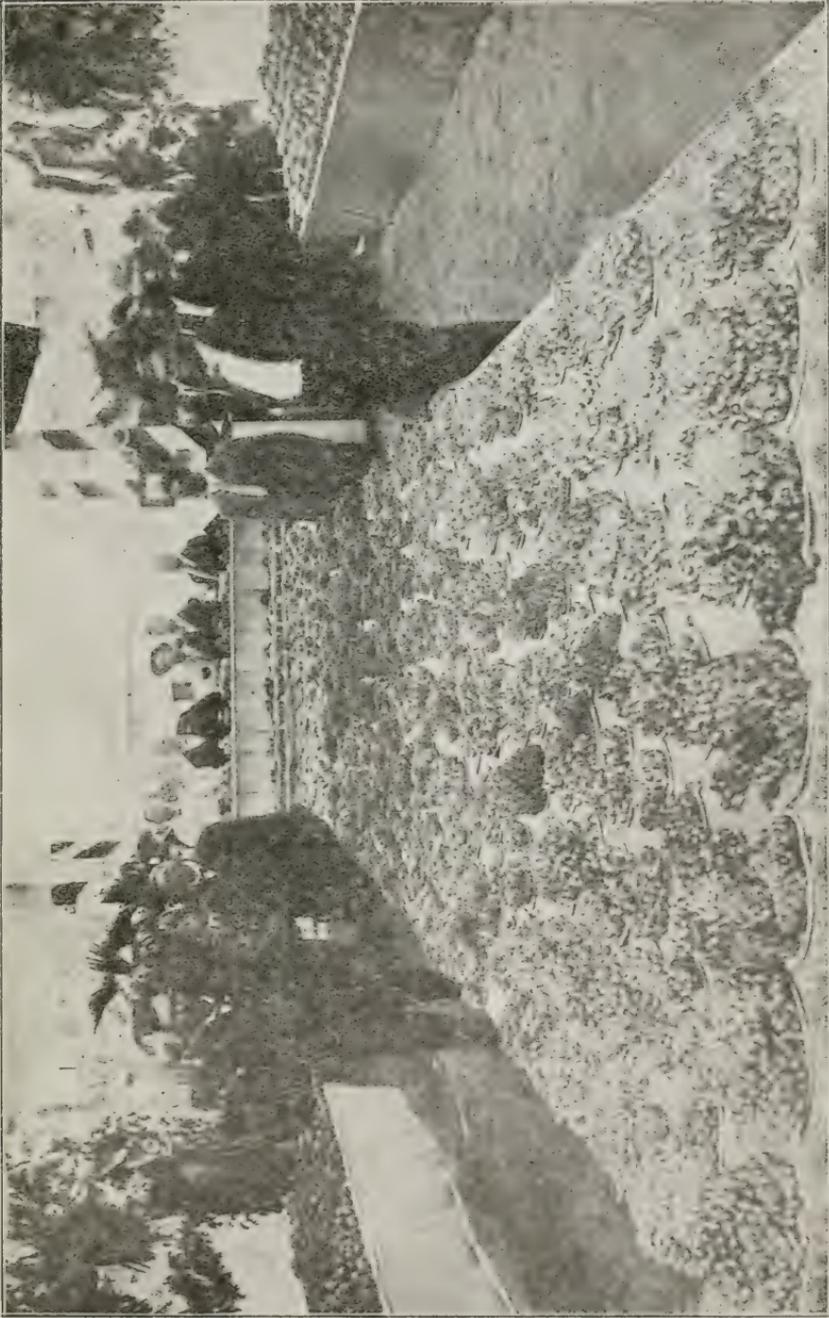
DISCUSSION.

Mr. Marshall: This society belongs to a breeders' association and I think Professor Emerson could give us the results. It is all right, but some way it doesn't work well. Some way we can't get at it right as a society. It seems to be left to individuals. I don't know what we could do in the way of organizing. We are almost killed off with organizations in the state now.

Professor Emerson: I do feel that this is a part of horticultural work, just as much, maybe, as other work we take up. But this society can put papers on the program, and I believe that is the only way we will ever get this matter before us successfully. We need to get varieties that are adapted to the most trying conditions in some part of the state. But I think we can do the work in this society without further organization.

President: It seems to me it would be a step forward if we could encourage the breeding or dissemination of some of our fruits that are grown in the state.

Mr. Marshall: We have several stations in the state. This society can buy those plants and distribute them to the stations. We have a synonym committee and they could look into all these things themselves



GRAPE EXHIBIT—NEBRASKA STATE FAIR.

and decide as to the merits and what should be reported to this society, and then they can be recognized or rejected as we see fit and the matter can be extended in the way of trial by sending to these stations which are scattered over the state. I think we are pretty well organized for that if we will work on that line. Now I want to speak of a rule of the Apple Growers' Congress that may seem silly, but it is wonderful how it works out. They have a rule that when you join that society you pledge yourself to call for an apple or apples on the table of every hotel or restaurant where you eat, if the apples are not there. Apple pie, apple sauce, baked apples, apples in any form. Encourage what we grow. I am not a member of that organization, but I have followed that for some time, and the places where I eat only two or three times a year, when I come begin to rustle around to get apples on the table. I have heard the editor of the Rural New Yorker make the statement that at a restaurant where he ate occasionally, not very often either, he called the proprietor of the restaurant around, and putting on a serious look asked him why he didn't have baked apples and cream at such a wonderful restaurant as he had there. The fellow apologized and said he would have baked apples and cream, and he did; and some time afterwards he got a letter from this man thanking him for his suggestion. He said he was using five barrels of apples per day and people were walking blocks to that restaurant in the morning to get a dish of baked apples and cream. This is not a story, this is true. The apple is really the fruit of the whole world, and we do not give it its just place.

Mr. Bombarger: Mr. H. W. Collingwood, the editor of the Rural New Yorker, also told me privately, one very effective way of bringing about the consumption of apples aside from this. I have heard him tell of this incident also. He said he made it a point where he went into a Commercial Travelers' Association—he can tell a good story and good jokes, and the Commercial men enjoy those things very much, and then he gets on to this apple strain and he said he started the consumption of apples through the hotels of the east, and it has been a surprise what an effect it has had on the trade. If any of us have any influence or are mingling with these commercial men, who are men of wide business associations, it is a point we ought to press. You can do it here in Nebraska, and we can do it in the Iowa association.

Mr. Davidson: Do the Nebraska apple growers take any pains to get Nebraska purchasers? Most of them buy in New York or other places. If Nebraska packers would put up such a pack of apples as would compete with New York stock, they could sell their apples at home. In Aurora one merchant bought New York apples and I bought Nebraska apples. He had very poor success with the New York apples, Greenings—they did not keep as well as the Nebraska apples. If Nebraska packers would pack their apples good enough, and not put the largest and best on the outside, they can sell to Nebraska merchants, I haven't a doubt.

Mr. Christy: I shipped quite a few apples this fall. I shipped some to

Alliance and it cost me about thirty cents a bushel to ship them. I shipped two cars to Illinois and it cost me ten cents a bushel to ship them. I can ship apples from New York to Alliance for just a little more than I can from the eastern part of this state. So in order to compete with New York we must ship cheaper than they do from New York, and right there, in the shipping rates, is where we will have to look after the difference, largely.

Mr. Brown: Mr. Alexander's letter is a good one. I move that the whole matter of plant breeding be referred to the Board of Directors with power to act in conjunction with the Experiment Stations of the state.

The motion was seconded and duly carried.

The society then adjourned *sine die*.

RESOLUTION.

WHEREAS, The regents of the State University have recommended to the state Legislature an appropriation of \$40,000 for the erection of a building on the State Farm to be devoted to the exclusive use of horticultural work.

WHEREAS, The present equipment in the department of horticultural work is inadequate and insufficient and far below the standard of equipments of other departments of no more importance: Therefore, be it

Resolved, That we, the State Horticultural Society, in annual session assembled, do hereby approve this recommendation of the regents and instruct our committee on legislation to use all honorable means to secure said appropriation.

Resolutions unanimously adopted.

REPORT OF AUDITING COMMITTEE.

LINCOLN, January 16, 1907.

To the President and Members of the Nebraska State Horticultural Society:

We, your auditing committee, have carefully examined and audited the reports of the Secretary and Treasurer and find them correct.

C. H. GREEN,

J. A. YAGER,

H. W. MARSHALL,

Committee.

REPORT OF COMMITTEE ON FINAL RESOLUTIONS.

We, your committee on final resolutions, beg leave to submit the following:

Resolved, That we appreciate the presence of W. M. Bomberger, of Harlan, Ia., and J. W. Murphy, of Glenwood, Ia., and wish to say to them and their co-workers in Iowa that our latch-string is always hanging out.

Come again. Our special thanks are due J. W. Murphy for the magnificent display of 124 plates of Iowa apples, which display has added greatly to our fruit exhibit.

Our thanks are hereby extended to the State University, and especially to Dr. Bessey, and the department of botany, for the use of their rooms.

Our thanks are extended the daily press of Lincoln for liberal reports made of our meetings.

W. G. SWAN,
H. E. HEATH,
R. A. EMERSON,
Committee.

On motion, duly seconded and carried, these resolutions were unanimously adopted.

TIMBER FUNGI, WITH SPECIAL REFERENCE TO THE PINES.

CARLOS G. BATES, WITH U. S. FOREST SERVICE.

The subject of timber fungi, if treated exhaustively, would involve a discussion of a very large portion of the genera of that group of unrelated plants which come under the caption of "fungi." Our ignorance of this group, the small amount of time at our disposal, and the limited time for the treatment of such a paper in this place, make such a discussion altogether unwarranted. I propose to treat the subject, therefore, from the standpoint of the forester, who sees such things in their practical bearing, rather than from the standpoint of the more scientific botanist.

Under the head of timber fungi may well be considered all of the parasitic and saprophytic plants which attack the tree as it grows in the forest or elsewhere, the standing or fallen dead tree, and the wood as it is found in innumerable forms moulded by man. All of these come up for the forester's consideration, though the most important, and those which receive the most attention, are the fungi which act directly on the forest crop, the logs in the woods and the lumber and other woody products from these logs. In this connection it might be well to state that, so far as certain fungi are concerned, there is no difference between the trunk of a live tree and an unseasoned log lying in the woods. The life histories of some of the fungi will bear out this statement.

Since all of the fungi which attack trees and wood cannot be even mentioned here, I propose to enumerate only a few of the most common enemies of the genus *Pinus* which have come to the notice of European and American botanists and foresters. The pines, of which there are about 75 species, all of the northern hemisphere, present considerable differences in the structure of their several woods, have a wide geographic and climatic range, and are altogether the most important trees of the commercial world, so that their study cannot be considered anything but profitable. The habits of their enemies are characteristic of timber fungi in general.

(1) Damping-off.

When pine and other seedlings first appear above the ground, they are subject to the attacks of a number of fungi which make themselves felt as a disease which is known as "damping-off." The symptoms of the disease are a wilting of the leaves and decay of the stem of the plant just at the level of the ground, so that the afflicted seedling is soon prostrated. "The fungus seems to live in the sand in which the seedlings

are propagated, and to run in it from one to another, resulting in the rapid destruction of the plants in the bed. Upon taking up the specimens, the parts affected are found to be in the early stages of decay, and penetrated throughout, even in the interior of the epidermal appendages, by the branching filaments of a fungus. 'Damping-off' is due to the action of several parasitic organisms, of which *Pythium de baryanum* Hesse, is one of the most common" (Spalding, "The White Pine," Bull. 22, Div. of Forestry). According to Ward ("Timber and Some of its Diseases"), the fungus *Phytophthora omnivora*, a common one in European nurseries, may be taken as typical. This is a mildew of the *Peronosporaceae*, and need not be described further. It is fostered by moisture, warmth, insufficient air, and the presence of decaying organic matter in the soil. "Damping-off" occurs very frequently in the government nurseries at Halsey, where the loss sometimes amounts to 90 per cent of the seedlings in a bed. This disease attacks especially the smaller seeded pines, such as the Jack pine and Scotch pine, which start life with a limited food supply, and hence have less energy to resist such attack. The remedial measure most successful at Halsey has been the aeration of the stems of the seedlings, obtained by covering the beds with gravel, which prevents the splashing of mud on to the stems.

(2) Pine Blister: Pine Cluster-cups. (*Coleosporium senecionis* Fries:
Peridermium pini Wallr.

This fungus of the family *Uredinaceae*, one of the heteroecious parasites, is one of the common enemies of the pines in Europe, and members of the same genus, if not the same species, are described as attacking Jack, red, white and Scotch pines in Minnesota (Spalding). The following is furnished by Ward:

"In the months of April and May, the younger needle-like leaves of the Scotch pine are occasionally seen to have assumed a yellow tinge, and on closer examination this change in color, from green to yellow, is seen to be due to the development of what looks like small orange-colored vesicles or blisters standing off from the surface of the epidermis, and which have in fact burst through from the interior of the leaf. Between these orange-yellow blisters the lens shows certain smaller brownish or black specks. Each of the vesicular swellings is an aecidium, and each of the smaller specks is a spermogonium.

"On the younger branches of the Scotch, Weymouth and Austrian pines, and some others, there may also be seen in May and June similar but larger bladder-like orange vesicles (aecidia) bursting through the cortex, and here again careful examination shows the darker smaller spermogonia in patches between the aecidia. These also arise from a fungus mycelium in the cortex, whence the fungus was named *Peridermium pini* (var. *corticola*). It is thus seen that the fungus *P. pini* was regarded as a parasite of pines, and that it possessed two varieties, one inhabiting the leaves and the other the cortex; the varieties were so considered because of certain trivial differences found in the aecidia and spermogonia. The disease may be popularly called 'Pine-blister.'"

The fungus lives in the leaves of pines for a year or two before

killing them entirely, though of course decreasing their productive power. In the cortex much more damage is done. The hyphae grow into the cambium and the wood beneath, and even into the medullary rays, where they obtain their food by piercing the cells. Turpentine flows from the wounds, and this eventually results in the drying up and death of the stem. The latter results from the cutting off of the water supply by the resin which permeates the wood. A swelling of the tissues at the point of attack results in a knot on the stem.

The teleutospore stage of *P. pini* is found to live on the common groundsel and other species of *Senecio* native to Britain.

(3) Hypertrophy of Cones.

The following by Professor Roth, from Bull. 13, Div. of Forestry:

"Among the diseases to which this tree is subject (speaking of long-leaf pine), the disease of the cones, recently discovered and studied by Dr. W. T. Swingle, deserves attention. The cones are attacked during the first year of their existence, and instead of attaining only about 1 inch in size, they swell up to the size of a second-year cone (3 inches and more), and take on a bright orange color. Only cones of this species and *P. heterophylla* have so far been found affected."

We now come to the consideration of a number of fungi of the order Basidiomycetes, commonly known, so far as they are found on timber, as "bracket fungi." Of these, some are strictly parasitic, others are facultative parasites, and some occur only on thoroughly dead wood.

(4) Ring Scale of Pine. *Trametes pini* (Brot) Fr.

The following from Freeman's "Minnesota Plant Diseases":

"Ring scale is a very common parasite on pines both in Europe and in this country; it is also known on Douglas fir. The fungus gains entrance to the tree usually through wounds or broken limbs, particularly the older branches, in the heartwood of which no protective coat of resin has been formed. After it has gained entrance to the stem, the mycelium grows in longitudinal strips above and below the points of entrance; in the same year's growth it works from the interior to the exterior. In this way zones of the diseased regions are formed exteriorly (ring scale). The wood attacked by the ring scale undergoes a peculiar disintegration. There are formed in the decaying wood numerous small, isolated patches of the white mycelium of the fungus. These differ from the similar patches of the *Trametes* root-rot in the absence of black centers. The fruiting body is brown and either forms a shelf or is diffused into a coating over the bark. It is woody and perennial, producing new pore areas successively for many years."

(5) Root-rot: Red-rot. *Polyporus annosus* Fries: *Trametes radiciperda* Hartig.

This dangerous parasite is described by both Freeman and Spalding, from whom I draw. In Germany the fungus infests various species of pine, including *P. strobus* and *P. sylvestris*, as also *Picea excelsa* and *Juniperus communis*. The life history is not essentially different from that of *Armillaria* and *Polyporus*, which will be described later. This

fungus attacks the roots, where the spores germinate, and the mycelium enters the bark and passes up through the cambial layers into the wood, and finally into the stem of the tree. A violet discoloration of the wood first takes place, the cells drying up and later becoming brownish yellow. The elements of the wood are finally separated like so many fibers of asbestos. The mycelium may extend up into the trunk to a height of twenty-five feet, and finally, when all of the roots have been permeated, the death of the tree results.

(6) *Polyporus* species—Red Rots.

Concerning the longleaf pine (Bull. 13, Div. of Forestry), Dr. Mohr writes as follows:

"Frequently fullgrown trees are found to show signs of rapid decay. These are recognized by the gradual dying of the smaller limbs, and their falling off, in consequence of the rotting of the wood surrounding their base; and after having been cast off a hole or diseased spot remains in the trunk, which is infested by a large fungus of the genus *Polyporus* (Punk holes, punk stools). The heartwood of such trees is of a reddish color, soft, sappy, and full of small channels caused by the breaking down of the walls of the wood cells, filled with the mycelium, the so-called spawn of the fungus, the threads of which also penetrate the medullary rays. Such punky or red-heart timber is found mostly on the ridges on the poorest soils. Apparently superannuated trees are most affected with this rot."

Further, in Alabama, this is almost unknown on the shortleaf. In northeastern Texas it affects only superannuated trees. The loblolly falls prey most frequently on account of its more sappy wood, and the fungus progresses in this very rapidly.

Concerning the lodgepole pine, Mr. F. W. Morrell writes from the Holy Cross Forest Reserve, Colorado:

"The most destructive disease of the lodgepole is a red-rot of the *Polyporus* order, which is quite prevalent in our district. It attacks mostly the mature trees, though it may be found occasionally in smaller ones. Forked-topped trees are especially liable to attack, probably because of the excellent lodging and germinating facilities offered by the crotches. A noticeable habit of the disease is its irregularity throughout the trunk. A log of sixteen feet in length will frequently be found sound at both ends, but badly decayed in the middle, and vice versa. Logs in which it occurs are of little use. They have a reddish appearance, and are brittle and powdery. A similar fungus attacks Engelmann spruce."

(7) Shoe-string Fungus: Tree Root Rot. *Armillaria mellea*: *Agaricus melleus* Cke.

This very common agaric is one of the most destructive enemies of the coniferous forests of Europe, and in this country is at least a series enemy of the white pine. Concerning the occurrence and habits of this species, in relation to white pine, Spalding writes:

"It also fastens upon various deciduous trees as a parasite, attacking living trees of all ages, but living as well upon dead roots and stumps

and on wood that has been cut and worked up, occurring frequently on bridges, railroad ties and the like, and causing prompt decay wherever it has effected an entrance. The most conspicuous part of the fungus is found frequently in the summer and fall on the diseased parts of the tree or timber infested by it. It is particularly distinguished by the formation of slender, dark-colored strings, consisting of compact mycelium, from which the fruiting parts arise. These hard, root-like strings (called rhizomorphs) extend just beneath the surface of the ground, often for a distance of several feet, and penetrate the roots of sound trees. These rhizomorphs are a characteristic part of the fungus. They constitute a most effective agency in the extension of the disease.

"The symptoms are characteristic. The external symptoms, to be observed especially in young specimens recently attacked, consist in a change of the leaves to a pale, sickly color, and often the production of short, stunted shoots. A still more marked symptom is the formation of great quantities of resin, which flow downward through the injured parts and out into the ground, resulting in the sticking together of the roots and masses of dirt that have been penetrated by the resin. Passing up a little way into the trunk, the cause of this is seen in the active working of the fungus in the medullary rays and around the resin canals, where apparently both cell contents and cell walls undergo degeneration and partial conversion into resin. This flows downward, as already stated, and also works laterally into the cambium, producing great blisters in the younger parts where growth is going on, and also resulting in the formation of unusually large resin canals.

"As the disease advances the fungus continues to attack the tracheids of the sound wood, and soon induces marked changes. Under its influence the walls lose their lignified character, become softer, and give the cellulose reaction, while the mycelium of the fungus penetrates and fills the large cavities of the tracheids.

"The whole inside of the trunk may finally become hollow for some distance above the stump, its interior being filled with a loose, rotting mass, penetrated by rhizomorph strings, and only becoming worse the longer it stands. The disease having once reached this stage, there is of course nothing to be done for the tree but to fell it as soon as possible, and save whatever wood remains unaffected."

Trametes, *Polyporus*, and *Armillaria* are quite distinctly parasitic, though the last named does indulge in saprophytism. The following are typical saprophytic, though occasionally attacking living trees through wounds:

(8) *Polyporus vaporarius*. Dry Rot.

No mention of this species on any other tree than the Scotch pine has been noted. It is a rather common wound parasite in Europe, but affects more frequently the timbers which have been cut and piled in a mill-yard, or placed unseasoned in a building. Its spores frequently enter the cracks of barked logs lying in the woods, and when such cracks are closed by soaking, as when the log is being transported by water to the mill, the spores germinate and later the wood is found to be infected with a snowy-white mycelium, and red or brown streaking of the substance, in lines radiating from the crack in which the spore germinated. The mycelium causes rotting and powdering of the wood.

Germination of the spores may not occur until after the timber has been placed in position, where the moisture present will lead to the development of the fungus.

(9) *Merulius iachrymans*. Dry Rot: House Rot.

This fungus is very similar in habits to the preceding, but is purely a domestic fungus. The spores germinate on the surface of the wood in warm, moist situations, and in the presence of an alkali, which is necessary to the opening of a little plug in the spore covering. The hyphae attack the medullary rays and the new wood. The mycelium will cross from one timber to another on the intervening brick-work, if that happens to be moist. Dry air is fatal to the mycelium.

The following are found on timbers such as posts, ties and poles, which are placed in position without proper seasoning:

Polystictus versicolor—railroad ties in Minnesota and Texas.

Lenzites sepiaria—on longleaf pine ties in Texas.

Lenzites abietina—on softwood fence-rails and posts in Minnesota.

Of an entirely different order of plants is the mistletoe which attacks the lodgepole pine of the Rocky Mountains. It is described by Morrell as follows:

“There is a species of mistletoe on the lodgepole pine easily detected by the presence of an abnormal growth of tufts of branches, commonly called ‘witches brooms.’ These tufts soon die and the tree begins to become ‘spike-topped’ (i. e., die at the top). Decay is not rapid, but the tree dies in a few years, and the soon passes beyond use.”

The scientific name of this mistletoe is not given by Morrell. *Razoumofskya americana* (Nutt) Kuntze, is noted by Rydberg (Flora of Colorado) as being parasitic on *Pinus murrayana*, *contorta* and *divaricata*; *R. cyanocarpa* on *Pinus flexilis*; *R. divaricata* on *Pinus edulis* and *monophylla*; and *R. cryptopoda* on *Pinus scopulorum* and *ponderosa*. It thus appears that the pines have much to fear from the mistletoes. In connection with the lodgepole, again, it is said that the trees on the poorer qualities of soil are the most afflicted with this parasite. This is doubtless due to the less thrifty condition of such trees, and their increased tendency to fork, which is quite noticeable.

In spite of the large number of these enemies of trees, of which I have mentioned only a few, there has been found, as yet, very little that it is practicable for the forester to do in the way of prevention or cure. He can spray the seedlings in the nursery that are liable to damping-off, and he can rid the beds of much of the organic material which keeps the mycelium of the fungus alive. He may also be able to spray the young trees which are affected with pine blister, if these are in the nursery. He can protect his forest from the depredations of cattle which would scar the trees and make openings for the entrance of wound parasites. In the forests of Europe it is even found profitable

to segregate by ditching trees or groups which are infested with root-rots such as *Armillaria*, but we have not yet come to hold our forest trees worth that amount of trouble. The orchardist or landscape gardener may prune his trees very carefully so that the wounds will heal over quickly, but the forester has to leave this process to the forces of nature, and the work is very crudely done, in most cases.

The greatest fight against fungi must be made with a view to preserving the life and lengthening the service of the wood that we put in exposed situations. To this end a number of so-called "preservative treatments" are at present commanding the attention of the foresters, or more accurately, the people who are using the timber; engineers of construction, railroad companies, etc. The following discussion of the character of wood and the habits of wood-rotting fungi, from Freeman, will throw some light on the subject:

The cell wall of wood in the young stages is whitish and not particularly resistant, for it is a cellulose wall. Later new substances are added which collectively are known as lignin, and the tissues then become woody. Cellulose membranes are pierced by fungus threads in a purely mechanical fashion, just as one would force a pin or needle through them. Wood membranes offer considerable resistance to most fungi, but some of them have solved the problem of penetrating these walls. Such are the wood-destroying fungi already mentioned. The threads of these parasites exude certain chemicals which are able to attack the lignin of woody tissues and dissolve out this lignin. These cell-walls now have the same chemical constitution that they had before they became lignified. But the fungus is also able to attack the cellulose wall, and the result is a more or less complete breakdown of the walls. The wood crumbles easily and can be converted into punk. From the points of contact the dissolving substance spreads over the cell wall, completing the rotting process in that vicinity.

Fungi have different methods of attacking and rotting woods. Certain wood-rotting fungi can be determined by the kind of rot which they produce. The wood-rot, therefore, often gives very definite symptoms of a determinable disease.

The study of wood-rots is receiving considerable attention at the present time on account of its vast importance economically. To realize this importance, one has but to think of the great losses sustained yearly by the decay of mine-timbers, house-foundation and cellar timbers, railroad ties, paving blocks, fence posts and rails—in fact, timbers wherever air and moisture can reach them. The creasoting of pavement blocks and tarring of cedar posts are attempts to aid the wood in resisting the attacks of fungi. Tar and creasote are substances in which the fungi cannot live, and their presence protects the wood. But as soon as the substances are washed off, the fungi commence their attack. What is wanted is some substance which when deposited in the wood will prevent the entrance of fungi and which will not readily leach out into the soil during heavy rains.

Seasoning of timber is an important factor; green timber contains more moisture, which is directly favorable to fungus growth.

The various methods of treating timber consist entirely of impregnation processes. Chemical compounds in solution or emulsion are forced into the timber or boiled in, so that they permeate the whole timber, or at least the surface portions. These substances must be

fungicides and antiseptics as well. They must prevent the growth or germination of fungi, and thus prevent rotting. If they permeate to the center, they will not leach out so readily; but the easier they penetrate, the easier the leaching, in the case of soluble salts.

The following substances have been used with considerable success: Creasote is sometimes forced hot into timbers placed in tanks. A penetration of several inches may be effected. This is a very expensive process. Zinc chloride is used much more cheaply, and this process is the generally accepted one. The Hasselman process, which consists of boiling for several hours in sulphates of copper, iron and alum, with a little kainit, fills the walls as well as the cavities of the cells, and ought to give good results.

In addition to those mentioned by Freeman, the following were used on ties laid for experimental purposes in Texas (See Bull. 51, B. F.):

The zinc-tannin process consists, after steaming and vacuum, of three injections under pressure. (1) Clear chloride of zinc, 4 per cent strong. (2) A solution of glue, 2 per cent strong. (3) A solution of tannin, 2 per cent strong. Twelve hours for each injection.

Ties treated with Beaumont oil were soaked in an open vat for twenty-four hours. Seasoned ties absorbed from 3.15 to 5.67 pounds of the oil.

The Burnetizing process is a combination of the zinc chloride and creasoting processes.

Treatment with spiritine consists merely in immersing the ties in a vat of spiritine for twenty-four hours. The average absorption was 3.3 pounds per tie.

HARDY CATALPA FOR PROFIT.

FRANK G. MILLER, PROFESSOR OF FORESTRY, UNIVERSITY OF NEBRASKA.*

Mr. C. D. Robinson, a prominent merchant at Pawnee City, Neb., has recently completed a very interesting experiment in the growing of hardy catalpa. In 1889, he purchased a small tract three miles northeast of Pawnee City, and immediately put plans under way to plant twenty acres to catalpa.

The land is of the rolling prairie type. The soil is a sandy loam with a small admixture of gravel and underlain with a clay subsoil. Seven acres were planted in the spring of 1889, on ground which had been carelessly farmed for some years, and was very much run down. The remaining thirteen acres were planted in the spring of 1890. This portion of the tract had been in virgin prairie sod until the spring of 1889, when it was broken out and allowed to stand idle until the following year. The ground in both cases was put in a thorough state of cultivation immediately before the trees were planted. The trees, which were one year old when set out, were spaced four by four feet, thus requiring twenty-seven hundred and twenty-two trees per acre. The plantations were cultivated the same as corn the first two years. After that no further care was given them, except that a few acres were pruned several years later. The plantation was always protected against fire and live stock.

The entire plantation was harvested in January and February, 1906. Since seven acres were planted in the spring of 1889 and thirteen acres in the spring of 1890, the average age of the grove was approximately sixteen and one-third years. The owner has kept a strict account of all expenses incurred in establishing, maintaining, and harvesting this plantation, as well as of all proceeds, and the figures following are taken from his records:

EXPENDITURES PER ACRE.

Plants, 2,722, at \$1.15 per thousand.....	\$3 13
Preparation of the ground, planting, cultivation, and pruning.....	18 46
Total	\$21 59
Interest on \$21.59 for 16 1-3 years at 5 per cent compounded.....	26 34
Cutting and marketing.....	61 90
Total expense for growing and harvesting the plantation per acre	\$109 83

* Since the preparation of this paper Professor Miller resigned his professorship in the University of Nebraska to accept a similar position in the University of Washington. His successor in Nebraska is Professor F. R. Phillips, recently of the United States Forest Service.

RECEIPTS FROM THE TWENTY ACRES.

The actual material sold and receipts from the same are as follows:

31,397 third-class posts, at 5c.....	\$1,569 85
17,349 second-class posts, at 10c.....	1,734 90
4,286 first-class posts, at 12½c.....	533 50
270 first-class posts, at 15c.....	40 50
211 8-ft. posts, at 20c.....	42 20
9 10-ft. posts, at 25c.....	2 25
4 10-ft. posts, at 30c.....	1 20
258 10-ft. posts, at 35c.....	90 30
41 12-ft. posts, at 40c.....	16 40
167 14 and 16-ft. poles, at 50c.....	83 50
	<hr/>
Total for posts and poles.....	\$4,114 60
214 cords of wood, at \$5.25.....	1,123 50
	<hr/>
Total income from twenty acres.....	\$5,238 10

The total of \$5,238.10, as the proceeds from twenty acres, is equal to \$261.90 per acre. If from this the cost of \$109.83 per acre for growing and marketing the crop is deducted, we have \$152.17 as the net proceeds per acre. Allowing 5 per cent compound interest for deferred payment, the \$152.17 as the net income at the end of sixteen and one-third years is equivalent to an annual net income of \$6.24 per acre. In other words, if the land had been rented, it would have had to bring an annual cash rent of \$6.24 per acre for this period to equal the income derived from the plantation. Anyone acquainted with the conditions that have prevailed in eastern Nebraska, and the reverses farming has suffered for the period included in the life of this plantation, knows that this would be a splendid showing for any sort of crop. It should be remembered that one-third of this grove was on poor land, and because of the impoverished condition of the soil, the trees were only just reaching post size when they were cut. This portion of the plantation would have been much more profitable had it been allowed to stand a few years longer.

Based upon careful measurements made in this plantation by the United States Forest Service a year or so before it was harvested, it is estimated that had the thirteen acres on virgin prairie soil been harvested and marketed alone, the net annual returns for this portion would have been \$9.00 per acre, after allowing 5 per cent compound interest for deferred payment.

The old stumps have sent up a vigorous growth of sprouts the past summer, and the owner expects to harvest a second crop in ten years. During the summer the sprouts were thinned out to the one, or in a few cases to the two, most promising sprouts at each stump. These have made a growth of from four to nine feet the past summer.

The cordwood sold readily at home, and is giving splendid satisfac-

tion. There was a good sale for the fence posts⁴ among the farmers of the vicinity, though most of them sold in carload lots to farmers and ranchmen in the western part of the state.

Mr. Robinson, writing in regard to his grove, says: "I am well pleased with the result. It has been a source of a great deal of pleasure and very little bother or worry—yes, I did worry some last fall for fear I might not find a market for my stuff, but now I worry because I cannot supply the demand for my posts. I could sell 60,000 more this spring if I had them.

"If I had it to do over I could realize quite a little more from the same timber. I should have had fifteen cents each for the posts which I sold for twelve and one-half cents. They were a fine post, and would have sold readily at fifteen cents. I also found a good sale for the ten-foot posts for stables and sheds, and could have sold several thousand fourteen and sixteen-foot poles for sheds and cross-country telephone poles."

In establishing, maintaining, and harvesting this grove, Mr. Robinson has hired everything done and paid good wages. A farmer could have done most of the work himself at odd times and could have easily saved one-half the expense. Nevertheless the enterprise has been a profitable one and is a splendid object lesson in showing what can be done in forest planting when rightly handled.

THE RELATION OF EARLY MATURITY TO HARDINESS IN TREES.

BY R. A. EMERSON.

HARDINESS A MATTER OF HABIT OR OF CONSTITUTION.

That a tree with well-ripened wood is better able to withstand severe cold than one with immature wood is a matter of common knowledge. A tree which has its leaves and soft, new shoots killed in May by a temperature only a few degrees below freezing might, if well ripened, pass unhurt through a January temperature far below zero Fahrenheit. One would no more question this than that ripe seeds which pass uninjured through the cold of winter might have been produced by plants as tender as beans or corn. It is perhaps less commonly known that resistance to cold in trees is due often almost wholly to the habit of early maturity rather than to constitutional hardiness. A concrete example may help impress the truth of this. Some black walnut trees from northern seed growing at the Experiment Station, by virtue of their perfect maturity, passed through the extremely severe winter of 1898-99 without apparent injury, while similar black walnut trees from southern seed, owing to imperfect maturity, have had their new growth killed back from a few inches to two or three feet every winter for the past six years, and yet, notwithstanding this great difference in resistance to cold in winter, a comparatively light freeze late in the spring of 1903 killed the new growth of the northern trees just as completely as it did that of the southern ones. All this goes to show that the northern trees were constitutionally no hardier than the southern ones, but that their greater resistance to winter cold was due to their habit of ripening their new growth perfectly in the fall.

The writer is of course aware that with some plants hardiness to cold is much more a matter of constitution than of habit. For instance, if pea and bean plants, both growing under the same conditions and both equally immature, were exposed to frost, the beans would doubtless be killed, while the peas might be unhurt. But the object of this paper is to show the connection between early maturity and hardiness; hence matters relating to constitutional resistance to cold will be passed over. From a study of relative hardiness of various trees, and through experiments aimed to increase hardiness, considerable material bearing upon the relation of early maturity to winter hardiness has accumulated. The most important of the data are presented here.

EARLY MATURITY AND HARDINESS IN FRUIT TREES A MATTER OF VARIETY.

PLUMS.—Peaches naturally grow late in fall and are comparatively easily injured by cold, while our wild plums ripen their wood early and

are very resistant to cold in winter. The same relation exists between various types of plums. The accompanying illustration (fig. 1) shows the degree of maturity of the season's growth of various sorts of plums on September 19, 1902. The trees were all two years old and stood close together in the nursery. The presence of small, newly-formed leaves at the distal end of the Abundance, Wildgoose, and Pottawattamie plums (representatives of the Japanese, Hortulana, and Chicasaw groups respectively) indicate that these varieties were still growing at the time the photograph was taken, while the absence of small, newly-formed leaves and the presence of well-developed terminal buds in the case of Wyant (Americana) and Cheney (Nigra) plums and sand cherry indicate that growth in length had ceased in the case of these trees, even by the 19th of September. Anyone who has ever grown these types of plums in the North knows that the Japanese, Chicasaw, and Hortulana types are injured by a less degree of cold in winter than are the other types seen in the illustration. The difference in winter hardiness commonly observed in Nebraska between the Abundance, Wildgoose and Pottawattamie plums is not indicated by the illustration, simply because the photograph was taken before either had begun to mature. Had the picture been taken a few weeks later, the hardier Wildgoose and Pottawattamie would doubtless have shown some degree of maturity, while the tender Abundance might still have been growing.

APPLES.—Varieties of apples illustrate well the relation between early maturity and resistance to cold. Figure 2 shows twigs of Whitney, Oldenburg, Prairie Crab, Wealthy, Ben Davis, Grimes, and a tender French crab seedling. All of these except the last named were taken from one-year-old root grafts in the Experiment Station nursery. The French crab seedling had finished its second season's growth, after having been lined out in a nursery. It was so very tender to cold that it froze to the ground during the previous rather mild winter. The twigs are shown with or without leaves, just as they were when collected in the nursery, and are arranged in order of hardiness, the tenderest at the right and the hardiest at the left. The ranking of these varieties with reference to resistance to cold winters is not only based upon the writer's personal observation but is in accord, it is believed, with the experience of fruit growers throughout the Northwest. The only variety the rank of which is at all questionable is Prairie Crab. The twigs were cut and photographed December 14, 1904. Had they been taken earlier, even greater differences in maturity would have been expected. A variety like Whitney, for instance, usually completes its length growth by July, even in case of young, vigorous nursery trees, and, while it is probably not thoroughly ripened until much later, it has more of the appearance of ripeness in midsummer than a variety like Grimes has in late autumn. The twigs pictured in the cut, taken as they were in early winter, are of special value in showing the relative maturity of the different varieties at a time of year when any further ripening had been

made impossible by the arrival of winter weather. It is interesting to note in this connection that the soft, undeveloped twigs of the French Crab were actually dead when cut, having been caught by winter's cold while still growing. The degree of ripeness of the twigs of two tender apples (French Crab and Grimes) and two hardy varieties (Oldenburg and Wealthy) is perhaps even better seen in figure 3, which presents longitudinal sections of the twigs. The left twig of each group was stained with iodine to show the deposit of starch in the pith, a very prominent feature of well-matured twigs. In case of practically all varieties of apple which the writer has observed in this connection, including many not shown in the cuts, the earliest to ripen their wood are the hardiest.

EARLY RIPENING AND HARDINESS OF TREES WITH RESPECT TO AGE.

It is very generally known that young trees are more susceptible to severe winter weather than older trees of the same kinds, except in case of trees that are so old as to be feeble from age. Nurserymen find it necessary to protect young plants, whether seedlings or from grafts, cuttings, etc., though they may need little or no protection after being set in the orchard. It is necessary here simply to point out the fact that young, vigorously-growing trees ripen their wood later in fall than older trees, and that this is at least in large part responsible for their lack of hardiness.

Figure 4 indicates something of the difference between the twigs of old and young apple trees. The varieties shown are Jonathan and Wealthy. The twigs were cut and photographed December 16, 1904. The twigs on the left in case of each variety are from one-year root grafts growing in the nursery, and the ones on the right are from old, bearing trees. The difference in maturity between old and young trees, even in case of so early ripening a variety as Wealthy, is quite apparent, and with the Jonathan the difference of course is even more noticeable.

EARLY MATURITY AND HARDINESS OF FOREST TREES FROM DIFFERENT LOCALITIES.

In the spring of 1897, seeds of several kinds of forest trees from various parts of the country were planted at the Experiment Station. The test was to have been carried on in cooperation between the Experiment Station and the United States Department of Agriculture, the latter having collected the seeds the previous fall. The Department of Agriculture, however, withdrew from cooperation after a year or two, leaving the work solely with the Experiment Station. The seeds were planted in nursery rows, where the seedlings have grown since. As the trees began to crowd, they were thinned, until at present only one average tree is left to represent each locality from which the seed was secured. The first records were made by Professor F. W. Card, then Horticulturist at this Experiment Station, or under his direction. The records since 1899 have been made by the writer.

BLACK WALNUT.—Seedlings from some states were injured during the first winter in the nursery and have been injured more or less severely every winter since. The trees from other states have never been appreciably injured, even in the severest winters. The illustration, figure 5, shows this difference well. The photograph was taken June 1, 1904, as the trees were starting on their eighth season of growth after having passed through a comparatively mild winter. Most of the injury shown in the case of the South Carolina and Georgia trees occurred during the more severe winter of 1902-03, as seen in figure 5 at *a* and *b*, but there was some injury in the following winter, 1903-04, as shown in figure 5 at *c*, *d*, *e*, *f*, and *g*. It is also noticed from the illustration that the trees from South Dakota and Nebraska seed suffered no injury during either of these winters, the growth being continued in each case from the terminal bud.

That there is a direct connection here between winter injury and degree of maturity may be seen from figure 6, which is from a photograph taken September 30, 1902. The tree from South Dakota seed was well prepared for winter, having ripened both its twigs and its leaves. The Nebraska tree was not far behind. It had lost most of its leaves. The trees from North Carolina, South Carolina, and California, on the other hand, were still in an immature growing condition, having lost scarcely a leaf. Figure 7 shows the condition of the young twigs of trees from South Dakota and South Carolina some ten days earlier. Even at this early date the South Dakota tree had lost most of its leaves. Figure 8 shows that by October 15th the Nebraska tree had lost all its leaves, while the trees from California and Oklahoma seed were no more nearly ready for winter than the South Dakota tree was a full month before, and the trees from South Carolina, North Carolina, and Georgia had even then lost almost none of their leaves. As a matter of fact, they actually held their leaves some two weeks longer and finally got ready for winter after the Nebraska tree had been ready a month and the South Dakota tree had been waiting a good six weeks.

That the difference in the time of shedding the leaves is accompanied by a real difference in the maturity of the new growth of these black walnut trees may be seen from figure 9. The twigs are shown as they appeared September 19, 1902, after the leaves had been removed. The terminal buds were well developed in the South Dakota and Nebraska twigs and the wood was thick and firm, while in case of the twigs from South Carolina and North Carolina trees the terminal buds were immature and the layer of wood near the top scarcely differentiated from the pith.

The fall maturity and the winter injury of trees from all the states represented in the test have been noted a number of times during the nine years' growth of the trees. From all these observations the trees from the different states are rated as to the earliness of their maturity in fall and also according to their resistance to cold during winter.

This rating is given in the following table, where "1" indicates extreme earliness and hardiness, and "6" extreme lateness and tenderness to winter's cold.

TABLE I.—*Black walnut trees from seed from various states, ranked according to earliness and hardiness.*

States from which seed was obtained.	Rank of trees.	
	Earliness.	Hardiness.
South Dakota.....	1	1
Nebraska.....	2	1
Colorado.....	2	1
Iowa.....	2	2
Pennsylvania.....	2	2
Ontario.....	2	2
Missouri.....	2	3
Illinois.....	3	3
Ohio.....	3	3
California.....	4	3
Virginia.....	4	4
Oklahoma.....	5	4
Kentucky.....	5	5
North Carolina.....	6	5
South Carolina.....	6	5
Tennessee.....	6	6
Georgia.....	6	6
Alabama.....	6	6

There is here, certainly, a very close relation between early maturity in fall and hardiness in winter. Apparently these trees have adapted themselves to the length of the growing season in their native homes (whether through natural selection or direct effect of climate—influence of habit—does not appear) and do not easily change their habit of growth when moved to a new climate. While in general the Northern trees planted in Nebraska are earlier in ripening in fall and more resistant to cold in the winter than Southern trees, there is also something of the same difference between the Western and Eastern trees in favor of the former. Perhaps this means that trees adapt themselves to short seasons of growth whether the season is cut short by early fall frosts, as in the North, or by dry weather in fall, as in many parts of the West.

HONEY LOCUST.—Observations made in spring to learn the amount of winter injury sustained by the trees from different states, and observations in the fall to determine their relative time of ripening, show that honey locust trees are no exception to the rule established for black walnuts, namely, that trees accustomed to the longer growing season of states to the south of us do not at once adapt themselves to our comparatively short season, but continue to grow late in fall and are consequently injured more or less seriously by our cold winters. The relative difference in time of ripening between honey locust trees from

various states and the degree to which they are usually winter injured are seen from the following statement:

TABLE II.—Relation of earliness to hardiness in honey locust trees.

States from which seed was obtained.	Time of maturity.	Amount of winter injury.
Alabama.....	Very late	Badly injured
Kentucky.....	Late	Considerably injured
Kansas.....	Fairly early	Slightly injured
Ohio.....	Fairly early	Slightly injured
Nebraska.....	Early	Uninjured

Figure 10 shows the degree of ripeness of the new growth of Nebraska and Alabama trees on September 19, 1902. Although the trees from Nebraska seed still held their leaves, the length growth of their twigs had been completed for the season and they were ripening preparatory to winter. The trees from Alabama seed, on the contrary, had not completed their growth but still showed much soft wood and many small, growing leaves. Figure 11 shows twigs from Nebraska, Kansas, and Alabama trees as they appeared on the above date after having had their leaves removed the better to disclose the degree of ripeness of the new growth.

INDUCED EARLINESS AND HARDINESS IN PEACHES.

The connection between hardiness of trees and a natural tendency to ripen early has now been discussed. It remains to be shown that the unnatural earliness forced upon a naturally late-growing tree makes that tree resistant to cold.

HIGH LAND AND EARLY RIPENING.—Every peach grower in this region knows that he must plant his trees on high land if they are to come through the winter with uninjured twigs and fruit buds, and many growers know that the reason for this is that the trees continue growth later on low land than on high land. In 1901 young Wager peach trees growing on high land at the Experiment Station ripened their twigs early in fall, while similar trees on low land near by continued growth until the middle of October, though the trees in both situations received the same culture. During the following winter five of the eight trees on low land were killed outright and the other three seriously injured, having had their tops killed back perhaps one-half. The high land trees, on the contrary, came through the winter without injury except for some discoloration beneath the bark of the twigs.

COVER-CROPS AND EARLY MATURITY.—Tests at the Experiment Station have demonstrated that peach trees, which naturally grow late in fall, can be rendered much more resistant to cold winters by sowing a cover-crop in the orchard in midsummer to dry the ground enough to check

the growth of the trees and cause them to ripen their wood well before winter. The results of the tests at the Experiment Station are borne out by the experience of fruit growers of this and other states.

The Experiment Station tests of the effect of cover-crops on the fall maturity and winter hardiness of peaches have extended over a period of four years. During this time the trees in the cover-crop plats have stopped growing and ripened their new wood from a few weeks to two months earlier than similar trees in adjoining plats that received late summer cultivation. Figure 12 illustrates the effect of cover-crops on early maturity of peaches. The twig on the left indicates the ripened condition of trees with cover-crops even in early fall when the trees given late cultivation are still growing rapidly as indicated by the twig at the right in the illustration. Figure 13 shows the effect of even a mild winter (1903-04) on peach trees in both the cover-crop and cultivation plats. The photographs were taken in May, 1904, and show representative twigs taken from the cover-crop and late cultivation plats. It will be noticed that in case of the cover-crop trees there was very little injury and that most of the terminal buds had started growth; while with the trees given late cultivation the winter injury was severe, none of the terminal buds having started growth and some of the twigs having been killed back almost their entire length.

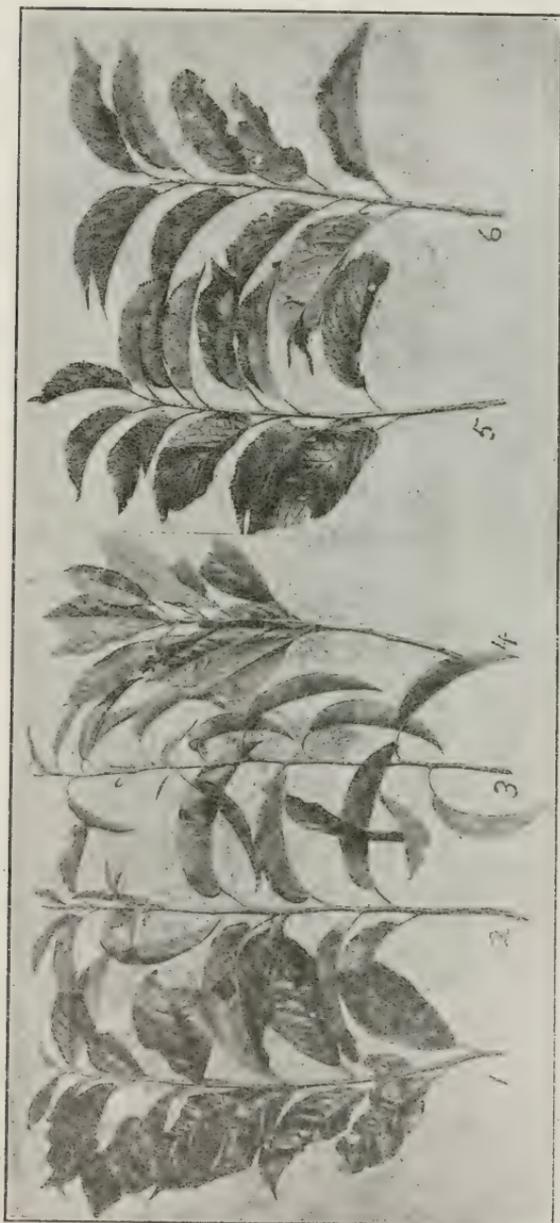


FIG. 1. Relative maturity of twigs of different varieties of plum on September 19, 1902.
(1) Abundance, (2) Wildgoose, (3) Pottawattamie, (4) Sand Cherry, (5) Wyant, (6) Cheney.

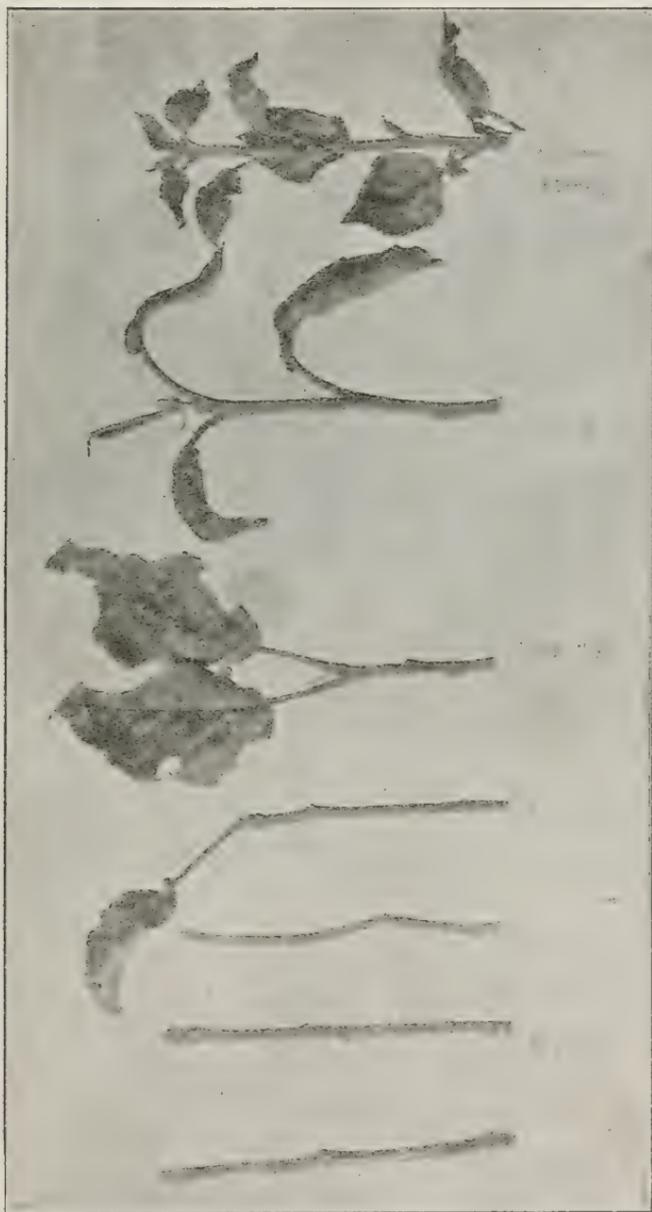


FIG. 2. Relative maturity of twigs of different varieties of apple on December 14, 1904.

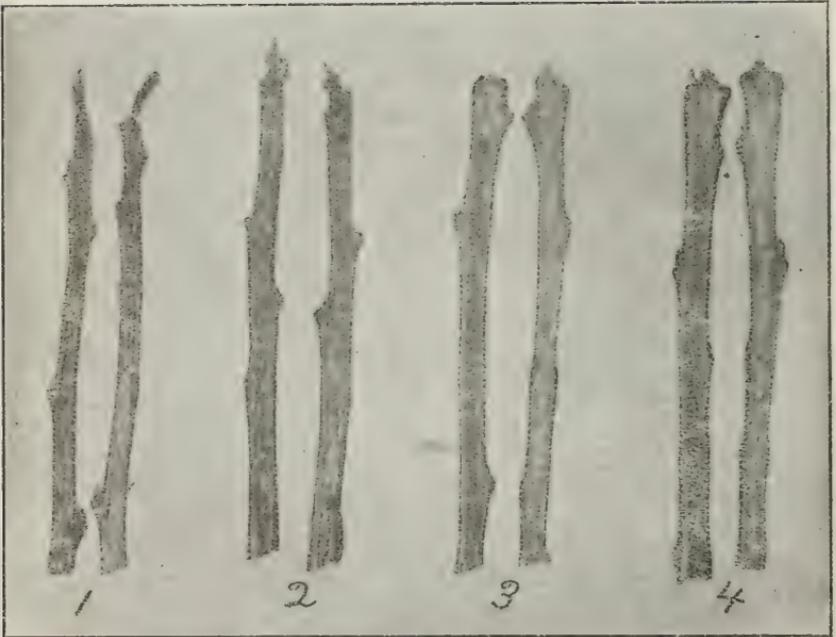


FIG. 3. Longitudinal sections of apple twigs: (1) French crab seedling, (2) Grimes, (3) Wealthy, (4) Oldenburg.

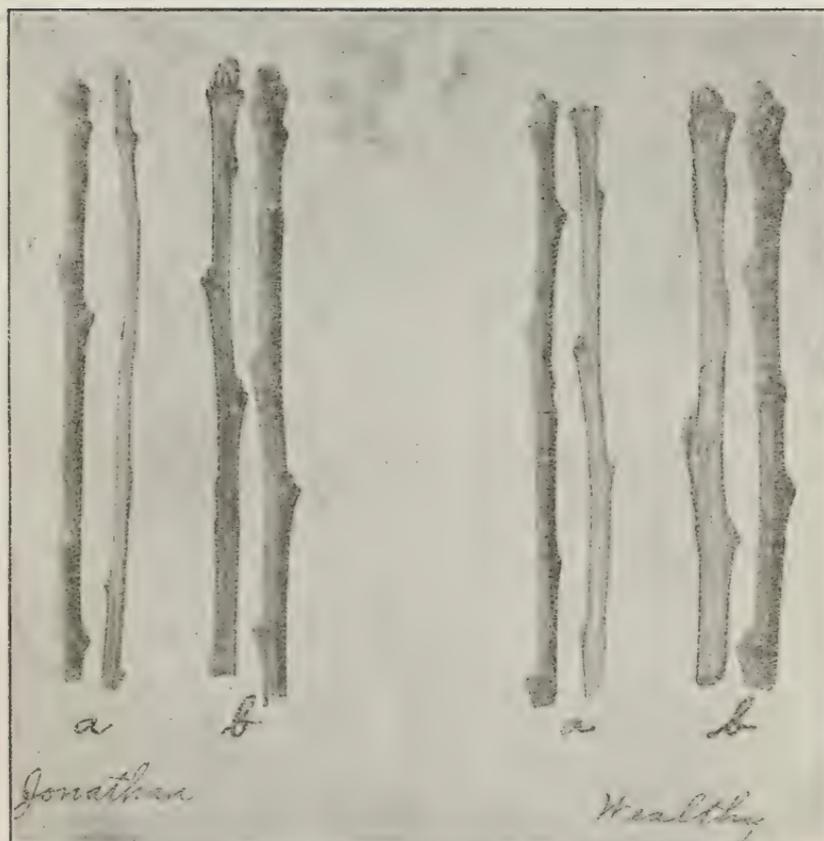


FIG. 4. Maturity of old and of young apple trees. (a) Twigs from one-year-old grafts, (b) twigs from bearing trees.



FIG. 5. Winter injury to black walnut trees grown from seed obtained in various localities. (1) Seed from South Dakota, (2) Georgia, (3) Nebraska, (4) South Carolina.

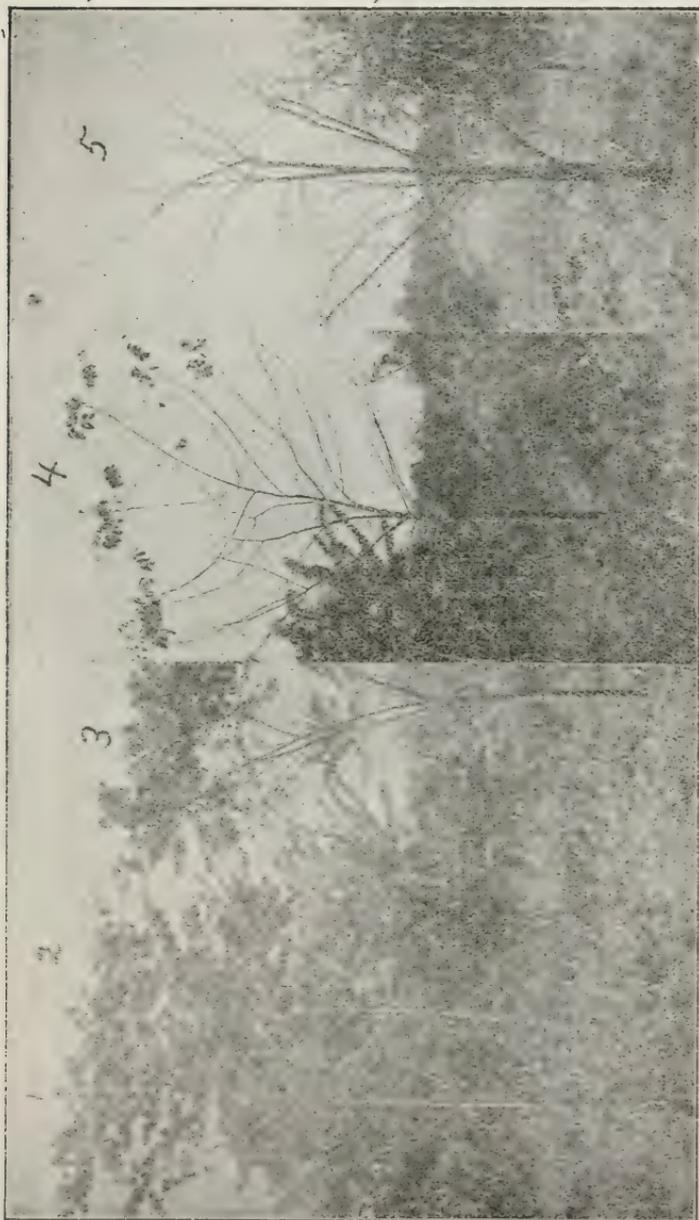


FIG. 6. Fall maturity of black walnut trees grown from seed obtained in various localities, as seen September 30, 1903: (1) North Carolina, (2) South Carolina, (3) California, (4) Nebraska, (5) South Dakota.

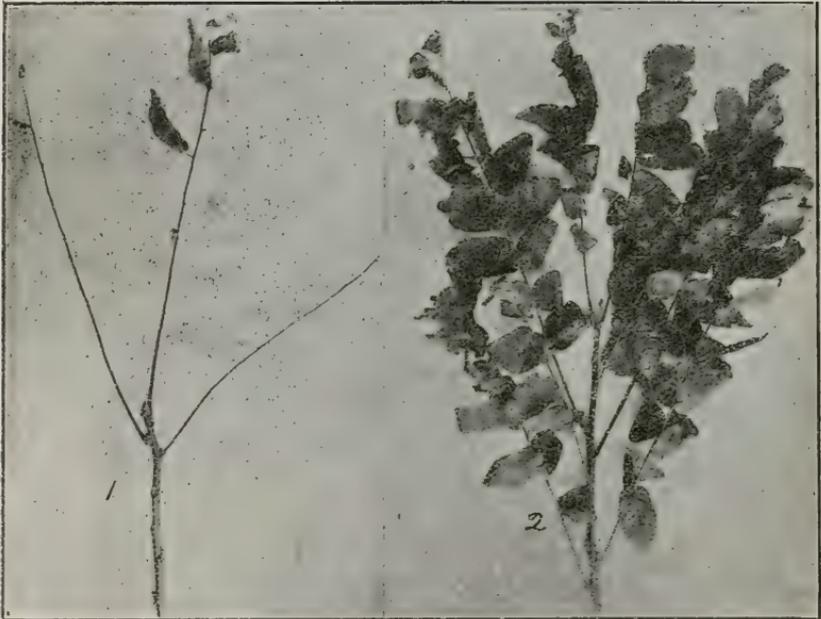


FIG. 7. Twigs of black walnut showing difference in maturity on September 19, 1902, between trees grown from seed obtained in South Dakota (1) and South Carolina (2).

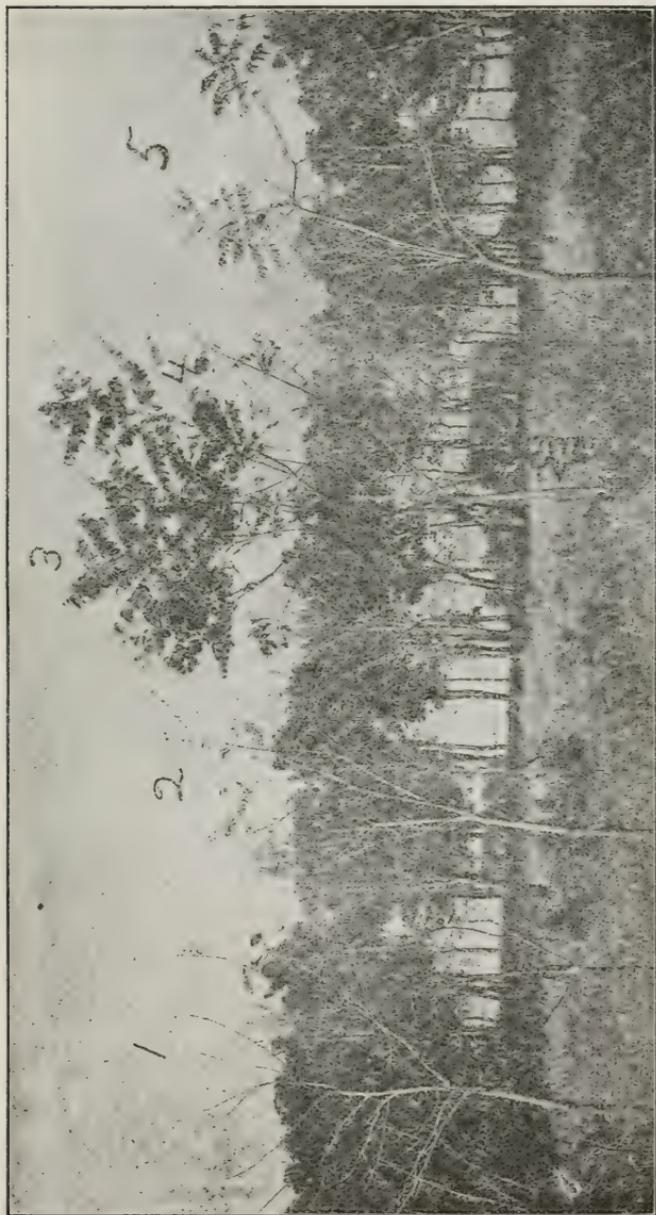


FIG. 8. Relative maturity of black walnut trees on October 15, 1902: (1) Seed produced in Nebraska, (2) California, (3) South Carolina, (4) North Carolina, (5) Oklahoma.

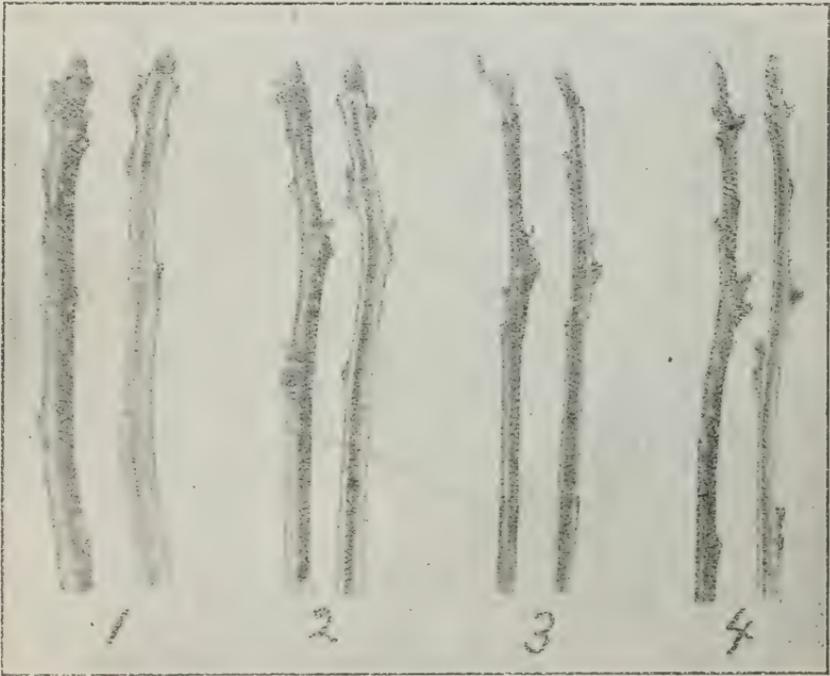


FIG. 9. Black walnut twigs showing differences in maturity on September 19, 1902. The trees were grown from seed obtained in (1) Nebraska, (2) South Dakota, (3) South Carolina, (4) North Carolina.



FIG. 10. Honey locust twigs, from a photograph taken September 19, 1902, showing (1) the immature condition of a tree from Alabama seed, and (2) the maturity of a tree from Nebraska seed.



FIG. 11. Twigs of honey locust with leaves removed. The source of seed was (1) Nebraska, (2) Kansas, (3) Alabama. Photographed September 19, 1902.



FIG. 12 Peach twigs showing the mature condition in early fall of trees with a cover-crop and the natural immature condition of trees given late cultivation.

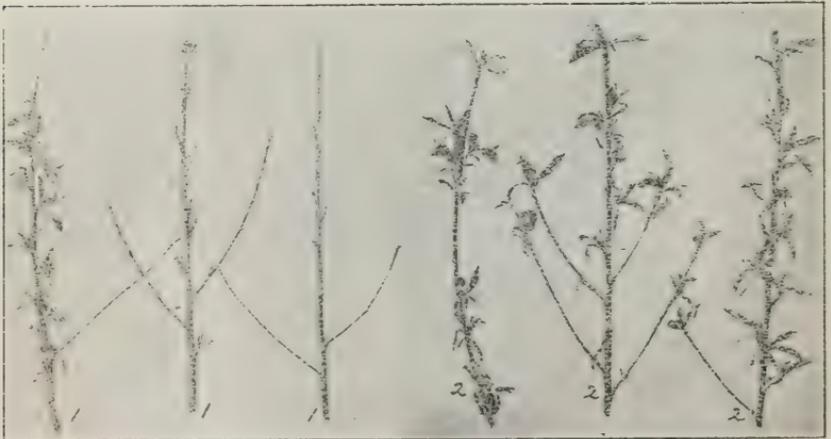


FIG. 13. Peach twigs showing (1) severe injury where given late fall cultivation, and (2) very slight injury where a cover-crop was grown the fall before.

SYMPTOMS OF DISEASE IN PLANTS.

BY F. D. HEALD, PH. D.

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It is highly important that all persons engaged in general farming, truck gardening, fruit raising or floriculture should be able to recognize the presence of disease. In their mute way plants tell us when they are suffering from constitutional or contagious diseases if we are only able to interpret their language. It is evident that many people do not recognize the presence of disease for it is not an uncommon thing to receive replies like the following to the letters of inquiry that are sent out over the state: "There are no plant diseases present in our locality." "All the crops in our region are free from diseases." "No diseases in our county."

The diseases that affect plants may be divided into three different groups: First, those disturbances of nutrition which are due to unfavorable conditions in the environment of the plant, or to the conditions inherent in the plant itself; second, troubles due to the presence of parasitic plants, generally either bacteria or fungi, which deform, stunt or kill the affected plant by their presence; third, those caused by insect pests, which are in many cases very evident, and in other cases not easily detected. Many of these insect troubles are hardly to be classed as plant diseases, while many are as truly diseases as those produced by parasitic fungi. In the nature of the resulting symptoms there are no sharp and fast lines that can be drawn between many insect and fungus troubles and often a careful microscopic examination is necessary in order to diagnose the disease. The first thing of importance for the farmer is to detect the presence of the disease and then to endeavor to find out its cause, nature, and probable outcome and the treatment which should be employed, by consulting those who have made the subject a special study.

The following outline will give a survey of the principal symptoms of disease in plants, placing most emphasis on those diseases included in the second group.

1. Discoloration or change of color from the normal.

(a) Pallor. Yellowish or white instead of the normal green.

(b) Colored spots or areas on leaves or stems.

Whitish or grey: mildews; white rusts, etc.

Yellow; many leaf spots.

Red or orange: rusts, leaf spots, etc.

Brown: many leaf spots.

Black: black rust, tar spots, etc.

Variegated: leaf spots, etc.

2. Shot-hole: perforation of leaves:
3. Wilting: "Damping off," "Wilt," etc.
4. Necrosis: death of parts, as leaves, twigs, stems, etc.
5. Reduction in size: dwarfing or atrophy.
6. Increase in size: hypertrophy.
7. Replacement of organs by a new structure.
8. Mummification.
9. Change of position.
10. Destruction of organs.
11. Excrescences and malformations.
 - Galls: Pustules, tumors, corky outgrowths, crown galls, etc.
 - Cankers: Malformations in the bark generally resulting in an open wound.
 - Punks or conchs and other fruits of fleshy fungi.
 - Witches' brooms.
 - Rosettes.
12. Exudations.
 - Slime flux.
 - Gummosis: Especially for stone fruits.
 - Resinosis: Especially for coniferous trees.
13. Rotting.
 - Dry rot and soft rot: the "gangrene" of plant tissue.
 - Root rots: Alfalfa, beets, cherry, etc. Generally woody or fleshy roots.
 - Stem or trunk: Dry rot of trees; rot of modified stems like rhizomes, bulbs, or tubers.
 - Bud.
 - Fruits: fleshy fruits of various kinds.

It is quite common to find the foliage of trees, in the western part of the state, showing a pronounced yellow cast instead of the normal green color. This yellowing is especially prominent in the regions where the soil is decidedly alkaline or where there is a seepage of ground water from high irrigation ditches to a lower level, or where both of these conditions prevail. The conspicuous sickly yellow corn plants that may be found in the early part of the season upon flooded fields or in water-logged soils is another example of this marked symptom of disease. The lack of sufficient iron in the soil will cause a plant to pass into what is technically termed a chlorotic condition, that is, the leaf green or chlorophyll is either not developed at all or only to a slight extent. These chlorotic plants can often be restored to their normal condition by supplying them with iron. The occasional white plants that appear in corn fields are some of our plant "albinos" and are suffering from rather complex disturbances of their nutrition. Another physiological trouble, the "mosaic disease," common in the tomato and the tobacco

plants, is characterized by the mottled appearance of the leaves, or in other words the leaf is somewhat variegated with yellow and green.

When the leaf shows colored areas or spots that are more or less definite and circumscribed, and different from any normal coloration, we may be fairly certain that it is suffering from either an insect or fungus disease, with the presumption in favor of the latter.

White patches more or less definite or somewhat diffuse are generally due to either some of the "Powdery Mildews" or to the "Downy Mildews." We have a good illustration of this symptom in the powdery mildews of the apple, peach, cherry, grape, gooseberry, wheat and other grasses, the elm, catalpa, the lilac, honey-suckle, crimson rambler, and other roses, golden glow, etc. In all of these cases the fungus that causes the disease lives on the surface of the host plant, or is what may be termed an external parasite. In the downy mildew of the grape, which is an internal parasite, we often find the under side of the leaf covered with irregular whitish patches, which are formed by the spore producing parts of the fungus that emerge from the interior of the leaf. It may be mentioned in this connection that the upper side of the leaf, directly over these spots is at first a yellow color, but later changes to a dark brown. Other downy mildews showing somewhat the same symptoms may be found on cucumbers, lettuce, spinach, and onions among garden vegetables, and upon some of our forage crops like millet, clover, and alfalfa. The "white rusts" generally show more definite whitish pustules, which eventually rupture and allow the escape of the spores. The white rusts may be observed upon cress, turnips, radish, cabbage, horse radish and related plants and also upon the leaves of the oyster plant.

Many fungi that inhabit leaves have a localized effect and produce more or less circular or slightly irregular spots of a marked yellow color. In such cases the disease is generally characterized as a "leaf spot." Symptoms of this kind may be noted in the leaf spots of the oak and violet, and in the anthracnose of cucumbers and melons. Sometimes the change in color becomes more general and the whole leaf turns yellow and falls from the tree as in the early summer stage of apple scab.

Another marked symptom of disease is the occurrence of red or orange spots or pustules. The "rusts" of our cereals and other crops received their name from the fact that in the early stage of the attack reddish or brownish spore producing pustules give the stems or leaves a rusty appearance. Sometimes these rust spots may be few in number, at other times so numerous that almost the entire surface of leaf or stem is covered, and thus the vigor and productiveness of the crop is seriously impaired. In all of our cereal rusts, black pustules appear on leaves and stems as a later growth. The red pustules always predominate and give character to the disease in the "orange rust" of wheat and the "crowned rust" of oats, while the black stage or black

rust is the conspicuous stage in the "stem rust" of wheat. Some of the other cultivated plants affected by rusts are the clovers and alfalfa, beans and peas, beets, asparagus, plum and cherry, cottonwood and willow, roses, carnations, and chrysanthemums. The cluster-cup stage of many of the rusts produce fairly large, well-defined orange-colored spots in many cases. This symptom is well illustrated in the well-known "cedar rust" of apple leaves, and in the cluster-cup stage of the "crowned rust" of oats on the leaves of the buckthorn. Deeper red or even purple-colored spots or extended areas indicate the presence of a leaf parasite in many cases. This is often noticed in the early stages of the shot-hole diseases of the cherry or the peach, and is especially characteristic in the bacterial blight of sorghum or Kafir corn. In the last mentioned case the dark red or purple patches are generally somewhat elongated and more or less irregular. The leaves of dandelion affected by rust generally show a reddening of the whole leaf, while the under side of blue-grass leaves affected with the powdery mildew frequently show spots of a deep purple color.

Definite brown areas, either small or somewhat extended, are quite characteristic of spot diseases of either leaves or fruits. The leaf-spots of apple, pear and plum are common diseases in this and adjoining states. As a result of these troubles, the leaves begin to drop and a premature defoliation is the result, thus sending the tree into winter rest with an insufficient supply of reserve food for the growth of the following season. As a result of the leaf-spot, Ben Davis trees in Nebraska are often defoliated when other varieties are in full foliage. The leaves of tomato plants often show an abundance of small brown spots. As these spots become more plentiful the intervening areas turn yellowish, the leaf begins to shrivel and curl and finally drops off. Many gardeners do not recognize this behavior of tomato leaves as a symptom of disease, since it is of such common occurrence. The early blight of potatoes is characterized by brownish spots on the leaves that often show more or less of a concentric zonation. As the fungus spreads the spots may coalesce and thus the entire leaf will be killed. Sometimes the brownish color is not confined to definite spots, but is more general as in the diffuse form of apple-scab, which shows upon either the under or upper surface of the leaves. The definite scab spots on the fruits or leaves of apples, pears or peaches may be gray, brown, dark olive green, or even almost black. More or less deep cracks or fissures often appear in later stages of scab. Many other examples of a somewhat similar character may be mentioned, as the leaf-spots of beets, watermelon, maple, mulberry, chrysanthemum, rose, etc. Other troubles, such as spray injury, or sun-scald, may be indicated by brownish discolorations, but in the majority of cases this symptom indicates a fungus disease.

The appearance of black spots upon stems or foliage is not an uncommon symptom of disease. One of the most striking cases of this character is in the so-called "tar-spots" of our maples and willows.

Leaves affected by this trouble show large, irregular blotches of blackened tissue, in fact they look almost as if they had been spattered with drops of tar. When these spots become abundant the intervening tissue of the leaf turns yellow, and the leaves are dropped quite early. In severe epidemics considerable injury may result from these "tar-spots." In all of our cereal rusts, the winter stage is indicated by either small, black-covered pustules or by elongated, black streaks, having a somewhat powdery appearance. The winter spore pustules of the orange leaf rust of wheat are small and covered and are generally confined to either leaf blade or sheath, while the winter spore pustules in the stem rust of wheat, rye or oats are in the form of elongated, naked streaks, which are more numerous on the stem than on any other part of the plant. In a leaf disease of the honey locust, the leaflets often show numerous small black spots on the under side; in many cases these black spots become so numerous that they coalesce and cover the entire surface of the leaflet, hence the common name "black leaf" disease. Another fungus trouble that is quite common in Nebraska orchards is the so-called "fly-speck" fungus of the apple. Fruits attacked by this fungus show small clusters of circular black spots which on account of their characteristic appearance have suggested the common name. This fungus is more common and evident on the yellow-skinned varieties. The "sooty fungus" produces larger, and more diffuse, smoky brown, or almost black, irregular patches upon the epidermis of apples.

Leaves which show circular or sometimes irregular perforations have probably been affected by some fungus parasite. In many cases leaves so affected will show brown spots of dead tissue which have not yet dropped out. Several diseases have been called "shot-hole" diseases on account of this peculiar effect upon the foliage. Notable among these troubles is the shot-hole disease of the cherry and plum. This disease is sometimes called "rust" by orchardists, but the true cherry rust is an entirely different disease. Nearly all of the English Morello cherry trees in the eastern half of Nebraska have been killed by this trouble during the past few years, while other varieties have suffered to a considerable extent. A "shot-hole" disease of the peach has been especially abundant during the past season in Nebraska. Unless its spread is checked by natural means or by spraying, it bids fair to cause extensive losses in the peach orchards of the state.

A sudden wilting of a plant which cannot be explained by dry conditions of soil or air is often due to the attack of a parasite. Both seedlings and mature plants exhibit this symptom, and the loss which is occasioned by diseases having this attendant symptom is often enormous. In a seedling the disease in which this symptom is prominent is often called "damping off." The young plant drops dead as it were, for a fungus parasite has entered the stem at about the ground level and has struck a vital blow, interrupting essential physiological functions. A disease of the squash and related forms called "wilt" is not

uncommon. In this trouble the parasite enters the stem and grows rampantly in the water vessels or ducts until they are completely plugged, and the supply of water to the foliage is interrupted. Often the first indication of the presence of this disease is the sudden wilting of the plant, no previous warning symptom having made its appearance.

In some diseases, the death of parts of the plant, as leaves, twigs, stems, flowers, etc., is the first symptom that is observed. In the fire-blight of pears and apples the young terminal twigs with their leaves and flowers are killed and even large branches are involved and succumb. The leaves turn brown and dry up while still hanging upon the tree and the twig will be found to be dead down to a certain point, which marks the advance of the bacterium which is the cause of the disease. In this disease small, gummy drops, which consist of myriads of these bacteria, often ooze out from the dead bark. Sometimes the blossoms of plums turn brown and die prematurely as if blasted by frost or fire. This blighting of the blossoms is due to the same organism, the brown rot fungus, which causes the rotting of peaches, plums, cherries and sometimes apples.

In many diseases a more or less marked reduction in size, a dwarfing or atrophy of the whole plant or some of its organs, is evident. A crippled and deformed individual or a poorly-developed organ, with impoverished nutrition, is the result in many cases. The dwarfing or reduction in size of apples by attacks of scab is often prominent. Many apples seriously affected do not reach over one-fourth the natural size, while others are gnarly and deformed, due to localized atrophy of the tissues of the fruit. The same may be said of apples affected by "cedar rust," although perhaps the effect is not as striking as in apple scab. In a disease of the peach, known as "little peach," a marked reduction in size of the fruit is one of the attendant and characteristic symptoms. Every farmer is familiar with the shrunken and shriveled appearance of wheat from badly rusted fields. The energy of the plant is sapped by the rust fungus, and as a result the grains are poorly developed, lessening the yield and quality of the crop. The dwarfing of stem, leaves, roots, flowers, or flower parts, or even the complete arrest of seed development is often the result of the inroads of some parasitic fungus.

While a large number of fungi produce more or less extensive atrophy or dwarfing of parts of their host, others cause abnormal enlargements of organs or parts of organs. The so-called "plum pockets" or "fools" is a striking illustration of hypertrophy. In this disease the outer layers of the fruit become thick and fleshy, while the pit remains undeveloped, causing the modified fruit to be hollow, hence the other common name of "bladder plums," which is sometimes employed. The flower parts of the radish and related plants are frequently enlarged and deformed as a result of the attacks of white rust, while the catkins of some of our trees show striking modifications of size and color due to the

stimulating effect of their fungus guests. The twigs, petioles and leaves of our common ash often show orange-colored enlargements, due to the growth of the cluster-cup stage of a rust fungus. The vegetative parts of plants, as stem, leaves, and roots, often exhibit peculiar enlargements, but most of these may be considered under the head of excrescences and malformations.

It sometimes happens that a parasitic fungus produces a new structure which takes the place of some normal organs of the plant, as in the so-called "ergots" of our wild and cultivated grasses and rye. These ergots are horny, resting bodies or sclerotia of the fungus that occupy the same position as the kernel or seed, and appear only with the destruction of the seed-producing structure. These ergots not only affect the seed production of the host plant, but they contain poisonous principles which produce serious disease when ergot-infested hay is fed to cattle.

The production of "mummies" is another characteristic symptom of disease in fruit trees. Apples that are badly affected with either brown rot or black rot often dry up slowly and remain hanging on the tree over winter in a more or less hard shrivelled condition. These mummies at the end of the winter period of rest may produce a crop of spores which will spread the disease. This spore production may take place while the mummies are still hanging on the tree or on fallen mummies. The formation of mummies is especially common in plums that are affected with the brown rot. It must be at once evident that mummies should be destroyed in order to prevent production of new crops of spores and thus to lessen the ravages of these rot-producing diseases in an orchard. The practice of allowing rotting plums to fall to the ground and remain beneath the tree should certainly be discouraged.

Change of position is a symptom of disease that is sometimes overlooked. This is well illustrated in some plants which are affected with a rust fungus, in the cluster-cup stage. Some of the spurgees which are normally more or less prostrate or creeping become erect when attacked by a fungus of the kind mentioned. This same symptom is present in some tree diseases, in which normally horizontal limbs or branches become more or less erect.

As a result of the attacks of a fungus parasite a complete destruction of organs may result. This effect is well illustrated in the majority of our cereal smuts. In the loose smut of wheat, for example, the complete inflorescence is destroyed, the glumes and other flower parts being reduced to a powdery mass of black material, the smut spores, which finally drop away, leaving nothing but the bare central axis of the head. The same effect with but little deviation may be noted in the naked and covered smut of barley and the loose smut of oats, while in the kernel smut of sorghum, the kernel smut of oats, and the bunt of wheat, it is the berry alone which is destroyed, the surrounding parts

remaining intact. In the last mentioned cases the berry or "seed" may show an increase of size or a modification of form with the complete destruction of all its tissues except a surrounding membrane which serves to confine the mass of smut spores. When the membrane is ruptured the interior brown mass crumbles to powder, since it is simply a loose aggregate of spores which has been formed at the expense of embryo and endosperm. Wheat from fields infested with bunt is often dark in color, due to the immense numbers of spores lodged upon the surface of the kernels and especially collected in the "brush" or tuft of hairs at the distal ends of the berries.

As a result of the stimulating effect of a fungus parasite, parts or organs of the host plant may exhibit variously formed excrescences or malformations. These malformations may be in the form of pustules or small, blister-like elevations upon the surface of the leaf or stem, as in the "white rusts," or the blistered area may be quite extensive and cause more or less deforming and rolling of the leaf, as in peach "leaf-curl." Sometimes the abnormal formation is in the form of a smut mass or tumor which when mature is filled with a brown or black powder, the spores of the fungus. In the smutted corn plant these tumors may occur on any part of the plant, not a single aerial organ being exempt. The so-called "cedar apple" is a good illustration of a fungus gall. These brown cedar apples may be present on the cedar trees in large numbers in case of trees that stand adjacent to an apple orchard, and they may vary in size from about that of a radish seed to nearly two inches in diameter. In several cases I have known people to admire these "cedar apples" as the true fruit of the cedar, little realizing that this fungus may often seriously affect the life of the cedar and greatly impair the productiveness of adjacent apple orchards.

Here may also be mentioned the disease of plums and cherries known as "black-knot." This disease is often not noticed until the conspicuous black enlargements become evident later in the season. The enlargements are somewhat irregular, roughened, and generally extend for some distance along the length of the affected twigs. When young or in the early spring the newly-formed knots are olive green in color. In this condition they produce a crop of spores that spreads the disease, while later the older knots produce a second kind of spore. The fungus that causes the black knot lives perennially in the twigs and branches and consequently new growths appear each year unless the affected limbs are pruned off. In several sections of the state plum orchards are seriously affected and it is not uncommon to find wild plums in many of the canyons covered with malformations of the character described.

In some fungus diseases the malformations do not show as pronounced enlargements. This is true in our common potato scab in which irregular roughened areas appear over the surface of the potato. An abnormal development of the corky tissue may result in a slight

elevation of the scab patch or in the deep form there may be more or less corrosion and destruction of tissue.

The so-called crown-galls which may be called our "vegetable cancers" are due to the stimulating effect of some organism in the majority of cases. In these cases irregular, abnormal enlargements appear at the crown or even upon some of the roots as in the raspberry, blackberry, grape, peach, apricot and apple. The club-root or finger-and-toe disease of the cabbage and other cruciferous plants should also be included in this category.

The name "canker" is applied to a malformation in the bark of trees which generally results in an open wound. In the younger stages of a canker the bark may be only slightly different from the normal, sometimes being sunken, sometimes showing a more tumid condition. The canker area may also show differences of color and with the advance of the disease the bark becomes roughened and begins to break and peel away. The destruction of the cortex or bark may thus leave an open wound which exposes the wood, while the parasite itself penetrates the wood deeper and deeper or other wood-rotting fungi gain an entrance and help to complete the destruction. There are at least six different canker-producing fungi which grow upon apple trees. The same organism which produces the canker may also cause a rotting of the fruit. This is true in the bitter-rot canker, the black-rot canker, and the Pacific-coast canker, all of which occur in this state, while the organisms which cause European canker, the Illinois apple-tree canker and fire-blight canker do not attack the fruit. In some cases open wounds on trees due to sun-scald may be confused with cankers due to fungi, but in general a careful observation of the location will reveal the difference. Canker-producing fungi, however, may enter sun-scald wounds and continue the destruction. A bacterial canker of plums has been observed in this state especially upon two varieties, the Wickson and Whitaker. These plum cankers are on the smaller branches and are produced by radial fissures in the bark which make more or less open wounds, due to the destruction of tissues and the relief of the transverse tension.

It is not uncommon to find upon the trunk or limbs of forest, ornamental, or orchard trees the fruits or sporophores of some of the higher fungi. Some of these common forms are toadstool-like in appearance, while others are in the form of brackets, the so-called bracket fungi. The latter are often called "punks" or "conchs" by lumbermen and foresters. Some of these higher fungi only grow in wood or branches that are dead or in a languid condition, while others gain an entrance through open wounds into healthy limbs and begin the work of destruction, while still others are more virulent and do not require either of the above conditions. In general, these fruits of fleshy fungi upon a woody plant may be considered indicators of disease, and they should be destroyed as soon as they appear to prevent the spread to other trees. The wood of a tree is always well pervaded by the vegetative body of the fungus

and partially disintegrated before these sporophores appear, and although the life of the tree is generally doomed it may often be prolonged by proper care. When orchardists recognize the fact that wounds should be protected to prevent infection, there will be less trouble from wood-destroying fungi.

The broom-like tufts of branches which appear on the silver fir, cedar, birches, cherry and other trees are popularly called witches' brooms. In the majority of cases a rust fungus is the cause of the abnormal proliferation, and the resulting branches generally stand more or less erect, giving the characteristic broom-like effect. Insects may in some cases be the cause of witches' brooms, but there are numerous instances in which the casual organism has not yet been observed. The witches' broom of our common hackberry is due either to an insect alone or to an insect and a fungus working together. Cockscomb-like growths are closely related to witches' brooms in their manner of formation. In growths of this sort on the gooseberry a louse and a mildew are quite constantly present.

While the formation of rosettes is the normal form of growth in many plants, such as the dandelion, shepherd's purse, lettuce, and others, the appearance of rosettes or the assumption of the rosette habit is a sure indication of disease in several cases. Very good examples of this symptom are to be observed in the "rosette disease" of the potato and in the "peach rosette." Both of these diseases are at present confined to the eastern and southern part of the United States.

There are many diseases in which the outflow of a slimy, gummy, or resinous substance is a characteristic symptom. In the so-called "slime-flux" of deciduous trees the exudation is semi-fluid in nature and does not set into a solid substance with the accumulation of the excretion. This symptom may indicate a parasitic organism or it may be due to deep-seated physiological disturbances induced by other factors. In coniferous trees in which an excretion of resin is a normal phenomenon, we often find an abnormal increase as a result of disease. One of the first symptoms attending the presence of wood-destroying fungi in our forest evergreens is this abnormal production of pitch or resin. This symptom is frequently noticeable before the sporophores of the fungus make their appearance on the surface of the trunk. The production of a clear or amber-colored secretion which accumulates upon the surface of trunk, branches or even small twigs is characteristic of the "gummosis" of cherries, and other stone fruits. This material generally sets into more or less solid, nodular or flattened masses, and the fruit itself often shows numerous "gummiperlen." In peaches and plums the fruit from affected trees often shows a splitting apart of the halves of the pit or stone. In general, however, cherry trees and peach trees suffer more from gummosis than any other stone fruits. In some cases gummosis is induced by wounds, in others it is a symptom attending the presence of a fungus parasite, while in many instances it is due

to a deep-seated disturbance of the nutritive processes which results in the decomposition of more or less extensive masses of tissue. Some of the external factors which especially favor or predispose to this trouble are heavy soils, high levels of ground water, deep planting, and transplanting at inopportune times.

The rotting of parts or organs of plant, the "gangrene" of plant tissue, is always due to the presence of some organism, either a fungus or bacterium. In some cases there may be a slow decomposition of the tissue without any liquefaction or softening of the affected parts. In these "dry rots" the parasitic organism gradually digests cell-wall or reserve food materials or both, with the result that living cells are deprived of their necessary food, and succumb or are directly attacked, while mechanical tissues are weakened and fail to perform their normal functions. In other cases the rotting may be fairly rapid, with more or less liquefaction and softening and discoloration of the affected parts. In these "soft rots" the fungus or bacterium generally spreads rapidly through the affected parts in case favorable conditions prevail.

There are no parts of a plant that are exempt from rotting, but in general the dormant or languid parts are more likely to suffer from the inroads of rot producing organisms. Nearly all the troubles in which rotting is a characteristic symptom may be grouped under the head of root rots, stem or trunk rots, bud rots, and fruit rots.

Plants with fleshy or woody roots often have their root system invaded by parasitic or semi-parasitic organisms, which work in such a way as to give rise to disease generally characterized as root rot. Woody roots generally undergo such changes that the trouble is characterized as a dry rot, while fleshy roots that are gorged with reserve food material often of a saccharine nature are more likely to be affected by organisms causing a soft rot. Our root crops, such as beets, turnips, carrots and sweet potatoes, are often affected. Sometimes the organism that causes the rotting gains an entrance while the roots are still growing in the field or garden, and continues the work of destruction after the crop is harvested and in storage. At other times the rot-producing organisms only gain an entrance after the crop is harvested and in storage or while the roots are in a dormant or languid condition and so less able to withstand the attack. The soft rots of beets, turnips and carrots are frequently due to bacteria, while the soft rots of sweet potatoes are of fungus origin. Much can be done to prevent these troubles by proper measures in the field and storage under conditions that are unfavorable for the growth of either bacteria or fungi.

Alfalfa or clover often suffer from root rots to such an extent as to cause serious loss. In one such disease the affected field will show small circular patches of dead plants which increase in circumference as the fungus advances through the soil. In another case the dying and dead plants are scattered throughout the field and show a rotting of the root of a different character. The evidence at hand leads to the

opinion that this last type of root rot is induced primarily by either unfavorable soil or climatic factors, or both, which so lower the tone and vigor of the plants that various saprophytic forms come in and complete the work of destruction. Some of our fruit trees, such as the cherry and apple, and also forest and shade trees, are attacked by root-rotting fungi. The wood of root and even the crown is slowly disintegrated, and the mechanical structures are so weakened that severe storms may cause the affected tree to be blown over. White strands of fibrils, the vegetative body of the fungus, may sometimes be seen upon the fractured surface. In other cases the affected tree may remain standing until it finally succumbs to the attack.

Modified stems like tubers, rhizomes, bulbs or corms which serve as storage organs for reserve food, suffer in many cases from rot-producing fungi or bacteria. These storage organs are affected in much the same way as the fleshy roots, but dry rots are not uncommon. The potato is affected by several diseases in which a soft rot of the tubers is a marked symptom. This is true in the disease known as the late blight, a fungus disease, and also in the bacterial blights, while in some cases a soft rot may result when the tops are not affected. In the dry rot of the potato the fibro-vascular ring often shows a conspicuous darkening when the tubers are cut across, and the badly rotted portions become shrunken and darkened and more or less corroded. Diseases of this kind may be spread by planting affected seed. Iris rhizomes, canna rootstocks, hyacinth or calla lily bulbs, onions and similar modified storage organs are often affected by organisms which produce soft rots.

An immense amount of loss is caused in standing timber and in fruit trees from dry rots of the trunk due to wood-destroying fungi which gain an entrance through wounds or otherwise. It frequently happens that the trunk of a tree is thoroughly permeated by the vegetative hyphae of the fungus before any external evidences of its presence can be detected. These wood-destroying fungi may give rise to external fruiting bodies, either loadstool-like or bracket sporophores, when they have reached a sufficient vigor of growth. The affected wood is gradually disintegrated by the work of the fungus which digests the woody elements. It is thus transformed into a brittle or even punky condition that renders it unfit for the purposes which it must serve as a functional part of the tree, and lessens or destroys the value of the wood for lumber. Wood affected by dry rot is often discolored, sometimes showing a marked blue, pink, yellow or reddish-brown coloration. Black lines may often be noticed crossing irregularly through the wood or surrounding definite areas. The vegetative body of the fungus is frequently invisible to the naked eye, but in some cases it shows as fine strands or ropes, or even lamellae that run between the wood fibers or along the silver grain.

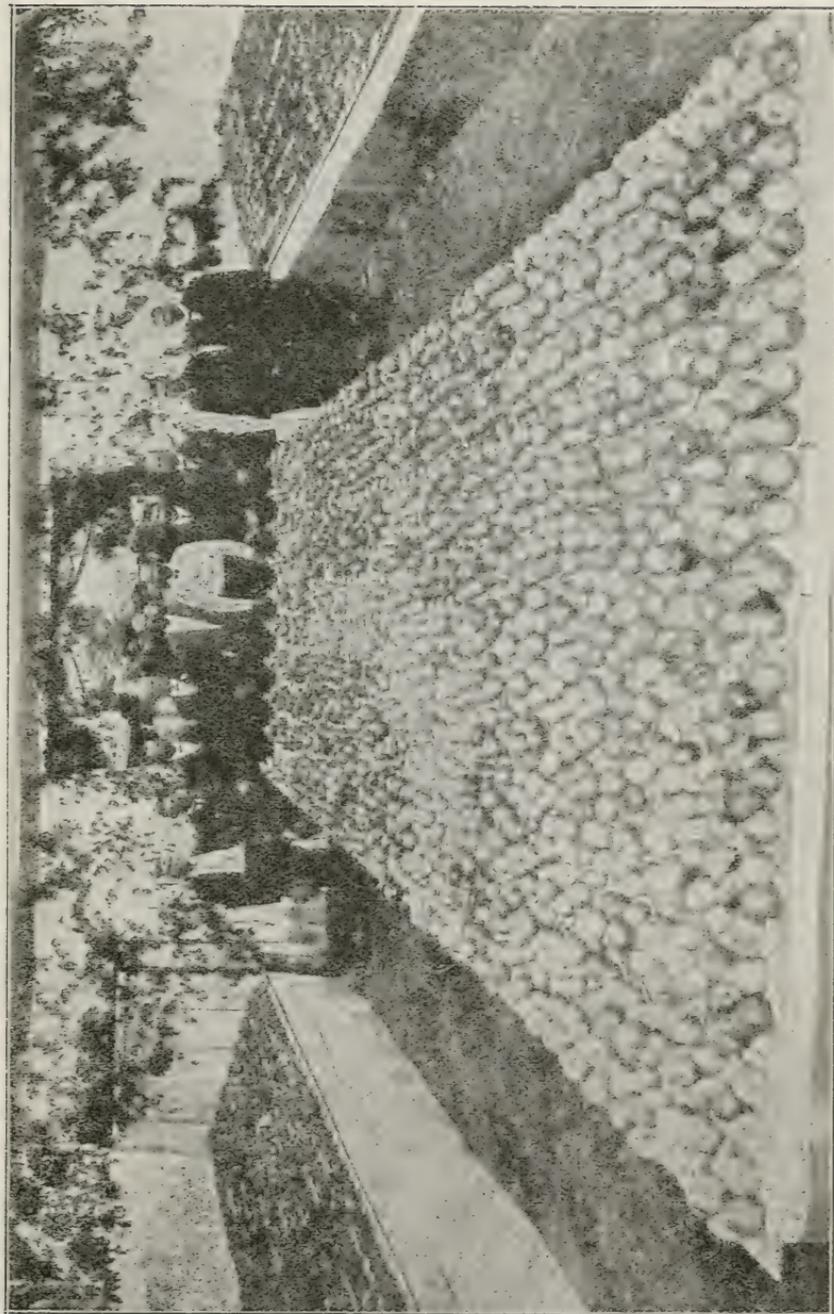
In a few cases buds are affected by rot-producing fungi. One of the best examples of this effect is in the bud rot of the carnation. In

this disease the fungus may gain an entrance into the bud at an early stage of its development, and cause a complete rotting of the petals before the calyx has opened. In other cases the rotting starts later and the flower may be partially opened before its development is arrested. In these affected flowers the claws of the petals will be brown and soft, even though the exposed portions are normal in appearance. A minute mite is constantly associated with this disease and the evidence points to the fact that the mite acts as a carrier for the fungus, carrying it from bud to bud. In this connection the black rot of the cabbage may be mentioned, for the cabbage is really a large bud. This disease is of bacterial origin, the organism entering at the leaf margins. They make their way down through the veins to the central axis and frequently cause a complete rotting of the fully or partially developed heads. This disease is particularly destructive on low, heavy soils.

The rotting of fruit is always caused by the inroads of bacteria or fungi. In the majority of cases it is some filamentous fungus that causes the trouble. The fruit-rotting fungi may gain an entrance through wounds or bruises, or in other cases they may penetrate the uninjured skin. In some cases the rotting may begin when the fruit is still immature and hanging on the tree, and the work of destruction may be continued after the crop is harvested. Many fruit-rotting fungi only attack the ripe fruit, just at time of maturity or after it has been harvested or during storage. Soft fruits like strawberries suffer rapid decay from fungi, while fruits like apples with a protective epidermis may be preserved for a long time.

The brown rot of peaches, plums and cherries is very destructive in certain regions when conditions become favorable. Affected fruits show brown patches of soft tissue. The patches spread rapidly in circumference until the whole fruit is involved and if the weather is moist these rotted areas will show conspicuous pale brown conidial tufts, which produce myriads of spores that spread the rot to other fruits. It is these rotting fruits that produce the "mummies" already mentioned. The same fungus that causes the brown rot of peaches, plums and cherries also affects the apple. It may work in the same way or it may transform the apple into a black mummy, shiny and coal black, with no external evidence of the fungus. This rot of the apple should not be confused with the true black rot which works in a somewhat similar way. In the true black rot the surface of the apple soon becomes covered with minute black pustules, and the fruit becomes more or less shrivelled and shrunken. In both the black rot and the brown rot the pulp is colored a dark brown, the black coloration being due to changes in the skin. The bitter rot shows brown circular areas with concentric zones of pink spore pustules. This is one of the most destructive apple diseases known for the central Mississippi Valley region, especially for southern Illinois and Missouri and adjacent territory. Green mold is one of the most destructive fungi for stored apples. Apples affected

by this rot often show only brown patches in which the tissue becomes rapidly softened and the whole apple transformed into a soft rotten mass. In moist conditions the bluish-green spore tufts of the fungus may be seen upon the surface of the fruit. In addition to the various rots mentioned a white rot of the apple has been recently observed in which the entire pulp may be transformed into a soft mass without any discoloration. By paying attention to proper spraying to prevent insect injuries and other fungus diseases, by careful handling in harvesting and by storage under conditions that retard the growth of fungi, much of the trouble from rotting of apples can be prevented.



APPLE EXHIBIT—NEBRASKA STATE FAIR.

THE CAROLINA POPLAR.*

BY CHARLES E. BESSEY.

In the west, especially in the Mississippi valley, a tree has been largely advertised and sold under the name of Carolina Poplar. In some cases extravagant claims are made in regard to its good qualities, which, on the other hand, are strenuously denied by some tree growers. There has been a good deal of doubt, also, in regard to the specific identity of the tree, some holding it to be quite distinct from the common cottonwood, while others regard it as a mere variation or sport of that species which has been propagated by cuttings from the staminate tree. In order to throw some light upon these questions, the following facts are now published as a preliminary paper, which may be followed by a more exhaustive discussion later.

DESCRIPTION OF THE TREE.

Leaves.—These are large, broadly heart-shaped, prominently serrated with incurved teeth, the veins rather prominent on the under surface. The texture is firm, and both surfaces are quite smooth. The color of the foliage is a rich, dark green, and the petioles, which are long and flattened, are more or less reddish, as is frequently, also, the midrib of the blade. On vigorous shoots, the leaves are often five to seven inches long, four inches broad, and their petioles fully three inches long, while on less vigorous shoots, the leaves may be as small as three inches in length, three in breadth, and their slender petioles may be no more than two inches long.

Twigs.—More or less angled by narrow, corky ridges which extend downward from the center and sides of the leaves. Color when mature, light brown. The angles are much more prominent on very vigorous twigs, and may be almost wanting on those which are slow-growing.

Young Branches.—These eventually become smooth and round by the expansion and stretching of the bark as the branch increases in thickness. Color, light brown. This brownish color should serve to distinguish the Carolina Poplar from the common cottonwood, on which the young branches ultimately become white.

Shape of Crown.—The crown or "top" of this tree is rather narrow on account of the more erect growth of the branches. Left to themselves, the branches of the crown tend to grow upward somewhat as in

*This paper was originally prepared at the request of the United States Forest Service, and was then printed in a somewhat revised form, with the permission of the chief of the service, in the Report of the Nebraska State Board of Agriculture for 1906-1907. It is now reprinted with some revision and slight changes, the importance of this tree to Nebraska planters warranting this early reissue.

the Lombardy Poplar, but by no means to such an extreme. Even when the top has been pruned back by having the terminal branches much shortened, it soon resumes its narrowed and somewhat compressed shape. This erect tendency of the branches and compact form of the crown in this tree, is in marked contrast to the common cottonwood in which the branches are much more divergent, resulting in a markedly spreading crown.

Buds.—Much less gummy than in the common cottonwood, but otherwise resembling them.

Trunk.—Darker colored (brownish) than in the common cottonwood, in which the trunk is grayish.

Flowers.—Only the staminate (“male”) flowers occur on the trees under observation. These are in elongated cylindrical clusters (catkins), which are compact at first, but eventually they elongate and become slender and drooping. When they first appear, they are purplish-red in color, but as they grow older, they fade into a dirty gray.

Rapidity of Growth.—Under cultivation, Carolina Poplar trees make a strong and vigorous growth, the shoots of a season often attaining a length of six to ten feet. Such shoots are nearly half an inch in thickness a little distance from the terminal bud, and are always very distinctly angled. This rapid growth of the young trees appears to be normal for the Carolina Poplar, since it occurs in all healthy trees. The same rapid growth, with consequent increase of size, and marked development of angles on the twigs, takes place in the common cottonwood when sprouts spring up from the stump after the cutting of the tree, and it may well be that this similarity of the abnormal shoot of the one tree to the normal shoot of the other has contributed to the confusion as to their specific identity.

VALUE FOR SHADE.

The Carolina Poplar, being a rapidly growing tree, with a tenacious life, which renders it very easy to handle and transplant, is especially well fitted to supply the needs of the man who wants a pretty shade tree in a short time. In a couple of years a few Carolina Poplars will cast a considerable shade on the ground immediately around the house, and make far more tolerable the heat of the midsummer sun. Of course it is not as pretty and graceful a tree as the American Elm, but it is often difficult to make the elm grow at once in the raw prairie ground, and it is a cruelty to the wife and children who live in shadeless houses to compel them to wait until the elms may be grown. Any tree that will live and grow rapidly is a boon to those who live upon the prairies and plains. It matters little to the plainsman that his shade trees are not as fine looking as American elms. They have quickly given him and his family some patches of shade to cut off the hot glare of the sun. This is the all-sufficient excuse for their planting. Better by far a Carolina Poplar today, which gives a grateful shade from the hot sun, than the most beautiful elm, which may or may not succeed in growing a

few years hence in the untamed soil of the plainsman's dooryard. So, too, in many a western village it is far better to shade the sidewalks with Carolina Poplars, which will certainly grow, and grow rapidly, than to wait for the uncertain growth of otherwise more desirable trees. Here is a case where "the best" is not "the cheapest," when we take into the reckoning the comfort of the dwellers in the shadeless houses, and the sun-scorched villages.

The western settlers have acted upon the theory set forth above in planting extensively of the common cottonwood for a quick shade. Of course they know that cottonwood trees were not as desirable as elms, oaks, ashes, walnuts and maples, but *the cottonwood would grow*, and grow easily, while the growth of the others was much more difficult and uncertain. So the plains were soon dotted over with cottonwood groves, and the village streets were lined with the quick-growing trees, which soon transformed the country and the village houses into comfortable homes. But when the shadeless heat was forgotten, and the trees, now grown large, began to shed their "cotton" in increasing amounts, the tree planters forgot the service rendered by the cottonwood trees in the early days and thought only of the troublesome cotton which they now shed. Thus it has happened that in many a village the cottonwoods have been cut down in wrath by the men who as boys played in the shade of these same trees—the only trees then to be seen—the only shade on the wide, hot prairie. The objection to the cottonwood which ultimately condemns it for a shade tree, namely that of shedding a disagreeable amount of cotton, does not hold against the Carolina Poplar, since only the staminate (male) tree is known in cultivation. With a more rapid growth, and the absence of the cotton nuisance, this tree must commend itself to every man who wants—who *must have* a quickly-grown shade tree. Let it be remembered that the Carolina Poplar as grown in Nebraska, is the male tree, and that as a consequence it produces no seeds, and therefore NO COTTON. It is a cottonwood *without cotton*. If you plant it you will not be bothered with the annual shedding of the cottony seeds.

VALUE FOR FUEL.

Exact data as to the relative fuel value of the dry wood of the Carolina Poplar are wanting, but cannot be far from that of the common cottonwood. Several years ago the writer made some careful calculations as to the relative fuel values of the growths of various common species of trees calculated as dry wood, as follows:

	At 10 years	At 15 years	At 18 years
Cottonwood	100	100	100
Hickory	11	12	12
Oak	6	5	6
Walnut	—	—	12
Ash	—	21	—

Even allowing the Carolina Poplar to have but one-half the actual fuel value of cottonwood (a most unlikely supposition), and supposing it to grow no more rapidly (which is certainly not the case) it is still a much better heat producer than any other of our common trees. It is safe to assume that in ten years' time the Carolina Poplar will yield an amount of fuel having at least three times the heat value of Ash, five times that of Hickory and Walnut, and ten times that of Oak. It must be remembered that these figures are only approximations, but they are quite certainly below rather than above, so far as the Carolina Poplar is concerned.

OBJECTIONS TO THE CAROLINA POPLAR.

That the Carolina Poplar is not without its drawbacks is evident from the objections made by many who have grown it. By some it is positively stated to be much shorter-lived than the common cottonwood, the length of life being given as low as ten to twelve years. That this cannot be their normal length of life is quite certain from the growth of trees under my personal observation. Near Lincoln are trees 17 years old which are about 60 feet in height, and 15 to 17 inches in diameter. Other trees, 15 years old, are about 50 feet in height and 12 inches in diameter.

It is quite certain that many Carolina Poplars suffer greatly from the attacks of borers, especially when the trees are isolated. This difficulty is apparently not as great when the trees are grown in compact plantations.

Still another objection is brought against this tree, and that is that its planting keeps out better trees. In many places, this is without doubt a valid objection, and full weight should be given to it. In many cases, it is far better to plant trees of acknowledged superior qualities, and in such places the planting of the Carolina Poplar is no doubt detrimental, and should not be encouraged. On the other hand, as has already been said, there are many more cases where a rapidly-growing tree, even of inferior quality of wood, is of the utmost importance and usefulness. To the man in the midst of the plain or the prairie, where the need of shade and fuel is a most urgent one, no harm will come from the planting of this or any other rapidly-growing, soft-wooded tree.

THE NAME, "CAROLINA POPLAR."

It is the opinion of some persons who have become interested in the question of the value of this tree that the name "Carolina Poplar" is of recent introduction, one correspondent going so far as to say that its use probably did not exceed twenty years, and that "the name has been given in order to defraud the people, by causing them to think they were getting something different from the cottonwood."

The earliest use of the name Carolina Poplar was by Aiton in the first edition of the "Hortus Kewensis," published in 1789 under his

original description of *Populus angulata*. In the second edition of this work, published in 1813, the description of *Populus angulata* is considerably improved, while the name Carolina Poplar is retained.

The name Carolina Poplar was used by Michaux in "Histoire des Arbres Forestiers" in 1813, and in his "North American Sylva," which was first published in 1819, and in the later editions in 1842 and 1853, and later (1857). In both works and all editions one of the poplars (*Populus angulata*) is described under the English name "Carolina Poplar," and it agrees in every respect with the tree we are now considering.

Decaisne and Naudin in their "Manuel de l'Amateur des Jardins" (1866) describe *Populus angulata*, naming it the Carolina Poplar (peuplier de la Caroline).

In Hemsley's "Handbook of Hardy Trees, Shrubs and Herbaceous Plants" (1877) the name Carolina Poplar is applied to *Populus angulata*.

In the "Dendrologie" of Koch, published in 1872, *Populus angulata* is called the "Karolinische Pappel" (Carolina Poplar).

In Dippel's "Handbuch der Laubholzkunde" (1892) *Populus angulata* is called the "Karolinische Pappel" (Carolina Poplar) and this name applies also to the variety *serotina*, which is known in the staminate form only.

In Koehne's "Deutsche Dendrologie" (1893) *Populus angulata* is called the "Karolinische Pappel" (Carolina Poplar), including also the variety *serotina*.

Bailey ("Cyclopedia of American Horticulture," Vol. III, 1901) discusses the matter as follows: "*Populus deltoides* var. *caroliniensis*, Carolina Poplar. A very distinct tree in habit of growth, making a straight, upright or pyramidal head; leaves usually less distinctly deltoid, and more gradually taper pointed than *Populus deltoides*. Native.—The Carolina Poplar is much planted, and nurserymen consider it to be distinct from the Cottonwood. It differs in strict, straight appearance and it is a most vigorous grower. It is much planted in Europe, where it is known as the Swiss Poplar. Its botanical position needs to be investigated."

IS IT A DISTINCT SPECIES?

Upon the question of the specific autonomy of *Populus angulata* the following additional citations of authority should be given full consideration.

Michaux in "Flora Boreali Americana" (1803) regards it (which he calls *Populus angulata*) as a distinct species.

Willdenow, in "Species Plantarum" (1805), describes *Populus angulata* as distinct from the common cottonwood.

Pursh, in "Flora Americae Septentrionalis" (1814) regards *Populus angulata* as a distinct species.

Eaton ("Manual of Botany for the Northern and Middle States of America," 3d edition 1822) gives a good description of *Populus angulata*, referring to the "wing-angled" character of the branches.

Elliott ("Sketch of the Botany of South Carolina and Georgia," vol. II, 1824) describes *Populus angulata* accurately and says that "the young branches are all winged and angled by the decurrent petioles or by the junction of different branches, and these vestiges are not effaced for several years."

In Eaton and Wright's "North American Botany," 8th edition, 1840, *Populus angulata* is described by the side of *Populus monilifera*, from which it is regarded as distinct.

Gray, in the first edition of his "Manual of the Botany of the Northern United States" (1848), regarded *Populus angulata* as distinct from the cottonwood. This distinction was maintained through the successive editions to and including the fifth, which appeared in 1867 (with reissues up to at least ten years later). In the sixth edition, which appeared in 1890, after Dr. Gray's death, *Populus angulata* is included without comment under the common cottonwood.

In Wood's "Class-book of Botany" (1868), *Populus angulata* is described as distinct from *Populus monilifera*, and is given the English name of "Water Poplar" or "Western Cotton Tree."

In Wesmael's treatment of the species of the genus *Populus* in De Candolle's "Prodromus" (1868), *Populus angulata* is regarded as certainly different from *Populus canadensis* (*P. monilifera*). The differential characters are, the scarcely gummy buds, the more prominently angled branches, which are brown (instead of gray or brownish green), and the larger leaves, which have red or yellow petioles and primary veins.

Vasey in his "Catalogue of the Forest Trees of the United States" (1878) distinguishes *Populus angulata* from the common cottonwood.

In his "Report on the Forests of North America," published in the reports of the Tenth Census (1884), Professor Sargent includes *Populus angulata* under the common cottonwood (*P. monilifera*). To the latter scientific name he applies the English name of Carolina Poplar as well as Cottonwood. In Volume IX of the "Silva of North America" (1896) the same author includes *Populus angulata* under the Cottonwood (here called *P. deltoidea*), and says "*P. deltoidea* is sometimes called the Carolina Poplar in European gardens."

In Britton and Brown's "Illustrated Flora of the Northern States and Canada" (1896), *Populus angulata* is included under *Populus deltoidea*, the Cottonwood, and at the end of the description it is said that it is "also called Carolina Poplar." The same treatment is given these two trees in both the first (1901) and second (1905) editions of Britton's "Manual of the Flora of the Northern States and Canada."

It may be helpful to call attention here to the treatment of the poplars in Dode's "Extraits d'une Monographie inedite du Genre Populus" (1905), which has recently appeared. In this work those true poplars which have flattened petioles are separated into four groups, viz.: *Caroliniensis*, *Fremontii*, *Virginiana* and *Nigra*. These may be regarded as species, each containing several varieties, or as groups of species. The

group *Caroliniensis* is characterized by the very angular branchlets, and contains three species, only two of which interest us heré.

Populus caroliniensis Fougér.—Leaves elliptio-deltoid, truncate and a little heart-shaped at base, very little acuminate at apex; petioles very red. In Dode's cultures only staminate trees of this species were grown.

Populus angulata Michx.—Leaves deltoid or rotund-deltoid, heart-shaped at base, acuminate at apex; petioles red. In Dode's cultures only pistillate trees of this species were grown.

The group *Virginiana* is characterized by the less-angled branchlets, and four species. Here we find our common cottonwood, which according to Dode are not of one species, as we have supposed, but of two or more closely related species.

The foregoing would indicate that the Carolina Poplar should be given a name distinct from the common Cottonwood, and I had reached this conclusion when a new phase of the question came up. For some time those botanists who had studied the Carolina Poplar and the Cottonwood had been in doubt as to whether we were not confusing more than one species of Cottonwood under one name. This has now been decided to be the case, and the eastern Cottonwood is considered to be the tree to which the name *Populus deltoides* was given by Marshall in 1785. This was for a long time erroneously supposed to be identical with the western Cottonwood which is so abundant along the Missouri river and the streams westward, but the western species is now considered to be distinct, and has been given the appropriate name of *Populus occidentalis*, or Western Cottonwood. We thus have an eastern and a western species of Cottonwood, as named above.

Now, what effect will this have on the name of the Carolina Poplar? From what has been said in this paper it is clear that the Carolina Poplar is entirely distinct from our Cottonwood, that is the western species. It is not so clear, however, whether it is distinct from the eastern species, but I have shown above that many botanists have regarded it as distinct, and even so late a writer as Professor Bailey has considered it to be at least of a different variety. I cannot decide this matter here, nor need I do so since the eastern Cottonwood is not planted in this region. It is sufficient to show that the Carolina Poplar is certainly of a different species from our western Cottonwood. My present inclination is to treat these trees as follows:

Eastern Cottonwood—*Populus deltoides*. Native of eastern North America, extending northward and westward to Quebec and Manitoba, and from thence southward and southeastward.

Carolina Poplar—*Populus angulata*. Native of eastern North America, extending southward and westward to Florida and Tennessee, and from thence northward until it meets the preceding species.

Western Cottonwood—*Populus occidentalis*. Native of the western region from Saskatchewan and Alberta, southward to Kansas and New Mexico. The point of the leaf is longer-acuminate, while the base is

relatively broader, and the teeth are coarser. Of this Western Cottonwood there is but one species in Nebraska, contrary to the belief of some of the old settlers. The names "White Cottonwood" and Yellow Cottonwood" are not the names of different species. When the tree is young and growing vigorously its wood is whiter and tougher, but as it becomes older the wood takes on a yellowish color, and loses much of its toughness, so that it can be worked much more easily. The first is what has been called "White Cottonwood" and the second "Yellow Cottonwood."

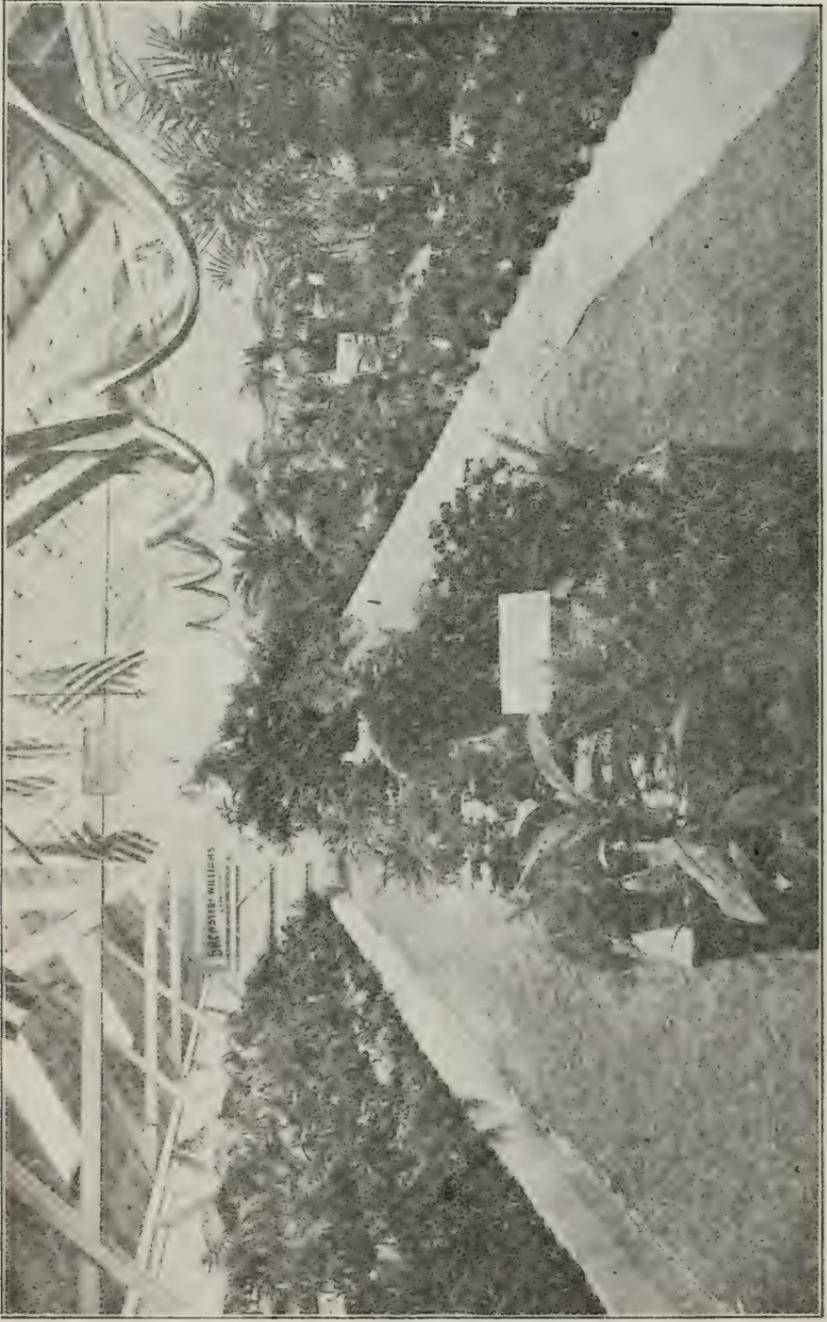
CONCLUSIONS.

Name.—What shall we call our Carolina Poplar in view of the foregoing discussion? To the writer of this paper the answer seems to be quite evident that we can do no better than to give it the name by which it was universally known in this country for nearly a hundred years, and by which it is still generally known in Europe, viz., *Populus angulata*. Apparently the tree as generally planted is staminate only.

Shall We Plant It for Shade?—In spite of the fact that it is said to be shorter-lived than the common Cottonwood, the Carolina Poplar can be recommended for planting where shade and protection are wanted in the shortest possible time. The fact that only the staminate trees are propagated assures planters that they will not be troubled by the disagreeable "cotton" which the pistillate trees of this genus produce. So I answer Yes, to this question.

Shall We Plant It for Fuel?—As in the foregoing question this may be answered safely in the affirmative where the quickest returns are desired. It must be remembered that this tree requires a good deal of moisture, and that it will not thrive on dry soil. For fuel it should be planted where it can obtain all the water it needs. Here again I answer Yes.

Shall We Plant It for Lumber?—From present information, the answer to this question should be negative. The common Cottonwood will produce a larger tree in a given time, and is apparently longer lived, so that where lumber of this quality is desired, it will be wiser to plant the Western Cottonwood, *Populus occidentalis*, rather than the Carolina Poplar, *P. angulata*. So to this question I answer No.



FLORAL EXHIBIT—NEBRASKA STATE FAIR.



PREMIUM FLORAL DESIGNS—NEBRASKA STATE FAIR.

A PARTIAL LIST OF OMAHA TREES.

BY F. GRACE ERNST, OMAHA, NEB.

This list was made during the summer of 1907, and is the result of studies begun in the University of Nebraska while pursuing the subject of Systematic Botany, a year or so earlier. Many visits were made to the parks and forests in and near the city of Omaha, as well as the private grounds of many of the citizens who have been interested in the growth of trees for ornamental purposes. The list is by no means complete, and is now published in order to call attention to the very considerable number of species which even a casual examination will show. Its chief value is that it may call attention to some trees which it includes and which are not known to people generally. For this reason the localities are given where specimens of each tree may be found. I am indebted to Mr. W. R. Adams, Superintendent of the Omaha Park Commission, and to several other friends for many kindnesses in helping to locate unusually good specimens.

FAMILY PINACEAE.

PINUS Linnaeus. The True Pines.

Leaves needle-shaped, in clusters of 2, 3 or 5. Trees of the northern hemisphere, and especially of cold climates.

Pinus sylvestris Linnaeus. Scotch pine. Riverview and Hanscom Parks.

Pinus laricio austriaca Endl. Austrian pine. Riverview and Hanscom Parks.

Pinus strobus Linnaeus. White pine. Riverview and Hanscom Parks.
Some very good specimens in Hanscom Park.

Pinus resinosa Aiton. Red pine. Riverview Park, northeast pond.

Pinus montana Du Roi. Mugho pine. Thirty-third and Woolworth avenue.

Pinus ponderosa scopularum Engel. Bull pine. Hanscom Park, north of greenhouse.

PICEA Link. The Spruces.

Leaves angled, placed singly on the twigs; never in clusters.

Picea canadensis (Mill) B. S. P. White spruce.

Picea pungens Engelm. Colorado blue spruce.

Picea excelsa Link. Norway spruce.

TSUGA Carr. The Hemlocks.

Leaves flat, and placed singly on the twigs, never in clusters. Cones not falling to pieces when ripe.

Tsuga canadensis (L.) Carr. Hemlock. Hanscom Park, north bandstand (small).

ABIES JUSS. The Firs.

Leaves flat, and placed singly on the twigs, never in clusters. Cones falling to pieces when mature.

Abies concolor Lindley & Gordon. White fir. Riverview Park.

Abies balsamea (L.) Mill. Balsam fir. Riverview Park, Elmwood Park (small).

THUJA L. Arbor Vitae.

Leaves small and forming a flat, smooth spray.

Thuja occidentalis L. Arbor vitae.

Thuja orientalis L. Chinese arbor vitae. Riverview Park, south of pine group.

JUNIPERUS L. Red Cedar.

Leaves small and forming spreading, smooth or prickly branches.

Juniperus virginiana L. Red cedar.

LARIX Adans. Larch, or Tamarack.

Leaves needle shaped, but falling off at the end of the season.

Larix laricina (Du Roi) Koch. Larch. Hanscom Park (small).

SALISBURIA.

Leaves fan-shaped, with parallel veins.

Salisburia adiantifolia Smith. Ginkgo. 1821 North Nineteenth street and Cudahy Place.

FAMILY SALICACEAE.

POPULUS L. The Poplars.

These are the true poplars, although they are commonly called cottonwoods in this country.

Populus alba L. White poplar. Boulevard, Thirty-fourth and Pacific streets.

Populus alba bolleana L. White poplar. Riverview Park by pond.

Populus candicans Ait. Balm of Gilead. West Farnam.

Populus italica Du Roi. Lombardy poplar. Tenth and Bancroft streets.

Populus deltoides Marsh. Cottonwood. Native.

Populus angulata Ait. Carolina poplar. Thirty-second and Lincoln avenues.

Populus tremuloides Michx. Aspen. Hanscom Park.

SALIX L. The Willows.

Salix babylonica L. Weeping willow. Jocelyn Place.

Salix vitellina Lin. Yellow willow. Hanscom Park, near greenhouse. A very large tree.

Salix missouriensis Bebb. Diamond willow. Native.

Salix interior Rowlee. Sand-bar willow.

FAMILY JUGLANDACEAE.

JUGLANS L.

Juglans nigra L. Black walnut. Native. Riverview Park.

HICORIA Raf.

Hicoria ovata (Mill.) Britton. Shell-bark hickory. Native. Riverview Park.

Hicoria glabra (Mill.) Britton. Pignut. Native. Hanscom Park.

FAMILY BETULACEAE.

CARPINUS L. The Hornbeams.

Carpinus caroliniana Walt. Hornbeam. Hanscom Park, northwest entrance.

OSTRYA Scop. The Ironwoods.

Ostrya virginiana (Mill.) Willd. Ironwood. Native. Riverview Park.

BETULA L. The Birches.

Betula populifolia Marsh. Birch. West Farnam.

Betula alba L. European birch. Tenth and Pine streets.

Betula alba laciniata pendula. Weeping Birch. 2211 St. Mary's avenue. A fine specimen.

ALNUS Gaertn. The Alders.

Alnus glutinosa Gaertn. Alder. Hanscom Park, south of first pond.

Alnus sp. Alder. 4243 Grant. These alders are large, handsome trees.

FAMILY FAGACEAE.

CASTANEA Adans. The Chestnuts.

Castanea dentata (Marsh.) Borkh. Chestnut. Thirty-third and Francis streets. Several good specimens.

QUERCUS L. The Oaks.

Quercus rubra L. Red oak. Native. 1418 South Tenth street. Handsome specimens are common.

Quercus coccinea Wang. Scarlet oak. East of Twentieth on Central Boulevard. Hanscom Park.

Quercus macrocarpa Michx. Bur oak. Native. 1418 South Tenth street.

Quercus lyrata Walt. Post oak. Hanscom Park, west entrance.

FAMILY ULMACEAE.

ULMUS L. The Elms.

Ulmus americana L. White elm. Native.

Ulmus americana, var. Feathery elm. Boulevard near Thirty-fourth street. Easily recognized by the short twigs growing on the trunk.

Ulmus americana, var. *pendula*. Weeping elm. Hanscom Park, south of pond.

Ulmus fulva Michx. Red elm. Native. Riverview Park, near pavilion.
Ulmus campestris L. English elm. Boulevard between Chicago and
 Davenport.

Ulmus montana. Scotch elm. 4239 Grant street.

CELTIS L. The Hackberries.

Celtis occidentalis L. Hackberry. Native. Hanscom Park, north of pond.

FAMILY MORACEAE.

MORUS L. The Mulberries.

Morus alba tartarica. Russian mulberry. Hanscom Park, northwest
 entrance.

Morus alba tartarica, var. *pendula*. Weeping mulberry. St. Joseph's
 Hospital.

TOXYLON Raf. The Osage Oranges.

Toxylon pomiferum Raf. Osage orange.

FAMILY MAGNOLICACEAE.

LIRIODENDRON L. The Tulip Trees.

Liriodendron tulipifera L. Tulip-tree. 3062 Woolworth avenue.

FAMILY TAMARISCACEAE.

TAMARIX L. The Tamarisks.

Tamarix gallica L. Tamarisk. 2204 St. Mary's avenue.

FAMILY PLATANACEAE.

PLATANUS L. The Plane Trees.

These trees are very generally called Sycamores, although this name
 properly belongs to another tree.

Platanus occidentalis L. Plane-tree. Thirty-second and Creighton avenues.

FAMILY POMACEAE.

SORBUS. The Mountain Ashes.

Sorbus americana Marsh. Mountain ash. 1038 Park avenue. There are
 a number of large specimens of both mountain ashes.

Sorbus aucuparia Linn., *pendula* Hort. Weeping mountain ash. 1021
 Park avenue.

MALUS Hill. The Apples.

Malus ioensis (Wood) Britton. Western crab-apple.

Malus malus (L.) Britton. Apple.

AMELANCHIER Medic.

Amelanchier canadensis T. & G. Service-berry. Native. Hanscom Park
 north entrance.

CRATAEGUS L. The Hawthorns.

Crataegus oxyantha L. English hawthorn. Riverview Park, west of
 pavilion.

Crataegus coccinea L. Red haw. 2314 South Tenth street. An exceptional specimen.

FAMILY DRUPACEAE.

PRUNUS L. The Prunes.

Prunus americana Marsh. Wild plum. Native. Hanscom Park, northwest entrance.

Prunus cerasus L. Sour-cherry.

Prunus virginiana L. Choke-cherry. Native.

Prunus serotina Ehrh. Wild black cherry.

AMYGDALUS L.

Amygdalus persica L. Peach.

FAMILY CAESALPINIACEAE.

CERCIS L.

Cercis canadensis L. Red bud. Native. 2545 South Tenth street. The woods south of Albright are full of Red buds.

GLEDITSIA L.

Gleditsia triacanthos L. Honey locust. Boulevard beyond Krug's Brewery.

GYMNOCLADUS Lam.

Gymnocladus dioica (L.) Koch. Kentucky coffee bean. Tenth and Bancroft streets, south.

FAMILY PAPILIONIACEAE.

ROBINIA L.

Robinia pseudacacia L. Locust. West Farnam.

FAMILY RUTACEAE.

PTELEA L.

Ptelea trifoliata L. Hop-tree. Hanscom Park, northwest entrance.

FAMILY SIMARUBACEAE.

AILANTHUS Desf.

Ailanthus glandulosa Desf. Tree of Heaven. Hanscom Park, fountain. An exceptionally handsome specimen.

FAMILY CELASTRACEAE.

EUONYMUS.

Euonymus atropurpureus Jacq. Wahoo. Native.

FAMILY STAPHYLACEAE.

STAPHYLEA L.

Staphylea trifolia Linn. Bladder-nut. Hanscom Park, northwest entrance.

FAMILY ACERACEAE.

ACER L. The Maples.

- Acer saccharinum* L. Soft maple, or Silver maple. Native.
Acer saccharum Marsh. Sugar maple. 1724 Davenport (1869). West
 entrance Hanscom Park.
Acer negundo L. Box elder. Native.
Acer platanoides L. Norway maple. 2408 South Eleventh street.
Acer palmatum. Japan maple. Kountze residence, West Farnam.

FAMILY SAPINDACEAE.

KOELREUTERIA.

- Koelreuteria paniculata* Laxm. Chinese Varnish tree. Riverview Park,
 south of deer park on drive.

FAMILY HIPPOCASTANACEAE.

AESCULUS L.

- Aesculus hippocastanum* L. Horse-chestnut. 1320 North Forty first
 street. Unusually large trees.

FAMILY RHAMNACEAE.

RHAMNUS L.

- Rhamnus caroliniana* Walt. Buckthorn. Riverview Park, opposite pond,
 south end. A small tree.

FAMILY TILIACEAE.

TILIA L.

- Tilia americana* L. Linden. Native.

FAMILY ELAEAGNACEAE.

ELAEAGNUS L.

- Elaeagnus angustifolia*. Russian olive. Common.

LEPARGYRAEA Raf.

- Lepargyrea argentea* (Nutt.) Greene. Buffalo berry. Hanscom Park,
 northwest entrance.

FAMILY OLEACEAE.

FRAXINUS L. The Ashes.

- Fraxinus lanceolata* Borck. Green ash.

FAMILY BIGNONIACEAE.

CATALPA Scop.

- Catalpa speciosa* Warder. Hardy catalpa.
Catalpa kaempferi Sieb. & Zucc. Chinese catalpa. Hanscom Park, east of
 greenhouse on walk.

SPRAYING DEMONSTRATIONS IN NEBRASKA APPLE ORCHARDS.*

BY R. A. EMERSON.

THE WORK OUTLINED.

PURPOSES OF THE DEMONSTRATIONS.—During the summer of 1906, spraying demonstrations were conducted in six counties in southeastern Nebraska. The purposes of the work were to give a practical demonstration of the value of spraying in the control of apple scab and codling-moth, to determine the cost of spraying, and to learn whether it pays to spray apple orchards under the conditions existing in this state.

COOPERATIVE NATURE OF THE WORK.—The demonstrations were carried on in cooperation between the United States Department of Agriculture, the Nebraska Agricultural Experiment Station, and six fruit growers of southeastern Nebraska. The six orchards selected for the work are located one in each of the counties of Johnson, Lancaster, Nemaha, Otoe, Pawnee, and Richardson. The orchardists cooperating in the work were:

John Gilligan, Falls City; manager, G. T. Grinstead.

Swan & Titus, Glen Rock; manager, J. G. Swan.

E. T. Hartley, Lincoln.

Morton Bros., Nebraska City.

J. E. Atkinson, Pawnee City.

Al. Russell, Tecumseh.

The owners of the several orchards provided for the most part the appliances, materials, and labor necessary for carrying on the work, and did the spraying under the personal direction of representatives of the

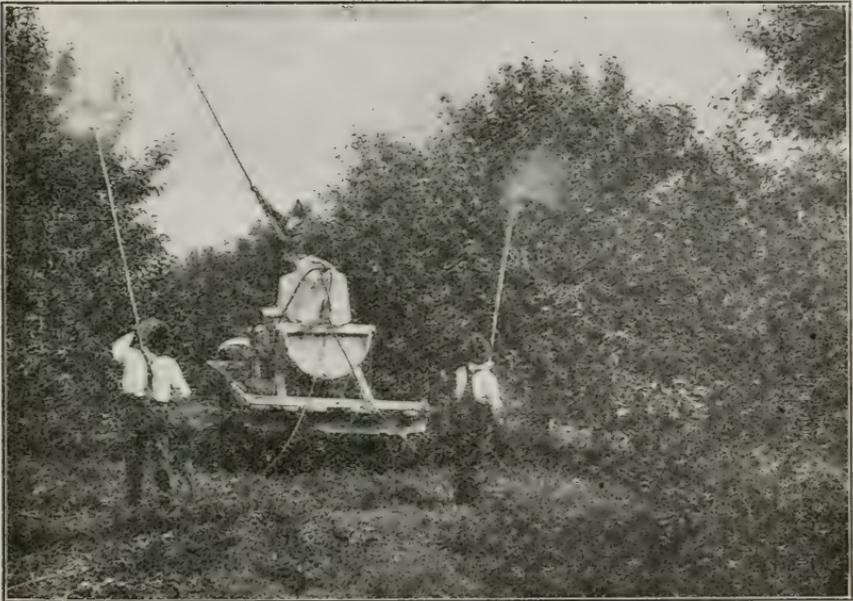
* The undersigned, as representing the U. S. Department of Agriculture in the demonstration spraying herewith reported, desire it to be understood by Nebraska fruit growers that the results obtained, while showing a considerable gain in dollars and cents in favor of spraying, are not as favorable, especially as regards the control of the codling moth, as similar work elsewhere has shown may be expected. Various circumstances connected with the inauguration and carrying out of the work in rather widely separated orchards combined to prevent as thorough attention to details as was desirable, and the present report is to be regarded merely as one of progress. The orchardist may expect to save a considerably larger per cent of fruit from codling moth injury than was saved in the present work, and the amount of scabby fruit should be reduced to practically nothing.

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Pathologist, Bureau of Plant Industry.

A. L. QUAINANCE,
In Charge of Deciduous Fruit Insect Investigations, Bureau of Entomology.

Department of Agriculture and of the Experiment Station. The plans were made and the records kept by the Department and Station. The work was conducted in three of the orchards by the Department alone, in one by the Station alone, and in the other two by the Department and Station together. W. M. Scott superintended the work for the Department of Agriculture and the writer represented the Experiment Station. Other men who assisted in the work were J. B. Rorer, Dudley Moulton and Val Keyser of the Department and F. E. Denny of the Station.

THE DEMONSTRATION ORCHARDS.—The trees sprayed were mostly standard varieties of winter apples, such as Ben Davis, Winesap, Gano, Missouri Pippin, Ralls Genet, and Jonathan. Some of the orchards were young



GASOLINE POWER SPRAYING-OUTFIT AT WORK IN THE LINCOLN ORCHARD.

and others old, the age varying from twelve to twenty-six years. Some of the trees were therefore rather small, while others were very large. Some of the orchards were close planted, with as high as 80 trees per acre, while others had not over 40 trees to the acre. The trees of some of the orchards had been pruned fairly well, while those of other orchards had not been pruned at all, recently, and were therefore so filled up with unnecessary branches as to make thorough spraying difficult.

THE SPRAYED AND CHECK PLATS.—In each of the six orchards a block of not less than 250 trees (in one orchard 890 trees) was laid off for the spraying demonstration, and in each orchard also a block of trees was left un-sprayed as a check. The remainder of the orchard in each case

was sprayed by the owner or left unsprayed, as he chose. Care was exercised in every case to see that the sprayed and unsprayed parts of the demonstration block were sufficiently uniform to insure a fair comparison between the yield and value of the sprayed and of the unsprayed trees.

DATES OF SPRAYING.—The proposed dates for the different sprayings were:

- (1) As the cluster buds open.
- (2) As soon as the petals fall.
- (3) 7 to 10 days after the petals fall.
- (4) 30 days after the petals fall.
- (5) About July 25th.
- (6) About August 15th.

Owing partly to the light infestation of codling-moth at the time the fifth spraying was given and partly to a desire to keep down the expense of spraying, the sixth application was omitted in all of the orchards, and in one orchard the fourth spraying was also skipped. The actual dates of spraying for the different localities were:

- (1) April 23d to May 1st.
- (2) May 7th to 17th.
- (3) May 15th to 26th.
- (4) June 6th to 9th.
- (5) July 10th to 25th.

THE SPRAYING MATERIALS AND APPLIANCES.—The spraying materials used were Bordeaux mixture and some form of arsenic poison. The Bordeaux used was mostly of the 4-6-50 formula; that is, 4 pounds of bluestone (copper sulfate) and 6 pounds of quicklime were used with 50 gallons of water. In most of the orchards a stronger Bordeaux (5-5-50) was used for the first spraying, and in one orchard a weaker mixture (3-5-50) was used for the last spraying. The poisons used were arsenate of lead in two orchards, green arsenoid in one, and Paris green in three. Poisons were added to the Bordeaux at the rate of 4 ounces to 50 gallons in case of Paris green and green arsenoid, and 2 pounds to 50 gallons for arsenate of lead.

The spraying outfits employed were barrel pumps in three orchards, geared power sprayers in two, and a gasoline engine sprayer in one. In most cases two leads of hose, 8- or 10-foot extension rods, and double Vermorel nozzles were used. With the gasoline power pump three leads of hose were used most of the time. In some of the orchards elevated platforms for the supply tanks or barrels were had, along with a convenient water supply, while in others the spray materials were prepared on the ground and lifted into the spray tank or barrel in buckets. In some cases the well and mixing stand were in the orchard and in others some distance from it.

THE RECORDS KEPT.—Exact records were kept of the quantities and cost of the various spray materials used and of the hours and cost of labor

for men and teams. An exact record was also made of the yield of the merchantable apples, culls, and windfalls of a part of the sprayed and unsprayed trees in each orchard. The market value of the fruit was ascertained as nearly as possible, and the total value of the fruit from sprayed and unsprayed trees calculated. Finally, records were made of the percentages of wormy and scabby fruits on three sprayed and three unsprayed trees of practically every variety of apple in the spraying block of each orchard.

COST OF SPRAYING.

The cost of spraying in the different orchards is given below. The time charged to the spraying includes the time spent in preparing the spray mixture and hauling it to the orchard as well as the time spent in applying it to the trees. The prices of materials charged are those actually paid by the orchard owners, and the cost for labor is figured at the prices prevailing in the neighborhoods where the work was done. The cost of the spraying outfits has not been included. Allowing one barrel outfit costing between \$15 and \$25 for each 1,000 trees, and estimating the annual interest on the investment and the deterioration of the machine at one-fourth the original cost of the outfit, would add less than one cent per tree to the cost of spraying. One gasoline power sprayer costing between \$200 and \$300 will take care of from 4,000 to 6,000 trees, depending upon the age of the trees, provided there are proper conveniences for mixing the materials and for getting them to the spray outfit in the orchard. This would not add more than a cent or two per tree to the cost of the year's spraying. In large orchards the saving in labor by using a power sprayer would more than make up for the increased cost of the outfit.

Statements and a tabular summary of the cost of spraying in the various orchards are given below:

Falls City, Richardson County. Orchard of John Gilligan; G. R. Grinstead, manager. Trees 13 years old. Average number sprayed, 295. Sprayed five times, using 2,550 gallons of Bordeaux mixture and arsenate of lead. Used team and three men. Outfit consisted of Meyer's barrel pump, one lead of hose, extension rod, double Vermorel nozzle.

Bluestone, 217 lbs. at 8½c.....	\$18.45
Lime, 293 lbs. at ⅝c.....	1.83
Arsenate of lead, 102 lbs. at 15½c.....	15.81
Cost of material	<u>\$36.09</u>
3 men, 6½ days at \$1.50.....	\$29.25
1 team, 6½ days at \$1.50.....	9.75
Cost of labor	<u>39.00</u>
Total cost	<u>\$75.09</u>

Total quantity of spray per tree, 8.6 gallons.

Cost of material per gallon.....1.4c; per tree, 12.2c

Cost of applying per gallon.....1.5c; per tree, 13.2c

Total cost per gallon.....2.9c; per tree, 25.4c

Pawnee City, Pawnee County. Orchard of J. E. Atkinson. Trees about 10 years old. Average number sprayed, 875. Sprayed five times, using 4,225 gallons of Bordeaux and green arsenoid (arsenate of lead in last spraying) Used team and four men. Outfit consisted of Morrill & Morley's barrel pump, two leads of hose, extension rods, double Vermorel nozzles.

Bluestone, 346 lbs. at 8½c.....\$29.41

Lime, 488 lbs. at ⅙c..... 3.05

Green arsenoid, 18 lbs. at 32c..... 5.76

Arsenate of lead, 26 lbs. at 15½c..... 4.03

Cost of material \$42.25

4 men, 8½ days at \$1.50.....\$51.00

1 team, 8½ days at \$1.50..... 12.75

Cost of labor 63.75

Total cost \$106.00

Total quantity spray per tree, 4.8 gallons.

Cost of material per gallon.....1.0c; per tree, 4.8c

Cost of applying per gallon.....1.5c; per tree, 7.3c

Total cost per gallon.....2.5c; per tree, 12.1c

Nebraska City, Otoe County. Orchard of Morton Bros. Trees 26 years old. Average number sprayed, 260. Sprayed five times, using 3,775 gallons of Bordeaux and Paris green. Used one horse and three men. Outfits consisted of Gould's barrel pump and Spray-Motor barrel pump, two leads of hose, extension rods, double Vermorel nozzles.

Bluestone, 319 lbs. at 9c.....\$28.71

Lime, 436 lbs. at ⅙c..... 2.91

Paris green, 18¾ lbs. at 20c..... 3.75

Cost of material \$35.37

3 men, 10 days at \$1.50.....\$45.00

1 man, 1 day at \$1.50..... 1.50

1 horse, 10 days at 50c..... 5.00

Cost of labor 51.50

Total cost \$86.87

Total quantity spray per tree, 14.5 gallons.

Cost of material per gallon.....0.9c; per tree, 13.6c

Cost of applying per gallon.....1.4c; per tree, 19.8c

Total cost per gallon.....2.3c; per tree, 33.4c

Glen Rock, Nemaha County. Orchard of Swan & Titus; J. T. Swan, manager. Trees 12 years old. Number sprayed, 280. Sprayed five times, using 2,505 gallons of Bordeaux and Paris green. Used team and three men. Outfit consisted of Field Force Pump Company's geared power sprayer, two leads of hose, extension rods, double Vermorel nozzles.

Bluestone, 208 lbs. at 8c.....	\$16.64
Lime, 293 lbs. at $\frac{1}{2}$ c.....	1.47
Paris green, 12 $\frac{1}{2}$ lbs at 20c.....	2.53
Cost of material	<u>\$20.64</u>
3 men, 26 hours at 15c.....	\$11.70
1 team, 26 hours at 15c.....	3.90
Cost of labor	<u>15.60</u>
Total cost	\$36.24
Total quantity spray per tree, 8.9 gallons.	
Cost of material per gallon.....	0.8c; per tree, 7.4c
Cost of applying per gallon.....	0.6c; per tree, 5.6c
Total cost per gallon.....	<u>1.4c; per tree, 13.0c</u>

Tecumseh, Johnson County. Orchard of Al. Russell. Trees about 20 years old. Average number sprayed, 240. Sprayed five times, using 3,013 gallons of Bordeaux and Paris green. Used team and three men. Outfit consisted of Field Force Pump Company's geared power sprayer, two leads of hose, extension rods, double Vermorel nozzles.

Bluestone, 256 lbs. at 8c.....	\$20.48
Lime, 347 lbs. at $\frac{1}{2}$ c.....	1.74
Paris green, 15 $\frac{1}{2}$ lbs. at 20c.....	3.10
Cost of material	<u>\$25.32</u>
3 men, 4 1-5 days at \$1.50.....	\$18.90
1 team, 4 1-5 days at \$1.50.....	6.30
Cost of labor	<u>25.20</u>
Total cost	\$50.52
Total quantity spray per tree, 12.6 gallons.	
Cost of material per gallon.....	0.9c; per tree, 10.6c
Cost of applying per gallon.....	8.8c; per tree, 10.5c
Total cost per gallon.....	<u>1.7c; per tree, 21.1c</u>

Lincoln, Lancaster County. Orchard of E. T. Hartley. Trees about 25 years old. Average number sprayed, 225. Sprayed four times, using 3,225 gallons of Bordeaux mixture and arsenate of lead (Paris green in one spraying). Used team and three men. Outfit consisted of Cushman Motor Company's gasoline power sprayer, two leads of hose first two

applications, and three leads of hose last two applications; extension rods, double Vermorel nozzles; also used Morrill & Morley's barrel pump for part of first two sprayings.

Bluestone, 231 lbs. at 8½c.....	\$19.64
Lime, 334 lbs. at ⅝c.....	2.09
Paris green, 4 lbs. at 30c.....	1.20
Arsenate of lead, 78 lbs. at 10c.....	7.80
Cost of material	<u>\$30.73</u>
3 men, 3½ days at \$1.50.....	\$15.75
1 team, 3½ days at \$1.50.....	5.25
Cost of labor	<u>21.00</u>
Total cost	\$51.73
Total quantity spray per tree, 14.3 gallons.	
Cost of material per gallon.....	1.0c; per tree, 13.7c
Cost of applying per gallon.....	<u>.0.6c; per tree, 9.3c</u>
Total cost per gallon.....	<u>1.6c; per tree, 23.0c</u>

Summary of Cost of Spraying the Six Orchards.

LOCATION OF ORCHARD	KIND OF SPRAYER	No. trees sprayed	Age of trees, years	Times sprayed	Gals. per tree	COST OF MATERIAL		COST OF APPLYING		TOTAL COST	
						Per gal.	Per tree	Per gal.	Per tree	Per gal.	Per tree
Falls City.....	Barrel pump.....	295	13	5	8.6	1.4	12.2	1.5	13.2	2.9	25.4
Pawnee City.....	Barrel pump.....	875	10	5	4.8	1.0	4.8	1.5	7.3	2.5	12.1
Nebraska City.....	Barrel pump.....	260	26	5	14.5	0.9	13.6	1.4	19.8	2.3	33.4
Glen Rock.....	Gearcd power pump.....	280	12	5	8.9	0.8	7.4	0.6	5.5	1.4	13.0
Tecumseh.....	Gearcd power pump.....	240	20	5	12.6	0.9	10.6	0.8	10.5	1.7	21.1
Lincoln.....	Gasoline power pump.....	225	25	4	14.3	1.0	13.7	0.6	9.3	1.6	23.0
The six orchards.....		2175	18	5—	10.6	1.0	10.4	1.1	10.9	2.1	21.3

The total quantity of spray used varied according to the size of the trees sprayed, from about 5 gallons to nearly 15 gallons per tree, with an average of nearly 11 gallons per tree, or a little over 2 gallons per tree for each application. The cost of material varied, from a little less than a cent a gallon to nearly a cent and a half, and averaged exactly one cent per gallon. The difference in cost was due largely to the kind and amount of poison used. The average cost of applying a gallon of the spray was a trifle greater than the cost of the material. The variation in cost of applying the spray, from a little over a half cent to a cent and a half per gallon, was due mainly to differences in conveniences for preparing and mixing the materials, different kinds of spray pumps, etc. In most of the orchards the expense of applying the spray could have been reduced materially by providing more convenient arrangements for mixing the materials. The average cost of applying the spray in the three orchards using hand pumps in barrels was nearly one and a half cents a gallon, as against two-thirds of a cent per gallon in the three orchards where power pumps were used. When we figure the cost per tree of applying the spray, the difference in regard to conveniences, kinds of spray pumps, and the like is very striking. For instance, in two of the orchards where the trees were nearly the same age and size and where almost exactly the same quantities of spray were used per tree, the cost of applying the spray in one case was 5.6 cents and in the other case 13.2 per tree, and in two other orchards, where the size and age of the trees and the quantities of spray used were also practically the same, the cost of applying the spray was 9.3 cents per tree in one case and 19.8 cents per tree in the other. The total cost per tree for all the sprayings varied from about 12 cents to over 33 cents, and averaged a little over 21 cents, or only a little over 4 cents per tree for one spraying.

In addition to the records from the orchards where these spraying demonstrations were made, reports of the cost of spraying have been received from orchards in two other counties of eastern Nebraska. Marshall Bros., Arlington, Neb., Washington Co., report the cost of spraying 12-year-old apple trees with 3-4-50 Bordeaux and 5 ounces Paris green per barrel, using a barrel pump, to be $2\frac{3}{4}$ cents per tree for one application, or almost exactly the same as in one of the demonstration orchards where the conditions were very similar. E. F. Stephens, Crete, Neb., Saline Co., sprayed 3,700 trees from 18 to 32 years old four times, using 37,500 gallons of spray. The work required the time of three men and two teams for 18 days. For the first three sprayings, 4-6-50 Bordeaux and arsenate of lead were used, and for the fourth spraying arsenate of lead was used alone. In the first spraying 2 pounds and in the other three sprayings $2\frac{1}{2}$ pounds of arsenate of lead were used for each 50 gallons of spray. The cost of the first three sprayings was $11\frac{1}{2}$ cents per tree, or 3.8 cents per tree for one application. The last spraying cost about 3 cents per tree. This was less than it cost to spray similar

trees in the demonstration orchards. The lessened cost is due in part to the use of somewhat cheaper materials (7 cents per pound for blue-stone and 9 to 12 cents per pound for arsenate of lead), and doubtless also in part to better arrangements for mixing the spray material and getting it to the trees. An ample and convenient water supply was provided in a large cistern and large elevated supply tank. The water was discharged by gravity from the supply tank into two dilution tanks; from them to a mixing tank, and from that to the spray tank or to the tank of the "helper wagon" used to haul the spray mixture to the spraying outfit in the orchard. The spraying outfit consisted of a Field Force Pump Company's gasoline power sprayer, two leads of hose, two quadruplex Vermorel nozzles. The spray was directed from an elevated platform above the spray tank.

EFFECT OF SPRAYING ON APPLE SCAB AND CODLING-MOTH.

In all the orchards, careful records were made of the percentages of wormy and scabby fruits on sprayed and unsprayed trees. In mid-summer, preliminary observations of this sort were made in which approximately a fourth of the apples on three sprayed and three unsprayed trees of several varieties in each of the orchards were examined and the numbers of wormy fruits, scabby fruits, and fruits free from scab and worms were determined. In the fall when the fruit was gathered, an examination was made of all the picked fruits and windfalls from about three sprayed and three unsprayed trees of most of the varieties in the six demonstration orchards. The number of scabby fruits, wormy fruits, and fruits free from scab and worms were again recorded. These final records were obtained from 37 sprayed trees and 39 unsprayed ones. Approximately 110,000 fruits were examined to get these records.

The total number of fruits examined and the numbers and per cents of scabby and of wormy fruits are given in the following table:

Effect of Spraying on Injury From Scab and Codling-Moth.

LOCATION OF ORCHARD	VARIETY	SPRAYED						UNSPRAYED					
		No. of Trees	No. of Fruits	Scabby No.	Scabby Per Cent	Wormy No.	Wormy Per Cent	No. of Trees	No. of Fruits	Scabby No.	Scabby Per Cent	Wormy No.	Wormy Per Cent
Falls City	Ben Davis	2	1289	0	0	650	50	3	695	3	0	553	80
	Winesap	3	2534	4	0	985	39	3	4244	177	4	3462	82
	Gano	4	3981	11	0	1099	28	3	2205	20	1	1343	61
Glen Rock	Winesap	3	5584	142	3	824	15	3	4408	558	13	1969	45
	Ben Davis	3	9777	33	0	3200	33	3	9174	1603	17	4411	48
Nebraska City	Missouri Pippin	3	8018	137	2	1641	20	3	4123	1145	28	1792	43
	Tecumseh	3	10059	670	7	2003	20	3	5400	2539	47	2176	40
Lincoln	Winesap	2	4338	468	11	1089	25	3	3200	2230	70	1885	59
	Ben Davis	2	3895	1200	31	936	24	3	4880	4419	90	1828	37
Pawnee City	Winesap	3	3506	105	3	450	13	3	2438	1058	43	776	32
	Missouri Pippin	3	5401	235	4	341	6	3	3598	2736	76	629	17
	Winesap	3	2979	70	2	273	9	3	1762	1203	67	393	22
	Ralls Genet	3	1925	63	3	429	22	3	971	152	16	350	36
Total		37	63286	3158	6	13920	22	39	47098	17843	38	21567	46

In case of some varieties of apples, in some of the orchards there was almost no scab, even on unsprayed trees. In all cases where scab was abundant on unsprayed trees the sprayed fruit was practically free from scab. Even in the single case where almost a third of the sprayed fruits were "scabby," the scab did very little real damage. All fruits that showed any scab spots were classed as "scabby." Most of the sprayed fruits so classed really had very little scab, while much of the unsprayed "scabby" fruit was scabbed so bad as to be practically worthless. The difference between sprayed and unsprayed fruit was therefore much greater than the table would indicate. The general average percentages of scabby fruits as shown in the table (6 per cent for the sprayed fruit and 38 per cent for the unsprayed fruit), show, however, that the scab was controlled well by the spraying.

That the codling-moth was not controlled so well is shown by the table, the average of wormy fruits being 22 per cent for the sprayed trees and 46 per cent for the unsprayed ones. The large number of wormy apples was due to the late brood of codling-moth, which developed in great numbers late in the season. Late in July, at the time of the last spraying, there were very few wormy apples on sprayed trees and in some cases even on unsprayed trees. It was partly due to the scarcity of worms then that the proposed August spraying was omitted. As it turned out, a late spraying would doubtless have been very beneficial. In studying results of spraying tests of this sort where the sprayed and unsprayed trees stood close together, as great differences are not to be expected as where the sprayed and unsprayed blocks are isolated for the reason that many of the moths that develop from the first brood of worms on unsprayed trees spread out to the sprayed trees close by, thus not only increasing the number of wormy apples on the sprayed trees but also decreasing the number of worms in the unsprayed fruit.

In figures 5, 6, and 7 (pp. 284, 285) are shown the entire yields of three Missouri Pippin trees, two of them sprayed and one of them unsprayed. The baskets at the right in each case contained the apples that were free from scab and worms, while those on the left contained the scabby and wormy fruits.

INFLUENCE OF SPRAYING ON THE HEALTH OF APPLE FOLIAGE.

In midsummer, injury to the foliage of a few varieties of apples was noticed in two or three of the orchards. Some of the leaves were yellow and falling, and more were spotted. No serious injury resulted, however, in any of the sprayed orchards. At the time the fruit was picked the foliage of the sprayed trees was good in all of the orchards, while in at least four of the orchards the unsprayed trees had lost much of their foliage. Much of this defoliation of unsprayed trees was apparently due to a leaf-spot which was very

abundant in some of the orchards. In many instances from 50 per cent to 75 per cent of the leaves of unsprayed trees was on the ground early in October, and in some cases trees were at that time almost completely defoliated. A peculiar occurrence was observed in this connection in several of the orchards. The heavy frosts of early October injured the foliage of unsprayed trees much more than that of sprayed ones. In numerous instances the leaves that still remained on the unsprayed trees

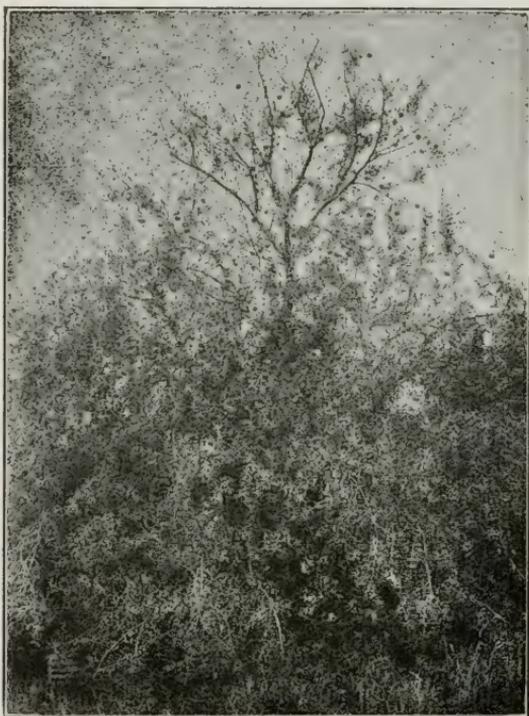


Fig. 1. Winesap apple tree in the Tecumseh orchard, sprayed five times. Foliage practically uninjured by disease on October 18, 1906.

were entirely killed by the frosts, while the foliage of adjoining sprayed trees was bright green and practically free from frost or fungus injury. Figures 1 and 2 show adjoining Winesap trees in the Tecumseh orchard, one sprayed and the other not sprayed, as they appeared early in October. Figures 3 and 4 show sprayed and unsprayed Ben Davis, Missouri Pippin, and Winesap trees in another part of the same orchard.

YIELD AND VALUE OF SPRAYED AND UNSPRAYED FRUIT.

An exact record was made of the yield of a part of the sprayed and unsprayed trees in each of the six orchards. In selecting the trees from

which the final records were made, care was exercised that they should represent average conditions in the sprayed and unsprayed plats. In one orchard where the final records were made from only a few trees, these trees were chosen early in summer, before it was possible to tell what the full effect of the spraying would be. While it would have been better, doubtless, to have recorded the yield of all trees of the sprayed and check plats, this was found impracticable. As it was,



Fig. 2. Unsprayed Winesap tree in the Tecumseh orchard, standing next to the one shown in fig. 4. Almost wholly defoliated by disease by October 18, 1906.

exact records were made of the yield of 215 trees of the sprayed plats of the different orchards and of 71 trees of the unsprayed plats.

In making these records the apples were picked from the trees and sorted into "merchantable" fruit and "culls." The "windfalls" were picked up and measured. In grading the fruit no definite standard was followed. Any fruit which the owners were able to market was called merchantable and the fruit that could not be disposed of or that could be sold only at cider mills or vinegar factories was classed as culls. In most of the orchards this grading was done by the owners or by the



Fig. 3. Ben Davis, Missouri Pippin, and Winesap trees in the Tecumseh orchard, sprayed five times. Foliage bright and healthy when photographed, October 18, 1906.



Fig. 4. Unsprayed Ben Davis and Missouri Pippin trees in the Tecumseh orchard, defoliated by disease. Photographed October 18, 1906.

men who bought the crop. Where the work was done by representatives of the Department of Agriculture or of the Experiment Station, the grading was made to conform as nearly as possible to the practice of the owners or buyers. In most cases the grading was not very close. Wormy and scabby apples were classed as merchantable except where the injury was conspicuous, and in some cases fruit conspicuously injured by worms or scab was included in this class unless there was a prospect of immediate decay.

To determine the value of the fruit, the prices actually received by the orchard owners were noted where possible. Where the whole crop was sold for a lump sum, making it impossible to get at the exact price per bushel, a statement was secured from the owner or buyer giving the price commonly paid for similar fruit in the neighborhood. Where the culls and windfalls were disposed of, the price received for them was also noted. In case the culls and windfalls were not sold, no account was taken of them in calculating the value of the fruit.

In all cases where possible, the net value of the fruit, that is, the value on the tree, was determined. Where the gross selling value of the fruit was alone obtainable, seven cents per bushel was deducted to cover the cost of picking and handling the fruit. The cost of this work of course varied in different orchards and may have been more than seven cents in some cases, but the actual cost in one of the orchards was between one and two cents less than the allowance made here. In cases of culls and windfalls, five cents per bushel was deducted from the selling price to allow for the work of gathering and marketing.

Statements and a tabular summary of the yield and value of fruit from the sprayed and unsprayed trees of the six orchards are given below:

FALLS CITY ORCHARD.—Records were made from 65 trees. The gross selling price of merchantable apples was 37 cents per bushel, and of culls and windfalls 12 cents per bushel. Net prices are here estimated at 30 cents and 7 cents respectively.

Winesap—

	Total	Per tree.
7 sprayed trees—		
Merchantable fruit	15½ bu. \$4.65	2.2 bu. \$0.66
Culls and windfalls.....	12¾ bu. .89	1.8 bu. .13
Total	28¼ bu. \$5.54	4.0 bu. \$0.79
11 unsprayed trees—		
Merchantable fruit	8½ bu. \$2.55	0.8 bu. \$0.23
Culls and windfalls.....	31½ bu. 2.21	2.8 bu. .20
Total	40 bu. \$4.76	3.6 bu. \$0.43

Ben Davis—

	Total	Per tree.
27 sprayed trees—		
Merchantable fruit	75½ bu. \$22.65	2.8 bu. \$0.84
Culls and windfalls.....	20 bu. 1.40	.7 bu. .05
Total	95½ bu. \$24.05	3.5 bu. \$0.89
10 unsprayed trees—		
Merchantable fruit	2 bu. \$0.60	0.2 bu. \$0.06
Culls and windfalls.....	9 bu. .63	.9 bu. .06
Total	11 bu. \$1.23	1.1 bu. \$0.12

Summary—

34 sprayed trees.....	123¾ bu. \$29.59	3.6 bu. \$0.87
21 unsprayed trees.....	51 bu. 5.99	2.4 bu. .29
Difference		\$0.58
Cost of spraying.....		.25
Net gain from spraying.....		\$0.33

PAWNEE CITY ORCHARD.—Records were made from 50 trees. The gross selling price of the merchantable apples was 30 cents per bushel for Winesap and 25 cents for Missouri Pippin, or 23 cents and 18 cents net respectively. A large part, perhaps half, of the culls and windfalls as here graded was sold at the prices noted above and the remainder was not marketed. The average net price of culls and windfalls is here estimated at 10 cents per bushel.

Winesap—

	Total	Per tree.
16 sprayed trees—		
Merchantable fruit	58¼ bu. \$13.40	3.6 bu. \$0.84
Culls and windfalls.....	13¾ bu. 1.38	.9 bu. .08
Total	72 bu. \$14.78	4.5 bu. \$0.92
12 unsprayed trees—		
Merchantable fruit	12 bu. \$2.76	1.0 bu. \$0.23
Culls and windfalls.....	13½ bu. 1.35	1.1 bu. .11
Total	25½ bu. \$4.11	2.1 bu. \$0.34

Missouri Pippin—

16 sprayed trees—		
Merchantable fruit	73½ bu. \$13.23	4.6 bu. \$0.83
Culls and windfalls.....	37¾ bu. 3.78	2.3 bu. .23
Total	111¼ bu. \$17.01	6.9 bu. \$1.06
6 unsprayed trees—		
Merchantable fruit	11¾ bu. \$2.12	2.0 bu. \$0.35
Culls and windfalls.....	12¼ bu. 1.23	2.0 bu. .21
Total	24 bu. \$3.35	4.0 bu. \$0.56

Summary—	Total	Per tree.
32 sprayed trees.....	183¼ bu. \$31.79	5.7 bu. \$0.99
18 unsprayed trees.....	49½ bu. 7.46	2.8 bu. .41
Difference		<u>\$0.58</u>
Cost of spraying.....		<u>.12</u>
Net gain from spraying.....		<u>\$0.46</u>

The Pawnee City orchard has a large per cent of Ben Davis trees, but unfortunately records of yield were obtained from only three sprayed and three unsprayed trees. Figuring the Ben Davis at the same price as Missouri Pippin, these records would indicate that the sprayed Ben Davis were worth an average of \$1.44 per tree and the unsprayed ones only \$0.82 per tree. The owner of the orchard, however, is of the opinion that in case of the Ben Davis, on the whole, "there was very little difference in yield of marketable fruit on sprayed and unsprayed trees of equal size." On account of this belief and owing to the fact that we have actual records from so few trees, the Ben Davis is omitted from the statement of results given above.

NEBRASKA CITY ORCHARD.—Records were made from 54 trees, only three of which were unsprayed. (There were 24 other unsprayed trees from which no record was made. They were left on account of their very poor fruit until the last to be picked and a windstorm blew most of the fruit to the ground, so that much of it was fit only for the vinegar factory.) The crop was sold for a lump sum, and exact prices per bushel are unknown. The buyer reported that the sprayed fruit brought him from 30 cents to 50 cents per bushel and the unsprayed fruit from 10 cents to 20 cents per bushel. Net selling prices are here estimated at five cents per bushel for culls and windfalls, 15 cents per bushel for merchantable fruit from unsprayed trees, and 30 cents per bushel for merchantable fruit from sprayed trees.

Ben Davis—

51 sprayed trees—	Total	Per tree.
Merchantable fruit	757 bu. \$227.10	14.8 bu. \$4.45
Culls and windfalls.....	197 bu. 9.85	3.9 bu. .20
Total	<u>954 bu. \$236.95</u>	<u>18.7 bu. \$4.65</u>
3 unsprayed trees—		
Merchantable fruit	22 bu. \$3.30	7.3 bu. \$1.10
Culls and windfalls.....	31 bu. 1.55	10.3 bu. .52
Total	<u>53 bu. \$4.85</u>	<u>17.6 bu. \$1.62</u>

Summary—

51 sprayed trees	954 bu. \$236.95	18.7 bu. \$4.65
3 unsprayed trees	53 bu. 4.85	17.6 bu. 1.62
Difference		<u>\$3.03</u>
Cost of spraying.....		<u>.33</u>
Net gain from spraying.....		<u>\$2.70</u>

GLEN ROCK ORCHARD.—Records were made from 74 trees. The selling price "net on trees" was 30 cents for merchantable apples and five cents for culls and windfalls.

Winesap—

	Total	Per tree.
20 sprayed trees—		
Merchantable fruit	78 bu. \$23.40	3.9 bu. \$1.17
Culls and windfalls.....	41 $\frac{3}{4}$ bu. 2.09	2.1 bu. .10
Total	119 $\frac{3}{4}$ bu. \$25.49	6.0 bu. \$1.27
3 unsprayed trees—		
Merchantable fruit	11 bu. \$3.30	3.7 bu. \$1.10
Culls and windfalls.....	20 $\frac{3}{4}$ bu. 1.04	6.9 bu. .35
Total	31 $\frac{3}{4}$ bu. \$4.34	10.6 bu. \$1.45

Gano—

45 sprayed trees—		
Merchantable fruit	190 $\frac{1}{2}$ bu. \$57.15	4.2 bu. \$1.27
Culls and windfalls.....	58 $\frac{1}{2}$ bu. 2.93	1.3 bu. .07
Total	249 bu. \$60.08	5.5 bu. \$1.34
6 unsprayed trees—		
Merchantable fruit	5 $\frac{3}{4}$ bu. \$1.73	1.0 bu. \$0.29
Culls and windfalls.....	18 $\frac{3}{4}$ bu. .94	3.1 bu. .16
Total	24 $\frac{1}{2}$ bu. \$2.67	4.1 bu. \$0.45

Summary—

65 sprayed trees	368 $\frac{3}{4}$ bu. \$85.57	5.7 bu. \$1.32
9 unsprayed trees.....	56 $\frac{1}{4}$ bu. 7.01	6.2 bu. .78
Difference		\$0.54
Cost of spraying.....		.13
Net gain from spraying.....		\$0.41

TECUMSEH ORCHARD.—Records were made from 30 trees. The crop was sold for a lump sum, and the exact price per bushel is unknown. The owner reported the gross selling price of apples in that neighborhood to be 40 cents per bushel for No. 1 fruit and 10 cents per bushel for culls and windfalls. From figures furnished by the buyer the selling price of the merchantable fruit on the trees was estimated at between 20 cents and 25 cents per bushel. Net prices are here estimated at 25 cents per bushel for merchantable fruit and 5 cents per bushel for culls and windfalls.

Winesap—

	Total	Per tree.
5 sprayed trees—		
Merchantable fruit	31 $\frac{1}{2}$ bu. \$7.88	6.3 bu. \$1.58
Culls and windfalls.....	19 $\frac{1}{2}$ bu. .97	3.9 bu. .19
Total	51 bu. \$8.85	10.2 bu. \$1.77

	Total	Per tree.
4 unsprayed trees—		
Merchantable fruit.....	11¾ bu. \$2.94	3.0 bu. \$0.74
Culls and windfalls.....	17¾ bu. .89	4.4 bu. .22
Total	<u>29½ bu. \$3.83</u>	<u>7.4 bu. \$0.96</u>
Ben Davis—		
6 sprayed trees—		
Merchantable fruit	56¼ bu. \$14.06	9.4 bu. \$2.34
Culls and windfalls.....	1¾ bu. .09	.3 bu. .02
Total	<u>58 bu. \$14.15</u>	<u>9.7 bu. \$2.36</u>
6 unsprayed trees—		
Merchantable fruit	18 bu. \$4.50	3.0 bu. \$0.75
Culls and windfalls.....	10½ bu. .53	1.8 bu. .09
Total	<u>28½ bu. \$5.03</u>	<u>4.8 bu. \$0.84</u>
Missouri Pippin—		
6 sprayed trees—		
Merchantable fruit	36¾ bu. 9.19	6.1 bu. \$1.53
Culls and windfalls.....	12½ bu. .63	2.1 bu. .11
Total	<u>49¼ bu. \$9.82</u>	<u>8.2 bu. \$1.64</u>
3 unsprayed trees—		
Merchantable fruit	9 bu. \$2.25	3.0 bu. \$0.75
Culls and windfalls.....	6¾ bu. .34	2.3 bu. .11
Total	<u>15¾ bu. \$2.59</u>	<u>5.3 bu. \$0.86</u>
Summary—		
17 sprayed trees	158¼ bu. \$32.82	9.3 bu. \$1.93
13 unsprayed trees	73¾ bu. 11.45	5.7 bu. .88
Difference		<u>\$1.05</u>
Cost of spraying.....		<u>.21</u>
Net gain from spraying.....		<u>\$0.84</u>
LINCOLN ORCHARD.—Records were made from 13 trees. The selling price of merchantable apples on the trees was 25 cents per bushel. Culls and windfalls were not marketed.		
Winesap—		
3 sprayed trees—		
Merchantable fruit	13 bu. \$3.25	4.3 bu. \$1.08
Culls and windfalls.....	4½ bu. .00	1.5 bu. .00
Total	<u>17½ bu. \$3.25</u>	<u>5.8 bu. \$1.08</u>
3 unsprayed trees—		
Merchantable fruit	9¼ bu. \$2.31	3.1 bu. \$0.77
Culls and windfalls.....	6¼ bu. .00	2.1 bu. .00
Total	<u>15½ bu. \$2.31</u>	<u>5.2 bu. \$0.77</u>

Ben Davis—

	Total	Per tree.
3 sprayed trees—		
Merchantable fruit	22 $\frac{1}{4}$ bu. \$5.56	7.4 bu. \$1.85
Culls and windfalls.....	5 $\frac{1}{2}$ bu. .00	1.8 bu. .00
Total	27 $\frac{3}{4}$ bu. \$5.56	9.2 bu. \$1.85
4 unsprayed trees—		
Merchantable fruit	13 bu. \$3.25	3.3 bu. \$0.81
Culls and windfalls.....	6 bu. .00	1.5 bu. .00
Total	19 bu. \$3.25	4.8 bu. \$0.81

Summary—

6 sprayed trees	45 $\frac{1}{4}$ bu. \$8.81	7.5 bu. \$1.47
7 unsprayed trees	34 $\frac{1}{2}$ bu. 5.56	4.9 bu. .79
Difference		\$0.68
Cost of spraying.....		.23
Net gain from spraying.....		\$0.45

Summary of Yield and Value of Sprayed and Unsprayed Trees.

LOCATION OF ORCHARD	Age of trees in years	TREATMENT	No. of trees	TOTAL		AVERAGE PER TREE				
				Bushels	Value	Bushels	Value	Cost of Spraying	Value less cost of spraying	Gain from spraying
Falls City.....	13	Sprayed.....	34	123.7	\$29 59	3.6	\$0 87	\$0 25	\$0 62	.....
		Unsprayed.....	21	51.0	5 99	2.4	29	.....	29	\$0 33
Pawnee City.....	10	Sprayed.....	32	183.3	\$1 79	5.7	99	12	87	.....
		Unsprayed.....	18	49.5	7 46	2.8	41	.....	41	46
Nebraska City ..	26	Sprayed.....	51	954.0	236 95	18.7	4 65	33	4 32	.....
		Unsprayed.....	3	53.0	4 85	17.6	1 62	.....	1 62	2 70
Glen Rock.....	12	Sprayed.....	65	368.7	85 57	5.7	1 32	.....	1 19	.....
		Unsprayed.....	9	56.3	7 01	6.2	78	.....	78	41
Tecumseh.....	20	Sprayed.....	17	158.3	32 82	9.3	1 93	21	1 72	.....
		Unsprayed.....	13	79.7	11 45	5.7	88	.....	88	84
Lincoln.....	25	Sprayed.....	6	45.3	8 81	7.5	1 47	23	1 24	.....
		Unsprayed.....	7	34.5	5 56	4.9	79	.....	79	45
Total.....	18	Sprayed.....	205	1833.3	\$425 53	8.4	\$1 87	\$0 21	\$1 66	.....
		Unsprayed.....	71	318.0	42 32	6.6	80	.....	80	\$0 86

In five of the orchards the average yield per tree was greater from sprayed trees than from unsprayed ones, while in one orchard the reverse was true. The percentages of increased yield of sprayed over unsprayed trees varied from 6 to 104. The differences in these percentages were due probably very largely to differences in the prevalence of scab in the different localities. In the three orchards where scab did comparatively little damage even to unsprayed trees, namely, the orchards at Falls City, Glen Rock, and Nebraska City, the average increase in yield due to spraying was only 16 per cent. In the case, however, of the other three orchards, Lincoln, Tecumseh, and Pawnee City, where injury from scab was much more pronounced the average



Fig. 5. Large sprayed tree of Missouri Pippin apple in the Tecumseh orchard with its entire crop of fruit. Sound fruit ($7\frac{1}{2}$ bushels) on the right, scabby and wormy fruit (5 bushels) on the left.



Fig. 6. Large unsprayed tree of Missouri Pippin in the Tecumseh orchard with its entire crop of fruit. Sound fruit (2 bushels) on the right, and scabby and wormy fruit (6 bushels) on the left.

gain in yield from spraying was 72 per cent (see figures 5, 6, and 7). Scab decreases the yield not only by attacking the flowers and very small fruits, causing them to drop, but also by checking the growth of the fruit that hangs on. In the Lincoln orchard, where scab was abundant, records made from 70 bushels of Ben Davis and Winesap apples show the individual fruits from sprayed trees to have averaged about nine per cent larger than the fruits from unsprayed trees. The fruits that were free from scab on a single tree of Winesap, a variety very susceptible to scab, averaged 19 per cent larger than the scabby fruits on the same tree.

The average yield for the six orchards was 8.4 bushels per tree from

sprayed trees and 6.6 bushels per tree from unsprayed ones, or a difference of over 27 per cent in favor of spraying. This difference in yield alone, to say nothing of differences in quality of sprayed and unsprayed fruit, was enough to have paid the cost of spraying twice over.

The difference in quality of sprayed and unsprayed fruit was very noticeable. The average per cent of culls in the fruit of all the orchards was about 23 from unsprayed trees as against only 8 from sprayed trees. A striking difference in the percentages of windfalls was also noticed, the average being, for the unsprayed trees of all the orchards,



Fig. 7. Small sprayed tree of Missouri Pippin in the Tecumseh orchard with its entire crop of fruit. Sound fruit (5 bushels) on the right and scabby and wormy fruit (3 bushels) on the left.

about 34 per cent, and for the sprayed trees 17 per cent. The codling-moth is probably responsible for more of the late windfalls than is scab. In case of some 16,000 fruits of Winesap and Ben Davis examined in the Lincoln orchard, the windfalls constituting about one-fifth of the whole crop, contained about one-third of all the scabby fruits and nearly one-half of all the wormy ones. That there was so large a number of wormy apples still hanging to the trees was due quite probably to the fact that a great number of worms had entered the fruits so recently that they had not injured them seriously at picking time.

The difference in quality was responsible in large measure for the difference in value of fruit from sprayed and unsprayed trees. While

the yield of sprayed trees was only about one-fourth more than of unsprayed ones, the value of the fruit per tree was about two and one-third times as great for sprayed as for unsprayed trees. The average value for sprayed fruit was \$1.87 per tree and for unsprayed fruit \$0.80 per tree, or a difference of \$1.07 per tree. Subtracting from this the average cost of spraying, 21 cents per tree, there still remains a difference of 86 cents per tree in favor of spraying. There was, then, on the average in all these six orchards, after allowing for the whole cost of spraying, a little over twice as much realized from each sprayed tree as from each unsprayed one. These orchards averaged over fifty trees to the acre. Does it pay to spray? Spraying in these six orchards not only paid for itself but, in addition to that, increased the net value of the fruit on the average by over \$40 per acre. If it pays to grow apples at all in southeastern Nebraska, where on land worth about \$100 per acre an average of \$40 per acre is received from unsprayed fruit after deducting the cost of harvesting, then it most certainly pays to spray that fruit, and spray it thoroughly, when by so doing the same trees are made to yield a net income of over \$80 per acre above the cost of harvesting and of spraying.

SUMMARY.

In 1906, spraying demonstrations were conducted in six apple orchards, one in each of six counties of southeastern Nebraska, in co-operation between the Nebraska Agricultural Experiment Station, the United States Department of Agriculture and the owners of the orchards. The objects were to demonstrate the value of spraying in controlling apple scab and codling-moth, to determine the cost of spraying, and to learn whether it pays to spray apples under the conditions existing in Nebraska. (Pages 262, 263.)

In each of the orchards a part of the trees were sprayed and a part left unsprayed for comparison. One of the orchards was sprayed four times and the others five times. The spray material was Bordeaux mixture containing some poison, Paris green, arsenate of lead, etc. (Page 264.)

An accurate account was kept of the quantity and the cost of the spraying materials used and of the time and cost of applying the spray. Extensive observations were made as to the percentages of wormy and scabby fruits on sprayed and unsprayed trees. An exact record was made of the yield of fruit of a part of the trees of the sprayed and of the unsprayed blocks of each orchard. The selling price of the fruit was also determined as nearly as possible in every case. (Pages 264, 265.)

The total quantity of material used per tree for the five sprayings varied from 5 to 15 gallons, averaging nearly 11 gallons, or a little over 2 gallons per tree for each application. The material cost from a trifle less than one cent to nearly one and a half cents per gallon, averaging one cent per gallon. The cost of applying the spray was

from .6 cent to .8 cent per gallon where power sprayers were used, and about one and a half cents per gallon where hand pumps were used, averaging a trifle over a cent a gallon. The total cost of both material and labor for spraying 2,175 trees five times was only a little over 21 cents per tree, the trees averaging about eighteen years old. The cost varied from 12 cents to 33 cents per tree, depending upon the age of the trees, the conveniences for mixing materials, the kinds of pumps used, and the like. The average cost was a little over four cents per tree for each spraying. (Pages 265-271.)

Records made at the end of the season from the entire crops of 37 sprayed trees and 39 unsprayed ones in the different orchards, including observations on over 110,000 fruits showed 22 per cent of wormy apples on sprayed trees and 46 per cent on unsprayed ones. Of the sprayed fruits 6 per cent and of the unsprayed fruits 38 per cent were scabby. (Pages 271-273.)

During the fall the foliage of the sprayed trees was much healthier than that of the unsprayed ones. In many cases, from 50 per cent to 75 per cent of the foliage of the unsprayed trees was on the ground early in October and in some instances the trees were almost completely defoliated at that time. Moreover, the leaves that remained on the unsprayed trees were entirely killed by the frosts of early October. At the same time the leaves of the sprayed trees were bright green, comparatively free from fungus diseases, and almost perfectly free from frost injury, and very few had fallen to the ground. (Pages 273, 274.)

The entire crop of fruit from 205 sprayed trees and 71 unsprayed ones in the different orchards was gathered and classified into "merchantable fruit," "culls," and "windfalls." The merchantable fruit was such as the owners were able to market in the ordinary ways, and the culls and windfalls were such as were fit only for vinegar factories and the like. The average yield of the sprayed trees was 8.4 bushels per tree, and of the unsprayed trees 6.6 bushels per tree. The smaller yield of the unsprayed trees was due in part to the smaller size of the individual fruits and in part probably to the dropping of many fruits early in the season. The culls amounted to 8 per cent of the total crop of sprayed fruit and to 23 per cent in case of the unsprayed fruit. The windfalls, likewise, were 17 per cent and 34 per cent for sprayed and unsprayed fruit respectively. The total value of the unsprayed fruit averaged 80 cents per tree, while for the sprayed trees the average value was \$1.87. Subtracting from the latter the average cost of spraying, 21 cents per tree, there remains a net value of \$1.66 per tree for the sprayed fruit against 80 cents per tree for the unsprayed fruit, or a direct gain from spraying of 86 cents per tree. On land worth \$100 per acre, the unsprayed fruit produced an average return of about \$40 per acre above the cost of harvesting, and the sprayed fruit on the same land gave an average return of over \$80 per acre above the cost of harvesting and of spraying. If it pays to grow apples at all, it pays to spray them! (Pages 274-286.)

RECOMMENDATIONS.

In order to control apple scab and codling-moth in the apple orchards of eastern Nebraska, spray the trees as follows:

(1) Spray with Bordeaux mixture after the cluster buds open, but before the individual flower buds open.

(2) Spray with Bordeaux and some poison, such as arsenate of lead, Paris green, etc., as soon as possible after the blossoms fall, and at any rate before the calyx lobes of the apple close.

(3) Spray with Bordeaux and poison three or four weeks after the flowers fall.

(4) Spray with arsenate of lead about July 20th.

(5) Spray with arsenate of lead about August 10th.

Use Paris green at the rate of one-fourth to one-third pound per barrel of Bordeaux. Use arsenate of lead at the rate of two pounds per barrel of Bordeaux or water.

Make Bordeaux as follows:

Bluestone	4 pounds
Quicklime	6 pounds
Water	50 gallons

Slake the lime, dissolve the bluestone, dilute each with half the required quantity of water, and mix thoroughly.

Use good nozzles and maintain a high pressure as uniformly as possible in order to distribute the liquid in a mist-like spray. Take care to reach all parts of the trees and to avoid drenching any part. Careless spraying should not be tolerated.*

* For a detailed discussion of methods of preparing and applying Bordeaux mixture see Farmers' Bulletin No. 247 of the U. S. Department of Agriculture, entitled "The Control of the Codling Moth and Apple Scab."

THE PLANTED FOREST FOR PROFIT.

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Throughout the entire United States, forest planting is constantly receiving more attention as an important factor in our future timber supply. In the richest of all agricultural regions, such as is found in Illinois, Iowa and eastern Nebraska, it is the farmer's woodlot which must supply much of the local demand. In southern California, where the remarkably fast-growing Eucalyptus trees reach a height of seventy-five feet and a diameter of seven to eight inches in five to seven years, we have the farmers' forests growing on land often valued at from \$100 to \$500 per acre and actually competing with citrus groves, vineyards and alfalfa fields as a means of profit. In the New England states, where agriculture has been pursued longer than in most other portions of the United States and where poor farming methods have resulted in run-down fields which are incapable of producing profitable agricultural crops, the New Englander is wisely making a start at growing a farm forest for future pulp and lumber supply, and not only making a sound financial investment but also enriching the soil for succeeding forestal crops.

Other phases of the work are also becoming of great importance over still more extensive areas than those which are at present characterized by the planted woodlot. In some of the states which were once known as the foremost timber-producing states in the Union, over one-half of the area in actual timberland as well as the non-productive or barren land which is capable only of producing a timber crop, is owned or controlled by the state, the farmer or the small land owner. This is contrary to the prevailing opinion that most of the standing forests, cut-over areas, and waste lands are held by the large lumbermen. Naturally, then, the broadest phases of forestry work in planting follow two general lines of action; first, that of the state and national activity over extensive areas held by the state and nation, and second, that of the small landowner who is interested in the development of his own possessions and of the local market. The state is also interested in forestry for the small owner, since the farmers form the majority of its citizens and are great consumers of wood.

Exactly what areas can best be used for forest planting, what forest trees to plant and along what lines the work should progress are questions that are more important now than they have ever been before. This is especially true in Nebraska and other prairie states, since these states are at a considerable distance from the great forest centres and naturally feel each advance in price more keenly than the timber-producing states. Moreover, the much-talked-of timber famine is bound to

cause its greatest stringency and discomfort in the states which have been without extensive natural forests. Each year the immense timbered areas have been lessened in extent; each year timber prices have been going higher and the regions distant from the forest centres have found it correspondingly more difficult to secure the much needed supplies. Already some of the greatest and best of our forest centers have exhausted the supplies of their best merchantable timber and lumbermen have been compelled to move to new fields or quit the business. The price which was formerly given for a section of land on which was growing the best timber in the world is now given for a single tree, and the rise of prices will certainly continue.

The question of conserving our timber supply and securing forest products from forest planting comes home vitally to those most dependent upon it. Within the short period of seven years the price for several classes of lumber has risen from fifty to three or four hundred per cent and, despite this high price, are becoming each year more difficult to secure. At a time not long distant, plantations were set out with only the idea of securing comfort from the shade, improved beauty to the farm or the possibility of securing a timber claim. The increased need for timber, however, is teaching the farmer to grow it for profit on much the same basis as his agricultural crops are produced, and today there are thousands of acres planted to forest trees for no other purpose than that of realizing a profit.

Most of the forest planting of the past has been made on good soil. This was due largely to the settlement of the great, fertile prairie region where tree growth was lacking except along the stream courses and where the need was great for shade trees, wind-breaks, and woodlots. Gradually, however, there has been a growing tendency for the reforestation of the poor soils over which some of our grandest forests have grown. This work has been followed by forest planting in the sand-hills of Nebraska, the region which has been referred to by some speakers as "the sea of sand-hills." The same tendency has been shown in the work done by the farmer. He has seen rising values on agricultural land—especially in the rich farming region of eastern Nebraska—and has been more inclined to plant his woodlot on the poorest soil the farm possesses.

This is as it should be. Analyses of these poor soils by the best soil experts and practical farmers have shown that they are unsuited for agriculture, while the forester knows that vast areas of these soils are well suited for forest growth. This is true both in this country and abroad. Several of these poor-soil forests have yielded 3 to 5 per cent on the money invested and thus given a profit far beyond that expected of them. Our future forests, then, should be grown for the most part on non-agricultural soils. When grown on agricultural soils, the forest plantation should be made to compete with the farm crop as a money producer or else be grown for its combined value

in protection, beautifying the place and as a source of supply for fence posts fuel, repair material, etc. The growth of the community demands the best use of every acre of soil and that every acre should produce some crop. *Good farms on rich soils and fine forests on poor soils means the greatest possible industrial development for the entire country.* Added to this, is the need for some forest growth in every region no matter how rich it may be in soil fertility.

This gives the basis for dividing Nebraska into two great forest-planting regions. The eastern portion is rich from the agricultural standpoint and has been constantly growing in demand for farm purposes. Its increasing value for this purpose is not yet fully developed and makes it imperative that forestry in this portion of the state be confined to woodlots, shelter-belts and windbreaks. In the western portion of the state, the growth of forests should be on a large scale and over extensive areas, since forests in this part of the state would greatly develop the region as well as furnishing a supply to the wood-needing farmer of eastern Nebraska. In both sections of the state, the work is already well established and steadily growing in importance.

FOREST PLANTING IN EASTERN NEBRASKA.

It is almost entirely the eastern portion of the state that has given Nebraska the name of the leading tree-planting state in the union. This place in the front rank is largely the result of the timber claim act of 1871, the stimulation to forest planting given by the inauguration of Arbor Day and the needs of the region. It was claimed that on the first Arbor Day and during the rest of the year 1874, more than 12,000,000 trees were planted. Though this was probably the record-breaking year, yet it is well known that forest planting is now on a more substantial basis than ever before.

Very few forest plantations have been made in the state with the single idea of profit. The primary purpose in the plantations of "early days" was to get trees of any kind to grow, and so fast-growing trees. such as cottonwood, green ash, box elder, soft maple and willow were most widely planted. These species, especially cottonwood, were easily propagated, cheaply obtained, rapidly grown and were thought to give promise of great results. Too often, however, in the scramble for quick results, poor plant stock was used and still poorer care given to the plantations. The result was that an extremely large percentage of the plantations showed either a complete failure or nearly so. This made many of the settlers dubious and gave a bad name to the quick-growing species which is not entirely deserved.

As the country became more thickly settled, the variety of tree species used for planting and successfully grown become greater. Slower-growing trees of longer life were used for permanence and there was a general desire to grow a specified tree for a specified purpose. Osage orange became the most prominent wind-break and hedge tree in the

southern half of the region and still continues so, though conifers are more widely used now than at any time previous. This is due to the greater protection which conifers give, especially in seasons when deciduous trees do not have a full leaf cover. Cottonwood is still important as a grove tree, but has been succeeded by hardy catalpa as the most desirable grove tree and by others somewhat secondary to the catalpa. Throughout the Middle West, hardy catalpa, honey locust, osage orange, black locust and Russian mulberry are now the favorite trees, and it is well to consider the results that may be obtained.

In Pawnee county, Nebraska, a sixteen-year-old catalpa plantation gave a net return of \$152.17 per acre at the time the plantation was cut. This meant an annual profit of \$6.24 per acre. A ten-year-old plantation of the same species in eastern Kansas showed a net value of \$197.55 per acre. Still another plantation in Nebraska gave a net income of \$170.50 when fourteen years old, which amounts to an annual income of \$8.69 per acre. All of these groves were planted as an experimental investment. The results show what can be accomplished when proper care is taken to select a suitable species for a definite site and when subsequent proper management is given to the grove. Several equally striking cases could be cited throughout the Middle West, and it is known that where the catalpa will succeed no other tree will pay so well. Good soil and good moisture conditions are essential for success with this tree.

Osage orange twenty-two years old has been known to produce as high as 2,640 first-class posts and 2,272 second-class posts, worth, respectively, 12.5 and 7 cents each, with a total acreage value of \$524.04. Two Illinois groves on rich agricultural soil were grown for a supply of posts, stakes, and fuel, and made a profit which compares favorably with farm crops. One of the groves was twenty-seven years old and covered four acres. A careful estimate showed that the yield per acre would be 536 second-class posts, 1,200 third-class posts and four cords of firewood. Portions of Illinois are gridironed with osage orange, planted about the field borders, giving the appearance of an immense checkerboard. These fences and windbreaks supply a large number of posts and still serve an excellent purpose as barriers. It is well understood that when properly seasoned no posts are better than those of the osage orange. Land producing such a stand of trees as noted above could hardly be put to a better use, since timber is the easiest of all crops to raise and from now on will never go begging for a market.

Red cedar should not be planted about apple orchards, since the cedar rust which affects this species also affects the apple. The cedar is, however, well adapted to dry soils and exposed situations in general and gives us one of the most durable woods on the market. An Iowa plantation of this species reached a value of \$200.54 in twenty-five years and, judging from the native growth which once occurred throughout Nebraska, this tree will have some usage on poor sites.

It does not take a lifetime to get results. Catalpa often reaches post size in from eight to ten years, and will give service as a post for from fifteen to forty or more years. Osage orange reaches post size in from twelve to fifteen years and usually lasts longer than catalpa. Black locust, though badly affected by the borer in some regions grows nearly as fast as catalpa and has almost the same post value, while it has the great advantage over catalpa of being able to thrive on poor land. European larch reaches a size suitable for telephone poles in twenty-five years. When treated with preservative, it will then last approximately fifteen to twenty-five years. Still other trees may be used for quick returns, while the list of slow-growing trees is still longer and embraces all of the species which are hardy in this region.

A classic example of improving existing growth is shown in the results secured by the Honorable J. Sterling Morton on his home grounds at Nebraska City. He pre-empted his farm from the government in 1855 and found that fifty-six acres could be classed as brush land, which most of his neighbors considered worthless and would grub out. It was not of high value for agriculture, since it followed the course of a creek. Mr. Morton at once commenced to improve the "singed-dog" woodlot by thinning and pruning. This land actually yielded an average of \$200 worth of wood annually and continued to improve in quality and quantity of yield. In 1901, it was estimated to have yielded \$9,000 worth of timber and to contain several thousand dollars' worth of standing timber. Pruning and thinning had resulted in straight, rapid-growing trees in a stand of decidedly high class. Natural reproduction was good because of the large number of seed-bearing trees and the excellent condition of the soil beneath these trees, making a suitable seed-bed for the seedlings' growth. Bur oak, green ash, white elm, and cottonwood predominated in the reproduction.

Numerous other figures could be given as a result of the United States Forest Service and private investigations to show the profit and rate of growth of the forest trees well suited for the prairie farmer. However, space permits only a general summary of the trees suitable for planting in the eastern region. A list of forest trees suitable for shade and ornamental purposes is included, since many inquiries are received regarding such usage.

Trees for fence posts: Hardy catalpa, honey locust, osage orange, Kentucky coffee tree green ash, Russian mulberry, European larch, red cedar.

Trees for fuel and farm repairs: Cottonwood, silver maple, Norway poplar, Carolina poplar, white willow, hackberry, American and slippery elms.

Trees for lumber and other large-sized material: Cottonwood, walnut, basswood, Norway poplar, European larch.

Trees for wind-breaks and shelter-belts: Red cedar, Scotch pine, Austrian pine, white pine Osage orange, Russian golden willow, white willow, green ash, honey locust, cottonwood, mulberry. *

Trees for shade and ornament: Honey locust, sycamore, American elm, slippery elm, hackberry, white birch, yellow birch, basswood, Kentucky coffee tree, red oak, scarlet oak, bur oak, walnut, horse chestnut, red bud or Judas tree, mountain ash, Russian wild olive red ash, green ash, cottonwood and other poplars, silver maple, tree of heaven, black cherry, willows, catalpa, Colorado blue spruce, Norway spruce, Austrian pine, Scotch pine, white pine, arbor vitae, red cedar, European larch, red fir, white fir.

None of these lists are exhaustive and many of the trees found in one list may be suited and used to some extent for the purpose heading another list. Other trees may prove of much value after further trial but the value of most of these species in regard to thrift approximate rate of growth, general usefulness and attractiveness is fairly well worked out.

FOREST PLANTING IN WESTERN NEBRASKA

Great potential importance is given to the work in the western portion of the state, especially in the sand-hill area. This area covers nearly 15,000,000 acres and, so far, has been largely used for grazing purposes, and owing to the sandy soil, often of a shifting nature, there are immense areas which are not high-class grazing land. Forest planting would add materially to the economic development of the region by adding to its diversity of product. Climatic conditions would also be improved and have a direct value in influencing the production of farm crops over the limited areas where they are at present produced. Grazing will not be disorganized but rather protected and encouraged.

The sand-hill work started with the Bruner Brothers' plantation in Holt county as a basis. Trees were furnished by the government and the planting site by the Messrs. Bruner. Several species were tried on the poorest sandy soil that could be found. The site was selected with slopes of all exposures. Jack or Banksian pine proved the most successful, Scotch pine next, and western yellow pine third. The growth shown by the jack pine at the end of fourteen years was truly remarkable when consideration is given to the fact that the seedlings were taken from the native forests of Minnesota, then planted on the poor sand-hill soil. At the end of this time over 90 per cent of these trees were alive and showed that they were remarkably adapted to thrive under such adverse conditions. The plantation contained at the rate of 4,530 trees to the acre, and during the fourteen years' time one-fourth of the trees averaged over nineteen feet in height, while one-half of the remainder had made a growth averaging sixteen feet in height. Even better results may be expected from the government plantings, since native-grown seedlings will be used and forest conditions will be established over large areas, thus favoring the trees in making a more healthy, vigorous growth. A somewhat remarkable feature connected with the sand-hill plantations is that so far none have suffered from insects or fungus disease.

The government has rightly reserved between 300,000 and 400,000 acres in this portion of the state for forestry purposes. Out of the nine forest nurseries established and maintained by the government, that at Halsey, Nebraska, is by far the largest and most important. It occupies about five acres of seed-bed and considerable transplant ground. The capacity last year was approximately 5,000,000 seedlings, and already about 2,000 acres in the hills have been planted. The oldest plantings were made four to five years ago and the trees have reached a height of six to eight feet. Jack pine and western yellow pine have been most extensively planted. Jack pine has proven most successful as a field tree, while western yellow pine has proven its worth only as a nursery tree and not fully established its value for field planting. Scotch pine has been started in the seed-beds and should prove a valuable tree in this region.

The extent of the work has not stopped with the government activity in establishing the Bruner grove and the extensive work at Halsey. The results of the government work have been watched from the first by residents of the western portion of the state, and last year a single dealer in Minnesota reported that he sold to Nebraskans over 600,000 jack pine seedlings, which he collected from the natural forests. Often, no more than 100 to 500 seedlings went to a single person. Many succeeded in having 80 per cent live and give promise of making successful growth.

Exposure to winds and sun in this portion of the state make it advisable to plant on north and east slopes, since conditions are less severe than on south and west slopes. Once a stand is secured on the north and east slopes, it will be much easier to secure a successful growth on the south and west slopes because of the ameliorating influence exerted by the trees growing on the planted areas.

It is reasonable to expect that higher class and a more diversified forest crop can be produced on the sand barrens and other sandy soils of the lake states than can be produced in western Nebraska. Michigan alone has at present from 8,000,000 to 10,000,000 acres of cut-over and waste land of this class while Wisconsin and Minnesota are not far behind. This will have material bearing on future conditions in the lake states region and adjoining areas, yet most of the planted timber will be needed in these states and the need for home-grown timber in Nebraska will ultimately be of the very first importance. The class of product which can be raised in western Nebraska should range from fence posts to dimension material. Since large areas are concerned, the problem is entirely distinct from that of the woodlot problem of the eastern part of the state. While the government should naturally take precedence in this region both as regards the area planted and the investigative work performed, there still should be pronounced activity by the ranchers. Every ranch should be made as self-supporting in timber supply as possible. As most of the ranches are large and have a considerable per cent of the area which is not suited to farming

nor well suited for grazing, such work can be carried on to excellent advantage and serve to furnish the ranch with a sufficient supply of fence posts, repair material, and shelter-belts. Once a forest cover is established in this region it will create conditions suitable for keeping the area in permanent forest.

FUTURE PROBLEMS.

Many other phases of forestry are of vital importance to the state and should be treated specifically. This article is intended to convey only a general idea of the importance of the well-established work in the state and the need for still more extensive work than as yet prevails. Owing to the importance of the national forest work the government has largely discontinued the preparation of planting plans for those who desire such assistance. This work should be taken up by the state and made an important feature of the work. Still broader study is needed for each of our prominent trees suitable for profitable grove purposes, especially relative to mixtures and spacing. Experiments are needed in wood preservation, since it is in the prairie that wood scarcity will be felt most keenly and where there will be a greater demand for the best preservation. Work should also be conducted to determine more exactly the actual benefits of wind-breaks and shelter-belts to the crop producer. More information is needed regarding desirable species for each county and each class of soil in order to get the most valuable stand of trees in the least possible time, or as Professor Graves has stated it, "To secure the best forest in the largest quantity in the shortest time and at the least expense."

The organization of tree buying and tree planting societies in each county or possibly a definite portion of each county would greatly benefit forest planting. Somewhat similar societies should be formed in our prominent cities for the improvement of park and street planting. Several other lines of work are needed and will develop from time to time.

ASSISTANCE IN PLANTING.

The prospects for future forest planting in the state are bright. Nurserymen report an increased sale of forest trees in both the east and the west and the work is shaping itself on a more practical basis than ever before. In the east it is the question of the woodlot on good soil, in the west it is a question of more extensive plantings on poorer soils. The farmer's forest already assumes several times the importance that it did ten or even five years ago and yearly becomes more important. It is well that no phase of forestry work is receiving more attention and that the men who are most dependent on the timber supply are also the ones who are most capable of raising it.

Work at the Nebraska State Experiment Station is designed for the benefit of the farmer. Advice will be cheerfully given relative to forest planting and it is hoped that before long some provision will be made by the state, or by co-operation of the state and national government, so that each farmer who desires to plant can have a personal investigation and recommendations from the men in charge of forestry work in the state.

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