Author: State Horticultural Association of Pennsylvania

Title: Proceedings of the State Horticultural Association of Pennsylvania...1910

Place of Publication: Harrisburg, Pa.

Copyright Date: 1910

Master Negative Storage Number: MNS# PSt SNPaAg228.8

1910

PROCEEDINGS

OF THE

State Horticultural Association of Pennsylvania

TUNKHANNOCK, WYOMING COUNTY

JANUARY 11, 12, 13, 1910

HARRISBURG, PA.:
UNITED EVANGELICAL PUBLISHING HOUSE
1910

State Horticultural Association of Pennsylvania

OFFICERS FOR 1910

PRESIDENT.

Gabriel Hiester, Harrisburg.

VICE-PRESIDENTS.

Hon. William T. Creasy, . Catawissa.
Robert M. Eldon, ... Aspers.
F. H. Fassett, ... Meshoppen.

SECRETARY.

Chester J. Tyson, ... Flora Dale.

CORRESPONDING SECRETARY.

William P. Brinton, ... Christiana.

TREASURER.

Edwin W. Thomas, ... King-of-Prussia.

LOCAL COMMITTEE OF ARRANGEMENTS.
(For the Fifty-first Annual Meeting.)

F. H. Fassett, ... Meshoppen.
James G. Leighton, ... Tunkhannock.
D. A. Knuppenburg, ... Lake Carey.

MEMBERSHIP.

LIFE MEMBERS.

Bartram, J. Hibberd, West Chester, Chester Co.
Barlow, Thomas W., Fort Washington, Montgomery Co.
Blaine, Geo. W., North East, Erie Co.
Boyer, John F., Middleburg, Snyder Co.
Boltz, Peter R., Lebanon, Lebanon Co.
Brinton, Wm. P., Christiana, Lancaster Co.
Chase, Charles T., Devon, Chester Co.
Chase, Howard A., Union League, Philadelphia.
Cummings, Joseph F., Sunbury, Northumberland Co.
Creasy, Hon. Wm. T., Catawissa, Columbia Co.
Eldon, Robert M., Aspers, Adams Co.
Engle, John G., Marietta, Lancaster Co.
Engle, Enos B., Harrisburg, Dauphin Co.
Fox, Cyrus T., Harrisburg, Dauphin Co.
Garrettson, Joel V., Aspers, Adams Co.
Good, C. W., Waynesboro, Franklin Co.
Grove, W. E., York Springs, Adams Co.
Hartman, D. L., Littleriver, Fla.
Hayes, Charles P., Philadelphia.
Heard, R. E., Buffalo, N. Y.
Hiester, Gabriel, Harrisburg, Dauphin Co.
Hostetler, Abram, Johnstown, Cambria Co.
Huff, L. B., Greensburg, Westmoreland Co.
Huff, Burrell R., Greensburg, Westmoreland Co.
Jones, S. Morris, West Grove, Chester Co.
Keller, H. M. Gettysburg No. 5, Adams Co.
Landis, Israel, Lancaster, Lancaster Co.
Loop, A. I., North East, Erie Co.
McCormick, James, Harrisburg, Dauphin Co.
McLanahan, J. King, Hollidaysburg, Blair Co.
Martin, J. O., Mercersburg, Franklin Co.
Meehan, S. Mendelson, Germantown, Philadelphia.
Mitchell, Ehrman B., Harrisburg, Dauphin Co.
Moon, Samuel C., Morrisville, Bucks Co.
Pannebaker, Wm. M., Virgilina, Va.
Reist, John G., Mt. Joy, Lancaster Co.
Scribner, Prof. F. Lamson, Knoxville, Tenn.
Shaffner, Jacob, Harrisburg, Dauphin Co.
Sharpe, Miss E. M., Accotink, Va.
Snavely, H. H., Willow Street, Lancaster Co.
Thomas, Edwin W., King of Prussia, Montgomery Co.
Thomas, Geo. B., West Chester, Chester Co.
Tyson, Chester J., Flora Dale, Adams Co.
Tyson, Edwin C., Flora Dale, Adams Co.
Tyson, William C., Guernsey, Adams Co.
Van Deman, H. E., 3630 13th St., N. W., Washington, D. C.
Wertz, D. Maurice, Waynesboro, Franklin Co.
Wertz, Hon. Geo. M., 437 Park Ave., Johnstown, Cambria Co.
Woods, Edward A., Frick Bldg., Pittsburg, Allegheny Co.
Youngs, L. G., North East, Erie Co.

HONORARY MEMBERS.

Edge, Thomas J., Harrisburg.
Heiges, Prof. S. B., Saxe, Va.
Parsons, Prof. S. B., Flushing, N. Y.
Rowe, Hon. D. Watson, Chambersburg.

ANNUAL MEMBERS FOR 1910.

A.

Adams, W. S., Aspers, Adams Co.
Allen, Carl G., Williamsport, Lycoming Co.
Allen, W. C., Tunkhannock, No. 3, Wyoming Co.
Anderson, David, North East, Erie Co.

Anderson, H. W., Stewartstown, York Co.
Atwater, Richard M., Chadds Ford, Chester Co.
Atwater, C. G., Flushing, N. Y.
Anwyll, H. L., 114 Herr St., Harrisburg, Dauphin Co.
Arny, J. J., Centre Hall, Centre Co.
Arny, L. Wayne, State College, Centre Co.

B.

Baird, A. T., Island, Clinton Co.
Banks, William, Mifflintown, Juniata Co.
Barclay, Richard D., 424 S. 40th St., Philadelphia.
Barnard, C. P., Northbrook, Chester Co.
Baugher, H. G., Aspers, Adams Co.
Bell, Robert Harry, State College, Centre Co.
Bergey, James, Mifflintown, Juniata Co.
Blessing, David S., 4 N. Court St., Harrisburg, Dauphin Co.
Bogenshultz, N. J., North East, Erie Co.
Bolton, W. P., McCall's Ferry, Lancaster Co.
Bostwick, D. C. & Son, North East, Erie Co.
Bourue, Capt. J., North East, Erie Co.
Bowman, F. L., North East, Erie Co.
Boyd, J. C., Guy's Mills, Crawford Co.
Boyer, W. W., Arendtsville, Adams Co.
Bream, Samuel, Biglerville, Adams Co.
Brenneman, J. W., Willow Street, Lancaster Co.
Briggs, J. S., Norristown, Montgomery Co.
Brinton, Samuel L., West Chester, No. 10, Chester Co.
Brinton, William H., Parkesburg, Chester Co.
Brooke, R. G., Schwenkville, No. 2 Montgomery Co.
Brown, M. B., North East, Erie Co.
Brunges, Howard F., Tunkhannock, Wyoming Co.
Brunges, Hon. Stanley, Tunkhannock, Wyoming Co.
Bucher, Dr. I. Riley, Lebanon, Lebanon Co.
Bucher, Floyd S., State College, Centre Co.
Buckwalter, Silas K., Lancaster, No. 8, Lancaster Co.
Bullers, A. J., Brookville, No. 6, Jefferson Co.
Bullock, W. H., Honesdale, Wayne Co.
Burgess, C. L., Lovelton, Wyoming Co.
Burnley, William, North East, Erie Co.
Butt, G. Will, North East, Erie Co.
Butt, J. L. Gettysburg, Adams Co.

C.

Carnahan, Dayton, North East, Erie Co.
Carr, E. E., North East, Erie Co.
Case, B. J., Sodus, N. Y.
Catchpole, E. W., North Rose, N. Y.
Chapin, Irvin, Shickshinny, Luzerne Co.
Christman, James M., Fort Hunter, Dauphin Co.
Claar, William, Queen, Bedford Co.
Cocklin, E. H., Siddonsburg, York Co.
Cope, Joseph, Westtown, Chester Co.
Coursen, I. H., Wyoming, Luzerne Co.
Couse, Norman W., North East, Erie Co.
Coward, E. H., Pittston, Luzerne Co.
Craig, John F., Sligo, Clarion Co.
Crawford Bros., North East, Erie Co.
Critchfield, Hon. N. B., Harrisburg, Dauphin Co.
Cumbler, H. B., Logania, Perry Co.
Cummings, R. M., Montandon, Northumberland Co.

D.

Davis, David, North East, Erie Co.
Davidson, R. A., North East, Erie Co.
Deardorff, Anthony, Gettysburg, No. 5, Adams Co.
Deardorff, J. A., Cashtown, Adams Co.
Deming Co., Salem, Ohio.
Demming, H. C., 15 N. 3d St., Harrisburg, Dauphin Co.
Dill, Robert, North East, Erie Co.
Doyle, George N., Tunkhannock, Wyoming Co.
Duncan, P. F., Duncannon, Perry Co.
Durell, Charles A., Reading, Berks Co.

E.

Eastman, Jas. E., Rome, Bradford Co.
Eichholz, Henry, Waynesboro, Franklin Co.
Ellis, D. M., Bridgeport, Montgomery Co.
Emerson, J. B., M.D., 20 E. 30th St., New York City.
Engle, D. J., Beaver, No. 2, Beaver Co.
Engle, Ezra B., Marietta, Lancaster Co.
Esbenshade, F. L., Refton, Lancaster Co.
Estabrook, F. L., Athens, Bradford Co.
Evans, Earl, North East, Erie Co.

F.

Fassett, F. H., Meshoppen, Wyoming Co.
Fassett, Wallace, Mehoopany, Wyoming Co.
Faust, S. L., State College, Centre Co.
Fenstermaker, P. S., Allentown, Lehigh Co.
Fernald, George H., North East, Erie Co.
Finn, A. O., Clifford, Susquehanna Co.
Force, J. M., North East, Erie Co.
Foster, T. C., Winfield, Union Co.
Frederick, T. J., Springchurch, Armstrong Co.
Freed, A. J., Racine, Butler Co.
Freed, W. A., Racine, Butler Co.
Freer, Edgar, Factoryville No. 3, Wyoming Co.
Fuller, N. P., North East, Erie Co.
Fulton, Hugh R., Lancaster, Lancaster Co.

G.

Garrahan, R. H., Kingston, Luzerne Co.
Garrettson, Eli P., Biglerville, Adams Co.
Garrettson, Robert, Flora Dale, Adams Co.
Gass, W. J., Paxinos, Northumberland Co.
Gay, G. E., Pittston, No. 1, Luzerne Co.
General Chemical Co., 223 Market St., Philadelphia.
Gibson, Ralph, State College, Centre Co.
Gill, J. F., North East, Erie Co.
Gochnauer, J. D., York Springs, Adams Co.
Good, Martin R., Narvon, Lancaster Co.
Griest, A. W., Flora Dale, Adams Co.
Griest, F. E., 3825 Baring St., Philadelphia.
Griest, C. A., Guernsey, Adams Co.
Gross, Joshua W., Harrisburg, Dauphin Co.
Gump, Dr. S. H., Bedford, Bedford Co.

H.

Haines, Miss Mary M., Cheltenham, Montgomery Co.
Harris, Edwin, Aspers, Adams Co.
Harris, Joseph, Shamokin, Northumberland Co.
Harris, Philip, Light Street, Columbia, Co.
Harshman, U. W., Waynesboro, Franklin Co.
Hartley, A. D., Pottstown, No. 3, Montgomery Co.
Hartman, William, Etters, No. 1, York Co.
Hartman, E. V., 625 Linden St., Scranton, Lackawanna Co.
Haskell, J. Wayne, North East, Erie Co.
Henning, J. C., North Mehoopany, Wyoming Co.
Hershey, H. F., State College, Center Co.
Hibshman, George, Ephrata, Lancaster Co.
Higgins, John, North East, Erie Co.
Hinkle, Horace, York, York Co.
Hill, William D., North East, Erie Co.
Howe, H. B., Wellsboro, Tioga Co.
Huber, J. H., Gettysburg, Adams Co.
Hull, D. W., Waymart, Wayne Co.
Hull, Ray W., Waymart, Wayne Co.
Hunt, Dr. Thomas F., State College, Center Co.
Huston, Charles L., Coatesville, Chester Co.
Hutchinson, R. H., 51 Front St., New York City.

I.

Ide, Silas C, Alderson, No. 1, Luzerne Co.

J.

Jacob, P. A., Wellsburg, W. Va.
Jacques, Mrs. E. S., Germantown, Philadelphia Co.

K.

Kane, J. A., Biglerville, Adams Co.
Keeney, A. C., Laceyville, Wyoming Co.
Keeney, Fred. B., Laceyville, Wyoming Co.
Kent, A. H., Cleveland, Ohio.
Kauffman, E. F., York, No. 3, York Co.
Kernan, William, Dushore, Sullivan Co.
Ketchum, E. M., North East, Erie Co.
Kidder, N. A., North Warren, Warren Co.
Kidder, O. S., North East, Erie Co.
Kilmer, A. B., Springbrook, Lackawanna Co.
Klinefelter, U. S., Biglerville, Adams Co.
Kloss, D. S., Tyrone, Blair Co.
Knouss, Francis C., Bethlehem, Northampton Co.
Knuppenburg, D. A., Lake Carey, Wyoming Co.
Knuppenburg, J. A., Tunkhannock, Wyoming Co.
Koons, Dr. P. R., Mechanicsburg, Cumberland Co.
Krady, W. S., Mt. Joy, No. 2, Lancaster Co.
Krewson, James, Cheltenham, Montgomery Co.
Krug, H. G., 203 S. McKean St., Butler, Butler Co.

L.

Laub, H. H., Jr., Lewistown, Mifflin Co.
Lawver, Rufus, Biglerville, Adams Co.
Lee, Ross F., Somerset, Somerset Co.
Leet, Charles A., North East, Erie Co.
Leet, C. C., North East, Erie Co.
LeFevre, T. C., 5104 Brown St., Philadelphia.
Leighton, James G., Tunkhannock, Wyoming Co.
Leonard, Frank E., Carlisle Springs, Cumberland Co.
Lewis, Bradley W., Tunkhannock, Wyoming Co.
Lewis, H. G., Pittston, Luzerne Co.
Lewis, W. J., Pittston, No. 1, Luzerne Co.
Lockwood, Harry C., Mt. Pocono, Monroe Co.
Lohmann, Karl B., State College, Centre Co.
Loomis, Edward, North East, Erie Co.
Luke, C. A., North East, Erie Co.

M.

McAllen, R. W., Fannettsburg, Franklin Co.
McBride, Charles G., State College, Centre Co.
McCanna, F. J., Pittston, Luzerne Co.
McClelland, John B., Cannonsburg, Washington Co.
McCord, F. H., North East, Erie Co.
McDonald, James A., North East, Erie Co.
McDonald, T. M., North East, Erie Co.
McFarland, J. Horace Co., Harrisburg, Dauphin Co.
McGowan, H. G., Geigers Mills, Berks Co.
McLaughlin, Joseph B., North East, Erie Co.
McLaughlin, Joseph M., North East, Erie Co.
McMullen, S. A., Waymart, No. 3, Wayne Co.
McQuitty, A. J., North East, Erie Co.
McSparran, W. F., Furniss, Lancaster Co.
McWilliams, Howard C., State College, Center Co.
MacAskie, Kenneth G., State College, Center Co.
Mackall, R. C., Beaver, Beaver Co.
Macneal, W. H., Parkesburg, Chester Co.
MacVeagh, Walter F., 326 Mulberry St., Williamsport, Lycoming Co.
Maffet, Miss M. A., 262 S. Franklin St., Wilkes-Barre, Luzerne Co.
Martin, Hon. A. L., Harrisburg, Dauphin Co.
Marshall, W. E., North East, No. 5, Erie Co.
Mayer, H. M., Rohrerstown, Lancaster Co.
Mayer, Dr. I. H., Willow Street, Lancaster Co.
Menger, G. E., Factoryville, No. 3, Wyoming Co.
Miller, A. Kent, Somerset, Somerset Co.
Miller, Norman G., Marion, Franklin Co.

Minter, D. G., Gettysburg, No. 5, Adams Co.
Moon, William H., Morrisville, Bucks Co.
Moorehead, E. T., North East, Erie Co.
Moorehead, J. A., North East, Erie Co.
Moorehead, R. J., North East, Erie Co.
Mottier, C. H., North East, Erie Co.
Moxon, J. R., 60 Wall St., New York City.
Myers, Prof. C. E., State College, Center Co.
Myers, George P., Biglerville, Adams Co.
Myers, Levi M., Siddonsburg, York Co.

N.

Nesbit, J. W., Oakdale, Allegheny Co.
Newcomer, Aaron, Midvale, Franklin Co.
Newcomer, W. S., Glen Rock, York Co.
Nissley, A. H., Bamford, Lancaster Co.
Nissley, Walter B., State College, Center Co.
Nix, J. L., Homer City, Indiana Co.
Norris, H. E., North East, Erie Co.
Norton, W. C., Waymart, Wayne Co.
Norton, W. M., Waymart, No. 1, Wayne Co.

O.

Oldach, J. F., North East, Erie Co.
Oyler, George, Gettysburg, No. 5, Adams Co.
Orton Bros., North East, Erie Co.
Ottaway, Frank, North East, Erie Co.

P.

Patterson, James A., Stewartstown, York Co.
Peachy, J. H., Belleville, Mifflin Co.
Pelton, Ward C., State College, Center Co.
Pennock, Edw. A., Chatham, Chester Co.
Persing, E. E., Sunbury, Northumberland Co.
Peters, J. E., North East, Erie Co.
Peters, Earl, Carlisle, Cumberland Co.
Phillipson, George, Tunkhannock, Wyoming Co.
Piatt, F. H., Tunkhannock, Wyoming Co.
Pierce, B. R., North East, Erie Co.
Pierce, George E., North East, Erie Co.
Pollock, G. B., Wyoming, Luzerne Co.
Pratt, B. G., 50 Church St., New York City.
Prickett, Josiah W., Aspers, Adams Co.
Pyle, Josiah W., Kennett Square, Chester Co.

R.

Raffensperger, Charles E., Arendtsville, Adams Co.
Rakestraw, Thomas, Kennett Square, Chester Co.
Reel, George L., 519 Walnut St., Columbia, Lancaster Co.
Rice, Daniel, New Bloomfield, Perry Co.
Rice, Louis S., Scranton, Lackawanna Co.
Rick, John, Reading, Berks Co.
Richards, A. C., Schellburg, Bedford Co.
Rife, Jacob L., Camp Hill, Cumberland Co.
Rinehart, George W., York, No. 4, York Co.
Rinehart, E. S., Mercersburg, Franklin Co.
Roberts, Horace, Moorestown, N. J.
Rittenhouse, Dr. J. S., Lorane, Berks Co.
Robinson, Fred J., Honesdale, No. 3, Wayne Co.
Robinson, Byron H., Meshoppen, Wyoming Co.
Rohde, William, Johnstown, Cambria Co.
Root, A. W., Manheim, Lancaster Co.
Ross, W. H., North East, Erie Co.
Rouf, Fred., Waltonville, Dauphin Co.
Rozelle, H. E., Pittston, Luzerne Co.
Rupp, D. C., Shiremanstown, Cumberland Co.
Runk, John A., State College, Center Co.
Rush, J. G., West Willow, Lancaster Co.

S.

Sampson, H. O., Scranton, Lackawanna Co.
Sangree, J. R., Glenshaw, No. 2, Allegheny Co.
Satterthwait, A. F., 334 Spring St., Middletown, Dauphin Co.
Saylor, J. C., Pottstown, No. 5, Montgomery Co.
Schaeffer, Dr. N. C., Lancaster, Lancaster Co.
Searfoss, W. H., Wyoming, No. 1, Luzerne Co.
Sedelmeyer, L. H., North East, Erie Co.
Selkregg, L. D., North East, Erie Co.
Shalcross, Frank R., Frankford, Philadelphia Co.
Shorb, Albert, Hanover, No. 2, York Co.
Shreve, Hon. Milton W., 562 W. Eighth St., Erie, Erie Co.
Siegler, Edward Horace, State College, Center Co.
Siegler, Franklin, 320 S. 44th St., Philadelphia.
Sloan, E. H., Orangeville, Columbia Co.
Smith, Arthur H., State College, Center Co.
Smith, Guy C., State College, Center Co.
Smith, W. O., M.D., 15 S. Market Square, Harrisburg, Dauphin Co.
Snavely, Henry C., Cleona, Lebanon Co.
Snavely, J. R., Harrisburg, Dauphin Co.
Snavely, M. H., Cleona, Lebanon Co.
Stahle, C. E., Gettysburg, Adams Co.
Stark, O. V., Nicholson, Wyoming Co.
Stein, George E., East Prospect, York Co.
Stephens, A. W., Hebron, Ohio.
Stewart, Prof. John P., State College, Center Co.
Stewart, John W., Martinsburg, W. Va.
Stewart, William, Landisburg, Perry Co.
Stone, B. M., Stull, Wyoming Co.
Stone, H. S., Nicholson, Wyoming Co.
Stoney, R. J., Jr., 424 Fifth Ave., Pittsburgh, Allegheny Co.
Stover, F. S., Bowmansville, Lancaster Co.
Stow, W. L., North East, Erie Co.
Strode, A. Darlington, West Chester, Chester Co.
Stull, James B., North East, Erie Co.
Surface, Prof. H. A., Harrisburg, Dauphin Co.
Swank, Luke H., State College, Center Co.

T.

Taylor, Prof. B. C., Chester, Delaware Co.
Tennant, J. G., Westfield, N. Y.
Thayer, J. C., Tunkhannock, Wyoming Co.
Thomas, Prof. Benjamin F., Lewisburg, Union Co.
Thorpe, Francis Newton, Mt. Holly, N. J.
Treible, C. E., Vosburg, Wyoming Co.
Trostle, F. C., York Springs, Adams Co.
Tyson, A. R., Norristown, No. 1, Montgomery Co.

V.

Van Tuyle, G. M., Pittston, No. 1, Luzerne Co.

W.

Wadhams, Miss L. F., Wilkes-Barre, Luzerne Co.
Wagner, George A., Landisburg, Perry Co.
Wagner, Harry S., Carlisle, Cumberland Co.
Walton, Robert J., Waltonville, Dauphin Co.
Walter, William, Blairsville, Indiana Co.
Weidner, A. I., Arendtsville, Adams Co.
Watterson, W. F., Cleveland, Ohio.
Watts, Prof. R. L., State College, Center Co.
Weaver, Abram, Windber, Somerset Co.
Wells, W. D., North East, Erie Co.
Whitehill & Co., North East, Erie Co.
Wheaton, E. H., Knoxville, Tioga Co.
Wiese, H. B., Parkesburg, Chester Co.
Wilbur, Harry, Bethlehem, Northampton Co.
Williams, J. L., Gettysburg, Adams Co.
Wills, F. A., 1206 Montgomery Ave., Philadelphia.
Wing, W. O., North East, Erie Co.
Wilsey, Riley, Falls, No. 1, Wyoming Co.

Withrow, J. C., Van Port, Beaver Co.
Wolfe, C. A., Aspers, Adams Co.
Woodruff, N. S., North East, Erie Co.
Wright, A. Cooper, Hummelstown, Dauphin Co.
Wright, Prof. W. J., State College, Center Co.

Y.

Yentzer, J. R., Conestoga, Lancaster Co.
Young, Willard S., 218 Briggs St., Harrisburg, Dauphin Co.

MEMBERSHIP BY COUNTIES.

The following list shows the number of Annual and 1910 Members in each county.

This matter of county membership is a perfectly proper field for competition and the officers are glad to encourage friendly rivalry in this direction.

Erie County heads the list this time, but already there are rumors that Adams County will be out for the lead next year. Erie is strong and spunky and the prospect is good for a lively contest. In the mean time it is perfectly possible that Wyoming or Lancaster or Center, with State College to draw on, may beat both. The county that *leads next year* will have a *fine representation* in the State Association; mark my word!

64 Erie.
35 Adams.
25 Wyoming.
24 Center.
23 Lancaster.
22 Dauphin.
15 Chester and Luzerne.
11 Philadelphia and York.
9 Franklin and Montgomery.
7 Wayne.
6 Cumberland.
5 Northumberland and Perry.
4 Allegheny, Berks, Lebanon and Lackawanna.
3 Beaver, Bedford, Butler, Cambria, Columbia and Somerset.
2 Blair, Bradford, Bucks, Indiana, Juniata, Lycoming, Mifflin, Northampton, Tioga, Union and Westmoreland.
1 Armstrong, Clarion, Clinton, Crawford, Delaware, Jefferson, Lehigh, Monroe, Snyder, Sullivan, Susquehanna, Warren and Washington.

ROLL OF HONOR.

The following have qualified for the 1910 Roll of Honor, by securing five or more new members (not renewals), one life member counting as ten annuals. The Treasurer and Secretary are not eligible:

Miss M. A. Maffett, Wilkes-Barre.
H. F. Hershey, State College.
C. G. McBride, State College.
F. H. Fassett, Meshoppen.
D. A. Knuppenburg, Lake Carey.
R. H. Garrahan, Kingston.
D. W. Hull, Waymart.

SPECIAL ATTENTION

at this time, is called to the Constitution and By-Laws, for a complete revision at the next annual meeting is proposed and will be considered.

CONSTITUTION.

Article 1. This society shall be entitled "The State Horticultural Association of Pennsylvania," and its object shall be the advancement of the science of horticulture and pomology.

Article 2. Any person may become a member of this society by a vote of a majority of the members present at any meeting, and by paying into the treasury the sum of one dollar annually; or the payment of one dollar to the treasurer, at any time, shall constitute membership, and entitle said member to a copy of the proceedings. The payment of ten dollars at one time will constitute life membership.

Article 3. Its officers shall consist of a president, three vice-presidents, recording and corresponding secretary and a treasurer, all of whom shall be elected annually by ballot.

Article 4. The following committees shall be appointed: A committee of five on nomenclature; a committee of three on insects, of whom the professor of entomology shall be chairman; an executive committee consisting of the elective officers of this association and three of whom, including the president, shall constitute a quorum; and a general fruit committee, consisting of one from each county represented, with a general chairman of the whole, each member of the fruit committee to have the privilege of appointing two assistants.

Article 5. The society may, at any time, elect honorary members.

Article 6. The society may, from time to time, appoint professors on etomology, botany, horticultural chemistry and geology.

Article 7. This constitution may be altered or amended by a vote of two-thirds of the members present at any regular meeting, notice of the proposed amendment, in writing, having been previously given.

Article 8. Seven members shall constitute a quorum for the transaction of business.

BY-LAWS.

Article 1. The committee on nomenclature shall collate and decide the standard and synonymous names of all fruit known in the society with the authorities for each, and report, so far as practicable, at each regular meeting, and record the same in a book kept for that purpose.

Article 2. The general fruit committee shall carefully and thoroughly investigate the subject of fruit culture in general. Each local committee of three shall collect such useful and interesting information in relation to the subject as may be in their power, and embody the same in monthly reports, to be made to the general chairman; such reports to be by him examined and embodied in his annual and semi-annual reports. Also that the said county committee shall form ad interim committees for their respective counties, and further that said ad interim committees are hereby authorized to publish the reports in the "Gardener's Monthly," or such other paper, as they may select, the same having been first submitted to the chairman of the general fruit committee for his approval: Provided, That said publication shall be free of expense to the association.

Article 3. The annual meeting of the association shall be held on Tuesday before the third Wednesday of January of each year, at such a place as the executive committee may appoint, at which time the election for officers shall take place; said officers to serve from the close of the meeting at which they are elected to the close of the succeeding annual meeting, at which an exhibition and discussion of fruits shall take place and other business transacted in the following order:

1st. Reading of minutes of previous meeting.
2d. Roll call and dues collected.
3d. Election of officers.
4th. Reports of officers.
5th. Reports of standing committees.
6th. Reports of special committees.
7th. Unfinished business of former meeting.
8th. New business.

The nomination and election of new members shall be in order at any time during the session.

Article 4. Other meetings may be convened by the executive committee at such time and place as they may appoint.

Article 5. No member who is in arrears for dues shall be eligible for any office, or serve on any standing committee; and any member who shall neglect to pay his dues shall cease to enjoy the privileges of membership.

PROCEEDINGS

OF THE

FIFTY-FIRST ANNUAL MEETING

OF THE

State Horticultural Association

of Pennsylvania

HELD AT

Tunkannock, Pa., January 11, 12, 13, 1910.

The Fifty-first Annual Meeting of the State Horticultural Association of Pennsylvania convened in the Court House at Tunkhannock at 1.30 o'clock, Tuesday aftennoon, January 11, 1910, with the President, Mr. Gabriel Hiester, in the Chair.

The President.—The meeting will please come to order. The first number on the program is the reading of the minutes of the last meeting.

Mr. Eldon.—Inasmuch as the subject matter of the minutes appears in the printed proceedings, I move that the reading be dispensed with at this time.

Mr. Fassett.—I second the motion.

This motion was carried in the regular way.

The President.—The next number on the program is an address of welcome by the Hon. Stanley Brunges.

ADDRESS OF WELCOME.

By the Hon. Stanley Brunges.

Mr. Chairman and Members of the State Horticultural Association: I have been requested to be brief in my remarks. To this request I shall most cheerfully assent, and promise you that my address will have the merit of brevity. I am entirely unaccustomed

to public speaking. My whole life has been devoted to actual agricultural pursuits, and still is, and I feel unfitted for the position into which I have been impressed.

I feel that perhaps words will fail me in my efforts to express to you the appreciation and profound gratitude of this people, that you have come among us, and in welcoming you to this little town, nestled among the hills of northern Pennsylvania, where for almost a hundred years it has been standing peacefully on the banks of the beautiful Susquehanna, as it flows on to mingle its pure and sparkling waters with the briny ocean. I say I feel unable to express the gratitude of this people, that you have come among us to give us an uplift and an inspiration to higher and better things in the field of Horticulture. We may learn lessons from failures, and often valuable lessons, never to be forgotten, from our mistakes, and in many cases an uplift and a boon comes to us from each others' mistakes and failures. We look to each other from a desire to emulate, and possibly from a desire to excel.

We do not have the broad and fertile fields of southern Pennsylvania, where we might farm for pleasure and grow fruit and grain profitably and easily. Our hills are steep, and our soil less productive. It requires continued and prolonged effort to live comfortably and lay a little by for a rainy day. In this respect we are unfortunate, and yet we try to extract some comfort from the fact that our struggles are crowned with some degree of success. Great achievements are not attained without great effort. History tells us that the communities which struggle to overcome severe obstacles, are the communities which last. History tells us that the communities which struggled with poverty and with adverse conditions are the communities which produced great men. Old Virginia, when she was struggling against great odds, produced her Washington, her Jefferson, and her Patrick Henry. When these severe obstacles were overcome, and she rested from her toil and from her labors, and turned her soil over to the laborers from far-off Africa, she began to fall, and from the point where he began to labor, the black man began to rise.

And this, gentlemen, is one of the reasons why we rejoice that you have come among us, to guide us right, and to encourage us to struggle on until success shall crown our efforts.

When our fathers cleared away the timber to establish the farm, they planted orchards, not for any commercial purpose, but only for their intrinsic value. They did not see any commercial value in them, but they did not consider the farm complete without the orchard. Some of them gave some little attention to their orchards. Many others have been entirely neglected. A neglected orchard has been compared to a neglected farm, and, gentlemen, you can readily see the analogy, because a neglected orchard is not only an injury to itself, but it becomes a constant menace to the whole community. With our Scale, and our lice, and our moths, and all the legion of ills to which our orchards are heir, we can readily see why orchards don't do so well. Our orchards are failures unless we adopt heroic methods and carry them on with expediency and dispatch. We look to you, gentlemen, to interpret for

us the handwriting on the wall, and to give us the instructions that will improve our orchards.

We believe, and we believe that we can make you believe, that we can grow as good fruit, and as good-flavored fruit in little Wyoming County, as is grown in any other section of our State, or of our land. What we need is to take hold and to work intelligently and industriously, and we have that in view.

I desire at this time to express the gratitude of the fruit growers of this section, for the good work, both by precept and by practice, which has been done by our esteemed neighbor and friend, the first officer of this Association, and I desire to say again, in welcoming you, I believe we feel and appreciate the honor and privilege of entertaining the Horticultural Association of the great State of Pennsylvania. We know it will be helpful to us, and we hope that when you come to go away from among us, it will be with the feeling that it was well for you to be here and that sometime, in the not distant future, we may induce you to come again.

And now, in behalf of the fruit growers of this section, and in behalf of the Horticultural Association of Wyoming County, and in behalf of the good people of Tunkhannock, which I think is one of the brightest spots on God's beautiful earth, I bid you a cordial welcome.

To this address of welcome, President Hiester responded as follows:

ADDRESS OF THE PRESIDENT.

By Gabriel Hiester.

I want to assure Mr. Brunges, the members of the Wyoming County Horticultural Association, and the citizens of Tunkhannock, that we are very glad that we have accepted Mr. Fassett's invitation to hold our meeting here. Four years ago, I think it was, I was invited to attend the annual meeting of the Wyoming County Horticultural Association. I met a few men, possibly five or so, who seemed to be impressed with the possibilities of the commercial apple in Wyoming County. There was no interest outside of this, and it seems incredible to me that these few men could in so short a time have worked up a sentiment resulting in this display of beautiful fruit grown right here in Wyoming County, by such a number of individuals, as is shown to-day. When I see it, I feel ashamed that I have not advanced as much as these men in "little Wyoming," as you are pleased to call it.

During the past year the Pennsylvania fruit grower has had a great many unusual conditions to contend with, some of them very discouraging, because they seemed to be entirely beyond his control.

First, we had a cold rain during the blossoming period, which seriously interfered with pollenation and caused a total failure of some varieties, and a partial failure of many others; warm rain at the period of ripening cut down the crop of cherries and strawberries below the point of profitable production, and furnished most

favorable conditions for the development of brown rot in the peach. Then succeeded the longest dry spell we have experienced for many years, during which insects of all kinds multiplied enormously. The apple aphis came in numbers heretofore unknown, and finished his destructive work before we were aware of his presence, and when we asked advice of our scientific men, they replied "It is too late to do anything this season; you may not have another such visitation for many years."

All the Scale insects multiplied in the warm, dry sunshine, without anything to hinder them, and many growers who thought their orchards were perfectly clean, found them badly infested before the close of the season.

And, yet, notwithstanding all these discouraging circumstances, commercial fruit culture has made greater strides in Pennsylvania during the past year than in any one year in its history. This statement is fully borne out by the magnificent display of fruit before us.

Some one said recently in a public address "one of these days Pennsylvania will be discovered by a fruit grower, and then the general market will get some fine fruit." I think this fruit display shows that it has already been discovered by several fruit growers. More counties are represented than ever before; more growers from each county are represented. The fruit, taken as a whole, is more perfect than ever before. The old worthless varieties have been eliminated; the varieties, with very few exceptions, have high quality, and are good sellers in the general market; all of which goes to show that more men all over the State, are seriously studying their business.

We find upon careful inquiry, that during the past year more spray rigs were purchased, and more spraying was done, not only for San Jos Scale, but also for fungous diseases. More fertilizers were used on orchards; more intelligence was displayed in their application; more seed was sown for the various cover crops; more fruit, both apple and peach, was thinned; more *new* barrels, and other uniform *new* packages were used; more care was exercised in grading and packing, and better prices were received than heretofore; more County Horticultural Societies were organized; more members were enrolled in the Association, among whom were a very gratifying number of life members.

The State Horticultural Association is working in harmony with the County Horticultural Societies, with the State Department of Agriculture, and the State Experiment Station. The orchard experiments which are being conducted by Prof. Stewart of the Experiment Station force, are already beginning to show some rather startling results, although they have run only two years, and we hope to derive great benefit from them in the future.

As we look back over the work of the past few years, everything seems to emphasize a statement that has often been made to this Society, namely: "We have all the natural advantages in Pennsylvania for growing fruit of the highest quality, and the best markets in which to sell it; all that we need is *men* properly trained for the work." State College is now prepared to train the men, and Prof. Watts, the very able head of the Department of Horticulture,

is actually engaged in the work. It is exceedingly gratifying to me to note the increased interest in Horticulture since Dr. Hunt was made Dean of the School of Agriculture, and Prof. Watts placed at the head of the Department of Horticulture. Four years ago there were nineteen Agricultural students; to-day there are four hundred and sixty-five, fully half of which are specializing in Horticulture.

Two years ago, during Farmers' Week, forty or fifty out of the four hundred farmers present, came to hear the lectures on horticulture. This year the lecture room was crowded to the door, with a number standing in the hall outside who could not get in. Two years ago one table was sufficient to hold the fruit displayed. This year, tables extending over a space more than one hundred feet in length, were filled with perfect, high-colored specimens of the leading varieties from twenty-one counties, representing sixty-four different orchards.

Altogether, I think we have great reason for congratulation and that we may all look forward with confidence for a very prosperous and happy New Year.

The President.—Next in order will be the Secretary's report.

REPORT OF THE SECRETARY.

CHESTER J. TYSON.

I am glad to report that your Association is in a thriving condition, showing some growth, and we believe, a tendency in the right direction. Effort has been made to secure new members, and more prompt renewals, with the following results:

In 1908 there were 110 paid annual members.

In 1909 there were 302 paid annual members,—119 of them secured through the summer meeting.

And yet with this nearly two hundred per cent. gain, your secretary hesitates to make public these very low figures before the delegates from other States; and does it only with the hope that you may share his shame, and forthwith get busy. An opportunity will be given you in a few minutes, to pay your dues for 1910. Don't let this opportunity go by. Then go after new members; ask your neighbor to join; continue to ask, and show him why, until he gives you his dollar, or mails it to the Treasurer or Secretary.

Through the efforts of Hon. N. B. Critchfield, Secretary of Agriculture, seconded by many members of this Association, the last session of our Legislature appropriated the sum of one thousand dollars for two years, or five hundred dollars a year, as "Aid to the State Horticultural Association." This is nearly fifty per cent. more than we have had heretofore; and I am sure you will rejoice with your officers in this recognition of our needs.

At our last annual meeting it was decided to hold a summer meeting if it became possible to do so. This was accomplished through the hearty co-operation of the Erie County Horticultural Association, and on August 3d and 4th a very successful meeting

was held at North East, in the heart of the Lake Erie Grape Belt. The State-wide attendance was less than had been hoped, but the local attendance was excellent.

We were addressed by Mr. C. E. Bassett, Secretary of the Michigan State Association, and by Mr. H. W. Collingwood, Editor of the "Rural New Yorker," two gentlemen who find admirers and make friends wherever they go, and by our own Professor, R. L. Watts, one of the busiest men I know, and always busy to some good end.

Two sessions were given to addresses, and a whole day was spent in visiting the vineyards of the district in the automobiles of the growers,—a most delightful trip.

The vast extent of the grape industry here, the almost perfect care being given the vines, the careful business-like methods and open-handed hospitality of the growers, were truly revelations to most of us.

Financially, the meeting was self-supporting, more than sufficient being collected by the Erie County folks in the shape of membership fees, to cover all expenses of the meeting. Special credit is due, and is hereby given and expressed, to the local committee of arrangements, whose names I feel like repeating: L. G. Youngs, A. I. Loop, George W. Blaine, Willis E. Gray, George E. Pierce, Frank B. Crawford, D. C. Bostwick, Francis Newton Thorpe. They are such whole-souled, broad-minded gentlemen as it does one good to meet.

Your Executive Committee favors the plan of Summer Meetings out among the growers and recommends that another such meeting be held during the summer of 1910, provided a suitable place can be found and the necessary funds are forthcoming.

The present meeting has been arranged along somewhat more elaborate lines than has been our custom. Several additional sessions and the banquet are innovations which we trust will meet with your approval. We ask your indulgence in any shortcomings, and your heartiest support in carrying out the program.

The President.—The next number on the program calls for the report of the General Fruit Committee.

REPORT OF THE GENERAL FRUIT COMMITTEE.

JOHN D. HERR, *Chairman.*

From the standpoint of horticulture the State of Pennsylvania is divided like ancient Gaul, into three parts, based on distinct differences in both soil and climate, which is accounted for by the fact that the Allegheny Mountain system crosses the entire State in a diagonal direction from southwest to northeast. The boundaries of these sections for the purpose of this report have been based on these physical features as well as the isothermal lines.

Section one comprised all that territory north of the isothermal line 48 degrees of mean annual temperature, which conforms almost with the latitude 41 degrees 15 minutes north, except a dip

to the south in the western part of the State, so as to include Mercer, Butler and Lawrence Counties.

Section three consists of the southeastern part of the State and is bounded by an imaginary line starting at the north end of Bucks County and extending in a northwesterly direction to the junction of the east and west branches of the Susquehanna River; thence southwest, following the river to the mouth of the Juniata; thence, the range of the Blue Ridge to Mason and Dixon Line. This boundary coincides almost exactly with the isothermal of 51 degrees mean annual temperature.

Section two comprises the intermediate territory and consists largely of the region covered by the different ranges of the Allegheny Mountains.

This paper is based on the data supplied during the last few weeks by 75 correspondents representing 50 counties of the State, which reports show much thought and care and great interest, and my sincere thanks are herewith extended to all who have given assistance in this work. The promptness and comprehensiveness of these reports, together with the painstaking care used in making them out, speak well for the future of Horticulture in Pennsylvania. Upon the receipt of these reports I have carefully tabulated them and this paper contains a resumé of the data contained in them.

The yield of apples in Section 3 was above the medium, but far from a full crop. Sections 2 and 1, according to the reports have had a poor crop with very few exceptions. The Adams-Franklin County apple growing region report the largest yields for the year. The reports on quality and prices coincides about with the yield, having been good in Section 1 and lower in the remainder of the State. The answers to the question "Is this crop profitable?" have almost universally been in the affirmative, only 5 answers in the negative and the reasons given are poor soil, too many worms, wet weather, and lack of interest. Successful growers attribute their success to careful attention to the Cardinal Orchard operations, except one case where the report stated that his success was due to accident. Dry weather seems to have been adverse, militating against the fruit grower all over the State and was without doubt the most discouraging conditions with which he had to deal, as, aside from such measures of cultivation as he could resort to, it was absolutely beyond his control.

I made a special effort to find out the leading commercial apples in each county of the State, and purposely included the question intending to bring out this fact, and I find that in Section 3 the York Imperial comes first, having received 8 mentions out of a possible 18. Smith's Cider, Smoke House, and Baldwin stand 2d with three votes each. Stayman's Winesap has two; Fallawater and Grimes each have one. Other profitable varieties are Rome Beauty, Mammoth Black Twig, Rambo, Gravenstein, Ben Davis, Jonathan, Crauser, Dominee, Yellow Transparent, Kime, Strine-town Pippin, and Summer Rambo.

In Section 2 the leading apple is Baldwin, which received 21 votes out of a total of 30; Northern Spy comes second with 5 votes, the others being divided between York Imperial, Fallawater

and Strine-town Pippin, while other popular varieties of this section are the Rhode Island Greening, Wagner, Ben Davis, Gano, Jonathan, Winesap, Roxbury Russet, Smoke House, Yellow Transparent, Delaware Winter and Benoni.

The leading apple of Section 1 has proved to be the Baldwin also with the Northern Spy a close second. Other profitable varieties mentioned are the King, Rhode Island Greening, Maiden, Blush Ben Davis, Hubbardston's Nonesuch, Wealthy, Wagner, Smoke House, Smith's Cider, Tolman Sweet, Red Astrachan, Bismark and Bellfleur.

There are only a few localities in which the grower reports the packing of apples, it is enlightening to note the large number reporting, who sell their fruit in local markets. This is not surprising when one considers the enormous demand for fruit within the borders of this State of 7,000,000 population, many of them included in the manufacturing towns of the State. No other State in the Union affords a better home market for all kinds of fruit.

The prices of apples in the commercial district range, as a rule, from $2.00 to $2.75 per barrel, the highest price mentioned is $5.00 per barrel for fancy grades.

The yield of pears is reported poor all over the State, with good and medium varieties selling at good and fair prices, which range from 75 cents to $2.00 per bushel. The only correspondents reporting the increased commercial pear planting comes from Section No. 2, and these report for the counties of Bedford, Blair, Clarion, Armstrong and Cambria.

The most destructive pests of pears are the San Jose Scale, and Pear Blight, the universal infection of which is indicated by the fact that all reports except 10 gave Blight as an answer to this question. Two reports gave caterpillars, one canker-worm, and one curculio, one codling moth, and one carelessness on the part of the grower.

One good feature of this report is the fact that peach growers give almost universal expression to the good peach yields, good quality and good prices of this fruit in the entire State, except 6 growers from the northern section who report the yield as being poor and attribute the fact to late frosts. The prices of peaches range from $1.00 to $4.50 a bushel. The conditions are favorable to the growth of peaches in sections 3 and 2 except for the dry weather of the last few seasons. The cold winters of the northern tier of counties of the State, make the growing of this fruit rather hazardous. One man reporting his crop is destroyed by frosts three years out of four.

The most destructive pests of the peach are the San Jose Scale, borers and yellows. Brown rot is also reported as well as curculio. It was the chairman's intention to call out all possible preventives of borers and the question inserted in the list, "What successful preventives have been found valuable for this insect?" Unfortunately, it seems this question was somewhat misunderstood and instead of preventives, the usual answer was the most common cure, consisting of cutting them out with a knife. A few, however, have answered according to the meaning of the question and painting

apple trees with white lead and raw linseed oil, wrapping trees with tar paper, spraying with lime-sulphur mixture, wrapping with wooden veneer, clean culture, mounding and eternal vigilance were mentioned as preventives.

In addition to this I wish to add my own experience with this pest. In the Spring of 1908, I planted, among other trees, 2,000 apple and peach trees, having left 100 trees for which I had no room, and which were heeled in beside the orchard. During the latter part of the month of June I applied to the trunks of those planted Good's Caustic Potash Whale Oil Soap, two pounds to one gallon of water, but did not apply any to the healed in trees. In the Spring of 1909 I took up the heeled in trees and found that 80 per cent. were infested with borers while on the treated 2,000 trees only one borer was found after a careful search. I would add this treatment therefore to the list given in these reports.

One large fruit grower submits as the most destructive pests that of careless workmen and mules. This statement many of us will heartily endorse because they are not only destructive, but exceedingly hard to control as no spray ever concocted will be in any way effective in checking their miserable ravages.

In answer to the question, "Is brown rot controlled?" the concensus of opinion is in the negative. The most common spray used to prevent rot is Bordeaux mixture, a few prefer to use the self-boiled lime-sulphur solution with indifferent results. This spray seems decidedly to be still in the experimental stage. In answer to the question, is peach culture profitable, we have only a have-dozen "nos" which come from the northern part of the State, and even they admit it to be profitable in favorable locations. This matter of site is exceedingly important in the northern section.

The yield of plums was as a rule from medium to very good, with quality fair to good and prices universally good, ranging from $1.00 to $3.00 per bushel. Conditions were usually favorable. Most destructive pests are San Jose Scale, Rot, Curculio, Black Knot, and Yellows. The most profitable varieties of plum seem to be the 1st Green Gage, 2d German Prune, 3d Lombard, 4th Burbank, 5th Abundance and Moore's Arctic. Two other profitable plums are 6th the York State Prune, and 7th the Damson. One grower reports that he grows most the Domestica and that they stand full strength of Bordeaux Mixture without injury to the foliage or fruit. Few plums are shipped outside of the State and the packages in which they are marketed range from the quart box to a half-bushel basket or crate.

The unanimity on the subject of cherry-growing is startling. Practically every correspondent answers by saying that cherry-growing is not largely engaged in, but that it is profitable. The small number of trees being planted may be the cause of its being profitable, but a few of us at least are planting cherry in the hope that the demand will consume more cherries than are already grown, especially in the neighborhood of the larger markets. As to the best varieties, Montmorency is in the lead, with Early Richmond a close second. Other varieties favorably mentioned, are Governor

Wood, Black Tartarian, Napoleon Biggareau, Morello, May Duke, Ida, Windsor, Reine Hortense.

Excepting in a very few cases the reports state that grape-growing is carried on only for the local market. The success attending the growing of grapes is very good, good and fair. Few localities report none grown and these only in the northern tier of counties. According to the reports there are practically only six varieties of grapes grown in this State which can be considered best varieties, namely: Concord, Niagara, Worden, Moore's Early, Brighton and Isabella.

The most profitable varieties of strawberries seem to be the Sharpless, Haverland, Gandy, Bubach, Wm. Belt, Glen Mary, and Senator Dunlap, in the order mentioned.

In the line of the most profitable varieties of raspberries the Cumberland is an easy winner. Other varieties frequently mentioned are the Cuthbert, Gregg, Kansas and Lawton.

The Kitatinny, Ward's Eldorado, Taylor and Snyder are among the best varieties of blackberries.

Other small fruits mentioned as profitable are: Currants and Gooseberries. The season for vegetables was exceedingly unfavorable to success on account of the general drought all over the State. The crops paying best in the order of their importance are: Potatoes, cabbage, tomatoes, sweet corn, cucumber, beets and celery. The most destructive pests are: Potato Bug, Potato Blight, Green Aphis, Flea Beetle, Cabbage Worm, Anthranose, Root Maggots and Celery Rust.

Market gardening is profitable according to the answers to the questions everywhere, except in five counties, in which the market is poor. I might add an extract from a letter of one of the leading market gardeners of the State, who writes: "There is probably no section where rust, blight, fungus, insects or other diseases are as injurious as in this valley. We have borers, yellows, scale, anthranose, rot, aphids, leaf blight and other pests to contend with as well as frosts and poor soil; also two successive dry seasons, so that the prospects are not very encouraging."

On the subject of pests and sprays, I have gone into considerable details and in answer to the question, is San Jose Scale held in check? all answer "yes" except 14. Under remedies, I have received 50 answers in favor of lime-sulphur solution and 13 for all other sprays including oils.

In quite a few localities in Section 1 no scales are reported and no spraying is done for this pest. Under the title, "What sprays are not satisfactory?" seven mention the oils. Five of which specify Scalecide, one Target Brand, one crude oil, and in addition to these a few report damage from the use of Bordeaux Mixture. I have requested these correspondents to specify distinctly in what this injury consists, and for the Bordeaux Mixture the answer is "defoliate the trees," and "russet the fruit," while for the oil injuries the report is, "roughens the bark," "enlarges the lenticils," "kills the bark" and "kills the trees."

A report from one of the leading and most successful fruit-growers in the State is that Scalecide gives best results in his

orchard. Another that he has used this spray in his apple orchard for 5 years without damage to the trees. While a third equally large grower states he would allow no oils to be used on his trees.

Spraying for Codling Both is largely on the increase and over 50 answered "yes" to this question. Arsenate of lead is the poison most used. Paris Green, London Purple, Arsenite of Lime and Pyrox are frequently mentioned as being used. A few mention Bordeaux sprays for the Codling Moth in spite of the fact that volumes have been written on the subject of spraying with fungicides for fungus diseases and stomach poisons for chewing insects. The results of Codling Moth sprays is universally good without a dissenting voice. The spray used for fungus diseases is Bordeaux Mixture, Pyrox and self-boiled Lime Sulphur, although, as brought out by a special question, this material is very little used.

The following results in answer to the question on the presence of Pear Blight shows that this disease is spreading with frightful rapidity all over the State. The same can be said of Collar Rot or Blight, which is the same disease located on a different part of the tree, but more destructive because it attacks the trunk and thus more readily destroys the entire tree. In reply to the question as to what remedies have been applied for Collar Rot, the only remedy is that of cutting out the disease, to which I would respectfully add that the wounds should be painted with some solution, followed by a coat of paint, to prevent the destruction of the wood, and also that the remedy published by certain western experiment stations, namely, a mixture of sulphur and lime using one part of sulphur to three parts of lime be applied to the base of the trunks after the diseased parts have been removed.

Injury by mice and rabbits seems to be very common all over the State, and the remedies offered are the use of wooden veneer and screens about the trees, wrapping with tar paper, cleaning up rubbish, tramping the snow about the trees in winter, spreading the prunings through the orchard and catching the mice and shooting the rabbits.

There seems to be a general awakening in the minds of the fruit grower as to the possibilities of the application of fertilizer in the orchard; 37, or one-half the entire number of correspondents answered by stating that commercial fertilizers are being used in the orchards of their respective districts, while those from the southeastern section of the State, where fruit growing is more intensive, report unanimously in the affirmative and most of the negative answers come from the northwestern half of the State, where, as one grower put it, "fruit growing is left to the beneficent care of a kind Providence." He says further, "I am by no means proud of our fruit growers, as they are not as a rule very progressive."

The composition of fertilizers applied to orchards, consist as a rule, of fertilizers high in potash and phosphoric acid, although many advocate the use of complete fertilizers on the formula of 2, 8, and 10. The results of applying this fertilizer are reported to be excellent, and stable manure is being used by 50 correspondents with good results, except on fertile soil and in peach orchards. Where there has been trouble with blight on apple, pear and quince

trees we should remember the well-known fact that too much nitrogenous fertilizer as well as cultivation disposes the tree to this disease, and where there are any signs of this trouble too much of the nitrogenous fertilizer should not be applied and cultivation should be changed to some system of mulching.

Cultivation of orchards is largely on the increase, especially in the southeastern half of the State. The usual system being plowing in the early spring, cultivating to July and then sowing a crop of peas, clover or some other cover crop. Growing of crops in the orchards is quite common, especially in young orchards. Some correspondents state that it is their earnest conviction that no peach orchard can be long maintained without cultivation. Which statement we heartily endorse. Mulching is practiced in quite a few orchards of the State with very good results.

On the subject of pruning trees, 55 agree that heavy pruning of peach is necessary and a few write that light pruning is all that is ever demanded, and a few take the stand that no pruning is necessary. The majority of the growers admit that thinning fruit is profitable, while many say it is not, giving as a reason that the work is too laborous on high trees to be economical. Nearly every correspondent states that to keep honey bees in an orchard is good. A few answer "no." While others declare their antipathy to these busy little insects and for personal reasons refuse to keep them. A few maintain that they are not necessary for the growing of any kind of fruit.

In answer to the question, "Is commercial planting on the increase?" 43 answer in the affirmative. This comprises the greater part of the State, and is in line with information I have received from other sources showing that in the State of Pennsylvania during the last two years an enormous amount of commercial planting has been going on. This is no doubt due to the fair prices received for fruits, as already reported and also that the fruit grower is assured of the fact that he can cope successfully with the insect pests and fungus diseases which were up, to recently, the bugbear of the fruit grower.

In the words of one correspondent who writes upon this subject: "Commercial fruit growing is on the increase. The results obtained by a few specialists has encouraged others to follow the example, but their financial account will only be measured by the care, attention and intelligence which they can exert towards making fruit growing a success. Those who are the most successful, work understandingly and leave nothing undone to deserve success. Where the old, haphazard routine is followed, disappointment and consequent loss of money and time is almost inevitable. The opportunities and possibilities are promising, and there is no doubt but what there will be many growers entering the arena who will merit and gain success.

"The work done by the State authorities in combating the pernicious San Jose Scale is invaluable. The total extermination of many large apple orchards was only prevented by their timely action and advice. The damage already done in eastern Pennsylvania is alarming, and even under most favorable conditions, many

years will be required to restore the valuable trees that were killed by the scale. What would happen without determined and concerted action is not difficult to contemplate.

New varieties recommended for Section 1 are Mammath Black Twig, Clearfield Pippin, Winter Banana, Stark and Pewaukee: for Section 2, Stayman Winesap, Rome Beauty and Gravenstein: for Section 3, Sutton Beauty, Banana, Stayman Winesap and Bonum.

In connection with the subject of new varieties I might mention an interesting report from the central part of the State describing an apple tree over 100 years old which is in the habit of bearing both sweet and sour apples simultaneously, and, wonderful to relate, apples sweet on one side and sour on the other. My informant fails to state which side is sweet and which is sour, but does make it plain that one cannot distinguish these from the others until one eats them. Probably this is the reason he failed to send me specimens for exhibition at this meeting for which I offered to pay him well.

Some light may be thrown upon the awakening of the citizens of this State to the necessities and possibilities of fruit growing within our borders by stating here that when it became known last November that the Division of Zoology proposed to enlarge its work by demonstrating methods and supervising orchards on a limited number of premises, within 6 weeks there were over 1,300 orchard owners who applied for this service. This at least shows that these people, many of them owners of thousands of trees, had reached a point in their experience in the work where they were open to instruction. Some of the pleas made for help were so pathetic as to almost provoke tears.

Your chairman begs to submit herewith what are considered as the most urgent needs of the fruit growing interests of the State as follows:

The enlargement of the scope of the work of the State Department of Agriculture in order that the assistance called for by the citizens of the State can be supplied either through the Division of Zoology or otherwise, so that fruit growing in Pennsylvania will be put on the high plane its importance and the natural advantages offered here deserve.

Co-operative buying of supplies by this association, thereby insuring a better grade of materials as well as a saving of from 20 to 40 per cent. on all purchases and incidentally largely increasing the membership of the society.

A law standardizing spraying chemicals, thus insuring the orchardist against failure on account of adulteration.

A survey of the fruit soils of the State for the use of prospective planters in selecting profitable varieties.

Respectfully submitted,

The President.—This report is now before the house; have you any questions, or any criticisms to make on it?

Prof. Surface.—I would like to ask at what time to apply the whale oil soap to prevent the borer. I have an idea that the time of application is very important.

Mr. Herr.—The last week in June.

Prof. Surface.—That is all right.

A Member.—Will one application be sufficient?

Mr. Herr.—It was with us. It sticks fast, and I believe kills thousands of the worms as well as of the larvæ.

A Member.—My experience has been that we have a great many new borers late in the season—fresh lots of them.

Mr. Herr.—Of course, there are lots of them that remain until the fall of the year, but they hatch in July, and that is the time to look for them.

Mr. Fenstermaker.—I would like to inquire whether he means the peach or the apple tree, and the strength of the application?

Mr. Herr.—Both; and the strength of it is two pounds of whale oil soap to the gallon of water. It can be applied with a paint or whitewash brush.

Prof. Surface.—I would suggest that if the season is rainy, it would be well to apply it not later than the beginning of July, as that is about the time when the borer begins to lay eggs. The last season was very dry, which was, perhaps the reason why one application was sufficient.

The President.—If I hear no objections, the report will be received and published in our proceedings. As I hear none, it is so ordered.

We will now take up an address by H. F. Hershey, of East Petersburg, on "Some Western Apple Methods." Mr. Hershey is a Senior at Pennsylvania State College.

SOME WESTERN APPLE METHODS.

H. F. Hershey.

Much has been and is still being written of the methods of the western apple growers and the fine apples they produce. Many sections, as the Hood River Valley, Oregon, the White Salmon District, the Wenatchee and the Yakima Valleys, Washington, and numerous other sections are known from the Pacific to the Atlantic coast and even farther than this. The people of Great Britain, Germany, France and other European countries eat their apples

and pay a high price for the privilege of doing so. Why is this true? It is because the people of the west are alive and looking for every opportunity to advertise and make their apples better known throughout the world.

In treating my subject I shall confine myself to the Hood River Valley, Oregon, as I am better acquainted with that valley than any other western district, and the methods vary but little at other places. It might be well to explain the reason of my visit to this district. The Department of Horticulture of the School of Agriculture of the Pennsylvania State College requires in its course that some time after the Junior year be spent in some large commercial orchard or some well-known fruit district, for the purpose of making a study of methods used, market conditions, etc. It is entirely optional with the student as to where he wishes to do the work, but suggestions are given. One of my classmates and myself took Hood River Valley, Oregon, as the place to do this work. We were furnished blanks by the Department as an outline. I will read the outline as it was given to us and as such it will serve in the discussion of my subject. (See Page 27.)

Hood River Valley is situated in the midst of the Cascade Mountains, along the Columbia River, and 65 miles east of Portland. The valley, as it is called, is seemingly a plateau and is drained by the Hood River which has its source in the glaciers of Mt. Hood. Mt. Hood stands in the southern end of the valley and Mt. Adams is just across the Columbia River in Washington. These two snow-capped mountains give the valley a cool climate in summer. The valley has three natural divisions—the West side, which lies between Hood River and west to the mountains; the East side, or the portion lying east of the river, and extending southward to about ten miles from the Columbia, and south of this extending for ten or twelve miles is the Upper Valley. This is a narrower and much higher valley and merges into the foothills of Mt. Hood. Only a small portion of it is cleared and set to fruit trees. The first two divisions named are where most of the fruit is grown. The valley is about 25 miles long and from 5 to 10 miles wide. It is indeed a very small place to have such a great reputation. Hood River is the principal town and there are several smaller towns scattered throughout the valley.

Methods of planting or setting out are practically the same as those used here in the east. The square, hexagonal, and quincunx methods are chiefly used. Planting distances as a rule are much closer than in the east for several reasons: (1) the trees do not live as long and (2) they do not attain such a large size. They are planted 25 feet apart and sometimes even closer.

The soils are mostly derived from volcanic ashe and as a general rule are very light in texture. Six soil types are found in the valley and the one occurring to the greatest extent is known as volcanic ash. Nearly all of the orchards are planted on this soil type. The soils being light and as rainfall is not very plentiful, irrigation is practiced to some extent. Strawberries are grown quite extensively in the orchards on the east side of the river, and here irrigation is necessary. When the orchards are not intercropped,

FRUIT ..... No. .....

.....County **ORCHARD SURVEY** Date.....

The Pennsylvania State College

Owner ..... P. O. .....

Location ..... When planted .....

Site ..... Aspect .....

Soil, type ..... Variations .....

Drainage, Natural or Artificial ..... Character .....

Soil management (now and for past 10 years) .....

....

If sod, method of treatment .....

If tilled, frequency .....

....

Fertilizers, kind ..... Quantity ..... Frequency .....

Cover crops ....

Pruning method ..... Frequency ..... Character .....

Spraying, mixtures ..... Effects .....

No. Applications ..... Machinery .....

Troubles, Fungi ....

Insects ..... Others .....

Present Condition .....

Varieties .....

Variety Notes ....

	19.....	19.....	19.....	19.....	19.....
Yields.....	.....	.....	.....	.....	.....
Price.....	.....	.....	.....	.....	....
Income per acre..	$.....	$.....	$.....	$.....	$.....

ACRES

Where and how sold .....

Package used ..... Labor .....

General observations .....

..... Observer .....

Planting Plan.

irrigation is seldom practiced. Many of the growers think that if the orchard is once irrigated, this method must be followed as the trees have become accustomed to plenty of water, and so demand it all the time. In other words the trees can be trained. As good results are obtained from non-irrigated orchards as from those that are irrigated. The water used in irrigation is brought all the way from Mt. Hood in canals along the sides of the mountain and is then distributed through the valley by means of laterals. The rill method is used chiefly in the orchards.

No sod mulch is used at any place in the valley. The dust mulch is counted upon to keep up the water content and a good mulch is always maintained. The orchard is gone over about every ten days with a spike tooth harrow and in every orchard into which I walked I could kick the loose earth away to the depth of several inches and underneath that I would always find a good moist soil. The average rainfall is not over twenty inches and most of this comes in the form of snow during the winter. It very rarely rains during the summer and yet they give their trees all the water they need by maintaining a good soil mulch. Many of our eastern growers might have better success if they gave this point more attention.

Cover crops are used to some extent but not as a general rule. When they are used they are sown about the middle of August and then disced in during the early spring. Crimson clover is used most largely but vetch and rye are also used to some extent. A number of the growers think that the time is not far distant when every one will be using cover crops.

Hood River Valley is comparatively a new country and there are not many orchards older than fifteen years. The orchards were all set out in the virgin soil and as the soil is of light texture, the older orchards are beginning to lack some of the essential elements of plant food. So in these orchards commercial fertilizers are used to a limited extent but their use is not general. The leading growers are of the opinion that in a few years fertilizers will be applied more generally and with results that will make their use more acceptable.

Both winter and summer pruning are practiced and there are some few of the growers who rely on summer pruning alone but they are the exception rather than the rule. A larger number prune both in winter and summer but by far the greater percentage prune in winter only. The open center tree is preferred and in nearly every instance the trees are headed low, 18 to 20 inches from the ground. In winter pruning the tree is shaped while in summer the water sprouts and cross limbs are cut out. As a general rule pruning is well done and careful attention is given to it, but every one has his own ideas as to the way it should be done, and so the same methods are not in vogue throughout the valley.

The fruit grower in Hood River is troubled very little with fungous diseases. One of the chief reasons for this is their effective methods of spraying. It has been said that there is a cloud of spray continually floating over Hood River Valley. This statement is somewhat exaggerated but the fact still remains that they do a great deal of spraying. Some of the fungus diseases found

are anthracnose, milldew and apple scab. The rots are not troublesome. Bordeaux mixture is the fungicide most commonly used and good results are obtained from it.

The codling moth and aphis are among the most troublesome insect pests at present. The San Jose scale at one time threatened to ruin the orchard business, but thorough spraying did the work and now it is hard to find any scale in the valley. Even though the scale has been practically exterminated, nearly every grower gives his orchard a precautionary spraying of lime and sulphur in the spring. The green and brown aphis are very plentiful and require effective methods of spraying to keep them in check. The brown aphis is hard to combat because of the fact that the leaves on which they feed are badly curled as a result of the wounds inflicted by them and they cannot be reached easily. The brown aphis make their appearance early and make a very vigorous attack upon young twigs in the central or shaded portion of the tree. The growth of many twigs is entirely stopped and others are weakened and caused to grow crooked. Their work lasts for only a short time as they disappear on the approach of warm weather. The green aphis is much more plentiful and more persistent but is more easily controlled by insecticides although several sprayings are often necessary. An extract of quassia chips and whale oil soap is in general favor as a remedy, and by far the greater number of growers use it, generally applying it several times. Kerosene emulsion and formaldehyde soap are also used.

The codling moth always was and always will be a serious pest and it is only kept down by a very close attention to spraying. Lead arsenate is the insecticide used and it is used with the best results. The home-made preparations have been abandoned for the commercial brands. A large number make the first spraying just as soon as the petals have fallen and others spray just as soon as the weather conditions are favorable. All agree that four, five and six sprayings are necessary for the best results and few give a less number than four. The general idea is to keep the apple well covered with the arsenate and as this is a district of little rain it is not very hard to do. The first sprayings are generally made at intervals of ten days and the last few at intervals of about fifteen days. Those who have power pumps always try to fill the calyx cup at the first spraying as they think that it is more effective.

The orchards as a rule are small and the average size for the valley is about sixteen acres. I do not think that there is one orchard over seventy acres in area. In the small orchards the hand pump sprayer is used while in orchards twenty-five to thirty acres in area the power sprayer is the general rule.

The leading apples grown in the district are the Yellow Newtown and the Spitzenberg. Ten or twelve years ago a great many varieties were planted in a single orchard. This was found to be unprofitable and a large number of the varieties were topworked with the Yellow Newtown and Spitzenberg. The later plantings have nearly all been of the varieties named. The reason for these two varieties being so popular is that they are good bearers, good shippers, good keepers, and high in quality. Then, too, they take

on a high color and put up a good appearance. The Ben Davis, Arkansas Black, and Jonathan are also grown to a limited extent.

The general opinion in the valley is that the Newtowns and Spitzenbergs need to be pollenized for the best results by some other variety. The Ortley and Arkansas Black are considered to be good pollenizers and are found scattered through many of the orchards. It has been demonstrated by actual experiment that these apples need to be pollenized but it seems to be the concensus of opinion that they must.

One thing that seems very peculiar in spite of the reported high yields and large profits made is that many of the owners have only bought their land recently and paid a high price for it. Many of the people are willing to sell but the price ranges from $1,000 to $2,000 per acre. This buying and selling seems to be characteristic of the west and should not be taken as a sign that these lands are not giving a good return for the money invested. On account of this fact it was rather hard to get yields from the growers. The yields vary from 150 boxes to 500 boxes per acre of first class apples. The price per box for the last few years has ranged from $2.00 to $3.15 per box and some of the apples have sold for even higher prices than this. The income per acre ranges from $300 to $2,000, the last named being very high and the average being about $500.

All of the apples are marketed in New York and London by the Hood River Fruit Growers Association. Every apple of the valley is handled by professional packers, who pack the product of all the orchards to a uniform grade, in one bushel boxes, and none of the growers are permitted to pack their own fruit. The grower's name, variety, and the number of apples in the box are found on the outside on a fancy label. The box is always lined with fancy paper. The Hood River Fruit Growers Association is to be commended for the thorough manner in which they do their work. Every box is inspected and such is their reputation that apples are ordered by telegraph in car load lots at the highest prices without the buyers ever seeing the fruit. The apples are sorted and packed according to size, exactly the same number of apples going into each box. These sizes run from 54 to 128 in a box, the designation being 3½, 4, 4½, and 5 tier fruit. This is certainly an enviable reputation to have and it clearly shows the value of a brand or label with an honest man or men behind it.

It is very interesting to note the class of people who have made Hood River Valley their home. Here is a professor who had taught in one of the eastern colleges. Here is a Yale and there a Princeton graduate. I will give an example of a Yale graduate and a graduate of the Boston Institute of Technology. These two young men were partners and evidently had plenty of money. They had come to the valley about three years ago and purchased about thirty acres of orchard land at $1,000 per acre. They were living in princely style, said they were making money, enjoyed the life immensely and had been offered $1,500 per acre only a few days prior to our visit and would not consider it. It was no uncommon occurrence to find a grower away from home on a pleasure trip either

to New York or California, or some other place. The people as a whole are very sociable and readily give any information asked. My opinion of the valley is that it is a place for the capitalist and not a place for the poor man who has to make a start.

It would seem that the eastern grower would not have a chance to compete with the western apples. The eastern apples have one thing which is becoming of more importance every year, namely quality and many of the western apples do not have good quality. A striking example of this point was made at the meeting of the Pennsylvania State Grange held at State College, December 21 to 24. Rogue River, Oregon, Spitzenbergs and Newtowns were pitted against Pennsylvania Baldwins, Grimes Golden and Stayman Winesaps. The Baldwins were grown in Perry County by our honorable President, Mr. Heister, and the Grimes Golden and Stayman in Adams County. The Pennsylvania apples won out on their merits both as to quality and color. A committee of three competent apple growers gave their decision in favor of our apples and the audience voted the same way. Considering everything and when the Pennsylvania apple growers as a whole, as is being done in some sections, apply the methods of the west there is a bright day ahead for the apple grower of Pennsylvania.

The President.—Are there any questions you would like to ask the writer of this excellent paper? He will be ready to answer any questions.

Prof. Surface.—I notice he says they have exterminated the San Jose Scale. I would like to ask what material they used.

Mr. Hershey.—Lime and sulphur.

Prof. Surface.—Commercial or home-boiled?

Mr. Hershey.—Commercial mostly.

The President.—I want to add to what has been said that we have among our exhibits four boxes of apples that were sent here from Montana. We have placed them alongside of some Wyoming County apples, and I want you to form your own opinion as to which is the finest fruit.

Mr. Case.—I notice that the gentleman says they sprayed several times with arsenate of lead for coddling moth. We have always understood that the only time we could catch it was before the calyx closed. The Chairman of the Oregon Board of Horticulture called on me last summer while on a trip east, and we talked over the matter with our State Entomologist at Ithaca, who died last summer. He told us that the coddling moth lays its eggs anywhere on the apple, but when the larvæ are hatched they look for some place to crawl, and about 90 per cent. get into the calyx, and the other 10 per cent. get in between the leaf and the apple. This gentleman said that on the way to their hiding place, the coddling moth larvæ

would take tiny bites out of the apple. Now, the question is, does it eat before it hides, or does it hide before it eats? Can any entomologists here oblige us by telling us?

The President.—That is something like the Irishman's question about the mule: does he bray because he kicks, or does he kick because he brays? We have our Entomologist, Prof. Surface, with us. Can he answer that question?

Prof. Surface.—The moth begins on the outside of the apple, and eats his way into it. The first brood generally gets into the calyx, and the second brood usually gets in between two apples, or between the apple and the leaf.

I would like to ask Mr. Hershey if he was not mistaken about their doing more than one spraying for the coddling moth? We have been led to think by the journals, that one spraying was sufficient, and I have understood that the practice in the western states was only one spraying for the coddling moth.

Mr. Hershey.—I understood that they followed that practice in some parts of the west, but not in the Hood River district. I was there twice, once in July and once in August, and found them spraying. Their idea was to keep the apple covered with arsenic.

Prof. Surface.—They did not make a special spraying for the second brood?

Mr. Hershey.—No, sir.

A Member.—I was out in Spokane, and I spoke with a fruit-grower there in regard to this second spraying. He appeared to think that sticking to it was necessary, and said they were going back to spraying the second time in his district.

Mr. Catchpole.—I would like to ask the growers here what has been their experience with the 3-4-50 formula for Bordeaux. We tried it, and the damage done by russeting the fruit was great.

A Member.—I would like to ask whether cutting the bluestone down to two pounds would be as beneficial in killing the fungous without being as injurious to the fruit.

Mr. Case.—I find that in Michigan they used two pounds of copper sulphate and three or four pounds of arsenate of lead, and they spray three, four or five times. They always look for a second brood, and when they do not spray for it they always fail; but climatic conditions may have something to do with this.

Mr. Walton.—I would like to ask Mr. Hershey what is the possible number of sprayings given by the Hood River growers during the season?

Mr. Hershey.—I don't know that I am able to answer that, but they have a preliminary spraying for nearly everything. Where they have no San Jose Scale, they give a preventative spraying for it, as well as for every other known fungus growth and insect. The spraying with the arsenate goes on practically the entire season, so that the whole season is practically taken up by spraying. Several times in the summer they spray for the asphis.

The President.—What do they spray with for aphis?

Mr. Hershey.—Whale oil soap.

Prof. Watts.—It seems to me that one of the main facts brought out in Mr. Hershey's paper is that the western men are so much more thorough than the eastern men. We read so much about the great possibilities and fine fruits of the west that people are beginning to think Pennsylvania is not in it, in growing the apple. I have had considerable correspondence this year with men of wealth and capital who are interested in growing fruit and seem to imagine that they must go west to grow good fruit, but I think if they realize what they must do in the west, and are willing to apply the same methods here, they can do even better at home, for here we have the soil, the climate, and the market close at hand.

The Secretary.—I would like to know if Mr. Hershey has heard any estimate of the cost of a box of apples f. o. b. cars?

Mr. Hershey.—No, I did not. I asked one of the growers if he could give me an estimate delivered to Chicago, and he said he could not.

The President.—This paper has brought out a very interesting discussion, and I think it has impressed us all with the fact of how much more thorough these men are than we are. It has certainly opened the eyes of some of our "Pennsylvania Dutch" fruit growers (myself among them), to the number of sprayings that they give. It is away beyond my limit.

We shall proceed now with the appointment of committees. We want you to name five members for the Committee on Nominations.

On motion of several memers, the following gentlemen were named: R. J. Walton, F. H. Fassett, D. W. Hull, Prof. R. L. Watts, and Cyrus T. Fox.

The President.—I appoint these gentlemen to be the Nominating Committee. We shall be glad to receive their report to-morrow morning. Now, while it is understood that these gentlemen will place in nomination members for the several offices, it is by no means necessary that you vote for those they select. You can vote for any one you please.

I will now appoint as a committee to judge the fruit, the following gentlemen: E. W. Catchpole, Prof. W. J. Wright and Horace Roberts. They are all men who know good fruit when they see it, and none of them are interested in anything on display. I have also appointed the two gentlemen from adjoining states for an-

other reason: we want them to examine Pennsylvania fruit and see what we can do.

As a committee to audit the Treasurer's account, I will appoint the following gentlemen: P. S. Fenstermaker, C. A. Griest, and D. W. Hull.

As a Committee on Resolutions: Prof. R. L. Watts, T. C. Foster and R. J. Walton.

We will now have the Treasurer's report.

The Treasurer here made his report, as follows:

TREASURER'S REPORT, STATE HORTICULTURAL ASSOCIATION OF PENNSYLVANIA.

Receipts.

Cash balance January 19, 1909,	$73 83	
Annual dues for 1909, collected at Harrisburg,	92 00	
Peter R. Boltz, life-membership,	10 00	
Donation,	300 00	
H. H. Snavely, life-membership,	10 00	
Additional dues received during the year,	75 00	
Annual dues for 1910 in advance,	4 00	
Chester J. Tyson, Sec., balance from Summer Meeting,	65 57	
Total,		$630 40

Disbursements.

To Steelton Store Co. Limited,	$7 50	
To J. Henry Spicer, Supt., use of tables,	3 00	
To Prof. S. B. Heiges, railroad fares, etc.,	20 45	
To Harrisburg Board of Trade,	21 00	
To The Lochiel, hotel bills,	33 75	
To Enos B. Engle, Sec., salary and sundries,	78 92	
To L. G. Youngs, travelling expenses,	20 54	
To Prof. John P. Stewart, travelling expenses,	6 08	
To Edwin C. Tyson, expenses to Washington,	14 82	
To R. M. Eldon, expenses to Washington,	14 82	
To Mrs. D. M. Stewart, stenographic report,	50 92	
To J. H. Hale,	77 00	
To Chester J. Tyson, General Fruit Committee,	43 00	
To J. Horace McFarland Co.,	3 00	
To Pub. House of the United Evangelical Church,	117 42	
To Pub. House of the United Evangelical Church,	14 65	
To Chester J. Tyson, Sec., sundries,	29 02	
To Balance, cash on hand,	74 51	
Total,		$630 40

The President.—What shall be done with this report?

The Secretary.—I move it be referred to the auditing committee.

This motion was properly seconded and regularly carried.

The President.—If there is no further business, the meeting stands adjourned until this evening at seven o'clock, when we will meet in Grange Hall to enjoy the banquet tendered us by the ladies of the Tunkhannock Grange.

Adjourned.

TUESDAY EVENING, JANUARY 11, 7 P. M.

Banquet.

About one hundred members and guests of the Association gathered in the Tunkhannock Grange Hall at the appointed hour.

The supper, provided by the ladies of the Grange, was plain and good and very nicely served. Much credit is due these ladies and the officers of the Grange.

As toast-master, Mr. W. F. McSparran conducted the further ceremonies of the evening in a pleasing and satisfactory manner. A long list of members, guests and officers were called upon and responded to informal toasts.

The avowed purpose of the banquet was to "break the ice," and to make everyone feel acquainted and at home in the convention. We believe this result was accomplished.

WEDNESDAY, JANUARY 12, 9 A. M.

President Hiester in the Chair.

The President.—The first number on the program this morning is a talk on "Grape Culture," by a very successful vineyardist of North East, Pa. I take great pleasure in introducing to you Dr. Francis Newton Thorpe of Mt. Holly, New Jersey, and North East. Pa.

GRAPE CULTURE.

By Francis Newton Thorpe, Ph.D., LL.D.

Mr. President, Ladies and Gentlemen: Some of you may think it a little far-fetched to present for discussion to the State Horticultural Association, the subject of Viticulture—the growing of grapes for commercial purposes.

I am reminded of what a friend of mine said he had learned from the prayer book, regarding marriage. He says that accord-

ing to the prayer book a man can have sixteen wives, and be married in sixteen ways—four better, four worse, four richer and four poorer. Now, the subject of Viticulture is something like that.

Some twenty-two or twenty-three years ago I became interested in the production of the grape. The work has gone on steadily and interruptedly. My experience has been among those who paid high for the truth, and enjoyed a very respectable proportion of the returns. We have received a net profit of a hundred to a hundred and twenty-five dollars per acre, and we have on the other hand

"CONCORDS."

From a photograph of a small corner of "Indian Arrow Vineyards," the property of Francis Newton Thorpe, at North East, Erie Co., Pa. Vines set in 1894 and photographed on October 1, 1906. Note the beautifully uniform vines, heavily loaded with fruit.

experienced the delights of postponing the payment of bills. Nevertheless, the culture of the grape for commercial purposes is a practical problem, which is determined to a large degree by natural conditions. If you want to raise grapes you must not farm upon the imagination; you must stick closely to facts, and put yourself in harmony with the laws of nature.

The cultivation of the grape in Erie County has been followed for the past fifty-two years. It so happens that a part of my own vineyard was among the first that were put out. The two great principles in viticulture are, first, climate, and secondly, care. In

this part of the State (Wyoming County), where you have such a wonderful opportunity for the production of the apple, perhaps you will not be greatly interested in the details of the production of the grape in Erie County. Most people, when they have a few vines, think they have a vineyard. In Erie County there is an acreage of about seven thousand acres devoted to the grape alone, some parts of which are in a very high state of cultivation. On the other hand we have among us men who think that all that is necessary is to put in the hand and take out the fruit. Any soil that is adapted to the production of the grape is very soon exhausted. We must understand that we are the prisoners of climate and servants of the soil.

To grow grapes successfully, we must have a climate that does not drop in temperature below 25 degrees, nor rise above a hundred degrees. Of course, that is a very wide range for the cultivation of any fruit. In the Italian vineyards, the temperature is regulated by the Pyrenees, and the Alps, mountain protectors to which is largely due the success of the vine in Italy. On the Pacific Coast of our country the mountains have a great deal to do with the production of a fine grade of fruit.

Another important factor in the successful production of the grape is the saturation of the atmosphere. Poor vineyards are sometimes due to trying to raise grapes in a climate that will germinate fungus. In the cranberry bogs of New Jersey, as well as in the vineyards of North East, the point of saturation of the air has much to do with results. It is doubtful whether grapes can be raised successfully in New Jersey, owing to the humidity of the atmosphere. Whether one can raise enough grapes to pay for his trouble and leave a little margin of profit, depends very largely upon climatic conditions. The happy man in viticulture is he who lives in a belt where the most favorable conditions are likely to surround him.

The vineyard, like the human skin, has to be ventilated, and growers are learning that they must so regulate their vines as to give them a free circulation of air and sunshine.

In Germany, where labor is at the bottom of the scale, viticulture is easily made more profitable than it is with us in the United States, where labor is at the top of the scale. One has to raise a great deal of anything to make it profitable. After climate and saturation, comes the question of labor. Not only must the high cost but the quality of labor be considered with us. We must have a labor that can be depended on—one that will not leave us on the slightest provocation, at the critical moment, and leave our crop to ruin. We know the importance of the proper kind of soil in our work, but after all experiments that have been made, we must come to the conclusion that soil is a thing that can be created. I believe that given anything that will take sunshine, and a little water, one can make soil. In Germany I have seen women carry soil on their heads in a little basket to the tops of the hills, and I suppose they planted vines in it, because there were other vines there.

ing to the prayer book a man can have sixteen wives, and be married in sixteen ways—four better, four worse, four richer and four poorer. Now, the subject of Viticulture is something like that.

Some twenty-two or twenty-three years ago I became interested in the production of the grape. The work has gone on steadily and interruptedly. My experience has been among those who paid high for the truth, and enjoyed a very respectable proportion of the returns. We have received a net profit of a hundred to a hundred and twenty-five dollars per acre, and we have on the other hand

"CONCORDS."

From a photograph of a small corner of "Indian Arrow Vineyards," the property of Francis Newton Thorpe, at North East, Erie Co., Pa. Vines set in 1894 and photographed on October 1, 1906. Note the beautifully uniform vines, heavily loaded with fruit.

experienced the delights of postponing the payment of bills. Nevertheless, the culture of the grape for commercial purposes is a practical problem, which is determined to a large degree by natural conditions. If you want to raise grapes you must not farm upon the imagination; you must stick closely to facts, and put yourself in harmony with the laws of nature.

The cultivation of the grape in Erie County has been followed for the past fifty-two years. It so happens that a part of my own vineyard was among the first that were put out. The two great principles in viticulture are, first, climate, and secondly, care. In

this part of the State (Wyoming County), where you have such a wonderful opportunity for the production of the apple, perhaps you will not be greatly interested in the details of the production of the grape in Erie County. Most people, when they have a few vines, think they have a vineyard. In Erie County there is an acreage of about seven thousand acres devoted to the grape alone, some parts of which are in a very high state of cultivation. On the other hand we have among us men who think that all that is necessary is to put in the hand and take out the fruit. Any soil that is adapted to the production of the grape is very soon exhausted. We must understand that we are the prisoners of climate and servants of the soil.

To grow grapes successfully, we must have a climate that does not drop in temperature below 25 degrees, nor rise above a hundred degrees. Of course, that is a very wide range for the cultivation of any fruit. In the Italian vineyards, the temperature is regulated by the Pyrenees, and the Alps, mountain protectors to which is largely due the success of the vine in Italy. On the Pacific Coast of our country the mountains have a great deal to do with the production of a fine grade of fruit.

Another important factor in the successful production of the grape is the saturation of the atmosphere. Poor vineyards are sometimes due to trying to raise grapes in a climate that will germinate fungus. In the cranberry bogs of New Jersey, as well as in the vineyards of North East, the point of saturation of the air has much to do with results. It is doubtful whether grapes can be raised successfully in New Jersey, owing to the humidity of the atmosphere. Whether one can raise enough grapes to pay for his trouble and leave a little margin of profit, depends very largely upon climatic conditions. The happy man in viticulture is he who lives in a belt where the most favorable conditions are likely to surround him.

The vineyard, like the human skin, has to be ventilated, and growers are learning that they must so regulate their vines as to give them a free circulation of air and sunshine.

In Germany, where labor is at the bottom of the scale, viticulture is easily made more profitable than it is with us in the United States, where labor is at the top of the scale. One has to raise a great deal of anything to make it profitable. After climate and saturation, comes the question of labor. Not only must the high cost but the quality of labor be considered with us. We must have a labor that can be depended on—one that will not leave us on the slightest provocation, at the critical moment, and leave our crop to ruin. We know the importance of the proper kind of soil in our work, but after all experiments that have been made, we must come to the conclusion that soil is a thing that can be created. I believe that given anything that will take sunshine, and a little water, one can make soil. In Germany I have seen women carry soil on their heads in a little basket to the tops of the hills, and I suppose they planted vines in it, because there were other vines there.

We must not only have the climate, and the soil, and the water, and the sunshine, and the atmospheric conditions, but we must also have the labor and that is where man comes in. Moisture, heat and light are the parents of our food, and the foster parent, man, can supply the nourishment necessary to make that climate and soil and heat respond; then there is nothing that will prevent successful commercial production of fruit.

I think the best kind of a soil is a sandy soil, but I have seen grapes grown very successfully on soil that was once the bed of a glacial river. I have a friend in North East who has such a soil as this. He is a graduate of the University of Michigan, and very fond of chemistry, so he took the pieces of rock from the glacial river bed and put them through the mill, to make a soil on which he planted a vineyard,—a vineyard as promising as any I have ever seen on sandy soil. Near his land is a cider mill. He covered his rocky land with pomice and so created a quick, warm soil. It was a very discouraging proposition, but it simply shows what can be done. He is realizing from that soil now, from ninety to a hundred and ten dollars an acre. Soil is a relative circumstance; it is the alembic of human labor. Of course, if climate and soil are given us, it is all we can ask.

The story of the vineyard is not one of unbroken profit. It is my experience that an orchard or vine that can be retarded in the spring, will ripen more fruit than one in which the bees swarm in April. We don't want early orchards, and we don't want early blossoms. We want them so regulated, in our belt, that the sun's rays, when it crosses the line, will not start the sap too soon; nor must late frosts nip the vines about six weeks after they have been in blossom. A northern exposure is the best protection against these dangers.

It is now twenty-two years since I began to raise grapes, and the results of my experience can perhaps be illustrated by a story. It was at the time when the administration was trying to start our banking system, and float our national greenbacks, that General Patterson, of Philadelphia, gave a dinner to Salmon P. Chase and some other prominent men. Mr. Chase was in favor of inscribing on the greenbacks a passage from the Bible, or from George Washington's writings, that might inspire the confidence of the people in them. The bankers present, perhaps not familiar with the writings of Washington, could not suggest any appropriate quotation, when General Patterson said he recalled one passage from the Bible which he thought would be satisfactory: "Silver and gold have I none, but such as I have, give I unto thee." It is a good deal so in raising grapes; we don't always have silver or gold, even after we have sold our fruit at high prices. It may be easy to raise five or six tons and make no more money than by producing three or four. You are dependent upon the market, and upon general market conditions. Of course, that brings up the question of the marketing of fruit, which is a rather large question to discuss in such an informal talk as this.

It does not follow that you will have a large amount of money for your fruit if you try to cheat the ground. You cannot take

same year after year. You must put something back. You not from three to five tons off an acre of land, and have it produce the only have to keep land in its natural state of health, but you have to stimulate it, as we stimulate athletes, and our young men in our universities. Our going to school is an artificial way of living. We could live without learning to read. We must do with the soil something as we do with our children and our neighbor's children. We must give the soil an opportunity. We must put the vine into a friendly soil, and then feed it and cultivate it. We have learned that nature starts it off well and that all that remains for us to do us to feed it and cultivate it. We cannot expect the cotyledon to grow unless we feed it. We see in the forest a large dropping of seeds. Those that get moisture from the soil and live in the sunshine, survive. The others, not so favorably situated, die. Most of them die; it is the old story of the survival of the fittest.

We must do something to stimulate and feed the plant. I do not believe that a vineyard of five hundred acres would produce ten tons if left to itself. When the French explorers in the 17th century came down from Montreal and Quebec, and penetrated the great Valley of the Mississippi, they made note of the things they saw. They found the vine growing along the south shore of Lake Erie. Where the wild vine will grow the tame or cultivated vine will grow. If nature has shown that Wyoming County is the place to grow apples, then grow apples here; the same with cherries or grapes or any other fruit. You can always depend on nature's hint. So when Father Hennepin, and other French explorers of that early period record that the wild vine did well on the lake shore, it was a hint to us that it was a good place to grow grapes. The famous vineyards of Erie County now attest the truth that to follow nature is to win success.

But even under the most favorable climatic and soil conditions, the vineyard must be kept fed and stimulated in order to produce well. If neglected one year, it takes several years to get it back to form and the effects of neglect increase in geometrical ratio. From the moment we break soil, until the property passes into the hands of our posterity, it must receive constant attention.

Now, I have noticed that most of the diseases which come to our vineyards are the result of our own carelessness. The law speaks of "acts of God" and "the public enemy;" I believe that our chief enemy in horticulture is our own ignorance and our own cupidity. I can take you through vineyards in Pennsylvania and western New York which have received the most assiduous attention. They are productive because they are healthy and are cared for in a more or less scientific manner.

As soon as the leaf falls you can begin to trim the grape vine. If you leave a wound that will not cover rapidly, and the sun and rain strike it, fungus growth will cover it, and in the open stub insects will hide, and soon there will be a little nest of bacteria. Nature never leaves an open wound unless the vitality of the plant is low. If you do not cover it, she will. If you will take notice, as you pass from Buffalo to Cleveland, you will see many vineyards which show the effect of a fungus growth and insect pests.

They have been neglected or improperly trimmed. Nature has covered them over with disease. These insects and fungus growths are beneficent though they are our enemies. I have discovered larvæ down among the roots of my own vines, although I owned the vineyard for sixteen or eighteen years before I recognized them. If the Horticultural Society and the scientists started in to tell us what they don't know about these insects and diseases, they could tell us a great deal more than when they try to tell us what they know. There is a certain resemblance between a man and his business. I am inclined to think that this so-called technical knowledge, before it is of any value, has to come from the alembic of experiment, experience and trial; and very often the theories of our scientific brethren are of less value than the judgment of the men of instinct. We have in our community a good many Germans from families who came to this country fifty years ago, and later started vineyards. With characteristic German energy they worked their vineyards with precision and profit. The successful man is instinctively what he is—horticulturalist, lawyer, clergyman, whatever it may be, and much of his success is due to his instinctive knowledge, rather than to his scientific training. I would not start in the fruit business the same way I would go into Wanamaker's and order a dozen collars. A gentleman here tells me that he is going into the orchard business because he likes it. That is the only way to do it. Most of us are obliged to check off values, but over against this dollar return there is the healthful surroundings, and the closeness to nature and to mother earth, which you cannot get anywhere more happily than in horticulture.

I love horticulture, and think it has as beneficial an effect on character as the Thirty-nine Articles. Most of us are inclined to look at the dollar value of a thing too much. When Emerson died, a man riding on the train saw in the paper the account of his death. He exclaimed: "Emerson is dead, and he left two hundred and fifty thousand dollars. Why! he was quite a man!" That was the important point—he left two hundred and fifty thousand dollars. That was all he could see in Emerson.

A good vineyard increases the value of the land. Twenty years ago I paid four hundred dollars an acre for my land. I have been offered more for it many times since. A gentleman from Montreal, Manager of the Bell Telephone Company there, a few summers ago, bought a vineyard at North East, for which he paid five hundred dollars an acre. I don't know of any good vineyard that has sold there for less than three hundred dollars an acre—and some sold at that price was not the best land, by any means.

I have known farmers who would persist in raising things that cost more than they are worth. As the old saying has it, they will do as their fathers did. Now, this very land that sells at from three to five hundred dollars an acre, twenty years ago was ordinary farming land, worth from $45 to $120 an acre. It possessed the same vitality then that it does now, but I have no doubt if it had been put out in vineyards seventy-five years ago, it would have yielded no adequate return for the labor, because there was then no demand

for the fruit. We are now in a position, in America, where any first-class fruit will find a market. The middleman may for a time keep us out of our just profits, but we own the land and have the title, and "sometime, we know not how or where, we shall surely come to our own." I am not afraid of overdoing the fruit business. There was a time when we could not have gotten rid of the grapes up in Erie County, any more than you could of your apples here in Wyoming County; but all that has changed. Our people are becoming every year greater consumers of fruit. There is no better investment than first-class fruit land. It is safer and pays better returns than an equivalent amount invested in railroad shares or bank stock. I am more and more impressed, as I grow older, and see the perils of investing money, by the opportunity offered by horticulture to the man who has ten, twenty, or thirty thousand dollars to invest. If it does not make him rich, it will at least keep him from the house that is poorer than his own. Law or medicine are all right, but give me the land. You are always sure of a return if you produce something that some one else wants.

Another important point is the handling and packing of the fruit. I have seen fruit on Chestnut Street from some of our vineyards so carelessly packed that it had been crushed and bruised in transit, and of such poor quality that it for a time destroyed the reputation of the vineyard. I will give you people the credit of doing the right thing in packing your fruit; we do not always do it at the lake shore. We are tricky, and if we find something that is not up to standard, some of us say: "Oh, well, stick it in; I have my check."

If time permitted, and it were worth while, I would like to enter into the large problem of marketing. Our crops seem to be produced, to a large extent, for the benefit of the middleman. Now, we are willing to be the middleman, and if necessary, the two end men also, ourselves. I have seen grapes sell in Philadelphia at four cents a pound, for which we at the shore received seven-eights of a cent. Still, I believe that a man gets about all out of the world that he is entitled to. That is not original with me. General Grant said it, as you will find if you read his Memoirs. Daniel Webster was Daniel Webster; he could not very well have been anything else, because God made him so. If we manage our marketing right, we will get our due share of the returns.

Our scientific friends at Washington are great advocates of spraying for the root worm. It will not harm the worm, they tell us, but it will destroy his posterity. I would rather have something that will destroy the old man himself than turn my vine over to him in the hope of destroying his grand-nephew. I don't believe in sneering at our friends at Washington, however; they are probably doing the best they know how. But this little corkscrew of a beetle that goes through the vine—straight through, if you will let him—if you take him out and expose him to sufficient sunlight, in early June, will shrivel up and die. Just stir him out of the soil, and expose him to sun and air for half an hour, and that will kill the old man himself, as well as his posterity.

There are big bugs that eat little bugs, and little bugs that eat big bugs. Now, nature loves a grape vine, and does all she can to protect it. There are fungus growths that feed on other fungi, and if any man who loves his vine, will take his magnifying glass, and put on his old clothes, and get down into the dirt, he will find that nature is ever protecting her own. Each species has its claim upon her, to which she will respond, if possible.

Nature gave us thirty-two teeth, and the man who chews his food never knows he has any stomach, or any bile, unless his neighbors stir it up. In Couvier's Museum, in Paris, years ago, I saw the skeletons of the old cave dwellers and the Bronze men of Lake Haldstead, in Austria. These men, surrounded by their bronze and stone implements, came down to us with thirty-two sound teeth in their mouths. We are not taking care of our teeth, and we lose them and health. The same thing holds true in our grape vines. I take a rather cheerful view of these diseases which come to our vines. It makes us take better care of them, and look after them, and, as a result, they become more productive. I believe that all the work of our Horticultural Societies, and of our State College, and of our Department at Washington has the same end in view—to give us a healthy vine which will reproduce itself.

Now, Mr. President, I did not write an address. I thought that an informal account of the Lake Erie grape industry might interest you. Nature has done a great deal for that little town of North East; it has only about eight thousand people, but its people ship from twelve to sixteen hundred carloads of grapes every year, not to mention heavy shipments of cherries, raspberries, currants, apples, gooseberries, plums and other fruit, which yield about four hundred thousand dollars annually.

Some time ago a relative of mine gave me an old book on horticulture which was of no interest to her, but which she thought might possibly interest me, since I am in the business. It proved to be Loudon's Encyclopedia of Horticulture, published in England eighty-five years ago, and is very interesting, indeed. We all know that the ancient Romans were interested in horticulture and grew grapes; the recent great historical work by Ferrero gives us a great deal of information about horticulture in the time of the Republic. The planting of the vine was common in the days of the Cæsars. Viticulture came into England in the time of Henry the Eighth.

You read in this old encyclopedia of the curious tools and implements used by the Romans and Greeks in the days of Alexander the Great. Horticulture to-day is very much like horticulture of old. If you read history and study the Bible, you will find that in old time they had the fungus diseases, bugs, and other troubles in their vineyards as we have to-day. One of the most vivid parables of the Old Testament is the parable of the unfruitful vine.

Now, Mr. President, I prize your time too highly to take up any more of it. I may not be able to answer all the questions that might be asked, but if any member of the Horticultural Society has a reasonable question, I will be glad to answer it to the best of my ability.

The President.—If you have any questions to ask Dr. Thorpe, we shall be glad to hear from you, and you may ask him some pretty hard ones.

Mr. Fenstermaker.—What variety is the most profitable?

Dr. Thorpe.—The Concord; it is popular, and freeer from diseases than other varieties.

The President.—Is there anything being done that is making any progress against the root worm?

Dr. Thorpe.—The United States Department of Agriculture has an Experiment Station at North East under experts, and I am told by them that they found an enemy of the grape root worm, and if one has been found, why not millions? There may be many enemies of the worm.

Mr. Lewis.—What four or five kinds would you plant for home use?

Dr. Thorpe.—In their order, the Concord, the Niagara, the Delaware, Moore's Early, Hartford, Ives, Worden. Early grapes (Worden, Moore), pay.

A Member.—Would you name half a dozen of the hardiest varieties to stand ten or fifteen degrees?

Dr. Thorpe.—The Concord, the Ives, a Port Wine grape formerly very much prized for domestic use, and coming into favor again; the Niagara, if protected is a pretty good grape. It is a trifle uncertain, but if successful, it is very successful; also the Delaware, the Worden (early). There are a hundred and two varieties of grapes, of which probably ninety-six are unprofitable except for nurseries.

A Member.—I would like to ask the gentleman whether he has discovered the name of the insect which conflicts with the grape root worm?

Dr. Thorpe.—The grape root worm is as old as the wild grape. If you will go to the woods on Lake Erie you will find it feeding on the wild grape vine to-day. I am inclined to think that it has its uses, like Adversity, and that the only way to overcome it is by cultivation.

Mr. McSparran.—If the Doctor could tell us the name of the parasite that feeds on the root worm, perhaps we might cultivate it while waiting for another remedy.

Dr. Thorpe.—We are not waiting; we are very busy trying to combat the root worm. We spray for it from the 16th to the 24th

of June, according to the weather; we also stir the soil and expose his wormship to the sun, thus destroying myriads. Half an hour's exposure to the sun will cause him to shrivel up and die. We need not wait for an enemy to destroy him; we attend to that ourselves.

A Member.—I would like to ask how we can detect the presence of the root worm?

Dr. Thorpe.—The evidence of the grape root worm is a zigzag path on the leaf; it looks as if the leaf were cut through. That is the track of the feeding insect. After he gets grown he is a beetle, and you will find him on the leaf and in the wood, something like a rosebug. He is protected by nature by being covered with a dun gray coat, so that when he drops on the soil, it is hard to see him.

The President.—Any further questions? If not, we will take up the next subject—"The Making and Use of Concentrated Lime-Sulphur," by Prof. J. P. Stewart.

Prof. Stewart spoke as follows:

THE MAKING AND USE OF CONCENTRATED LIME-SULPHUR.*

By John P. Stewart, *Experimental Horticulture, State College, Pa.*

Lime-Sulphur in the old dilute form has been of service to horticulturists and entomologists since the discovery of its value by F. Dusey, at Fresno, Cal., in 1886. Its first appearance in the east was in 1884, when it was tried in Maryland and pronounced a failure. The ban was partially lifted by the results of a second trial in 1900, but the real beginning of its success in the east dates from Forbes' work in Illinois in 1902.

The material used by Dusey in California was a sheep dip borrowed from a neighbor. To a similar transfer in use, apparently, are we indebted for the beginnings of our knowledge of the value of the concentrated solution as an insecticide. Some sixteen or eighteen years after the first horticultural use of the dilute material, it appears that in Utah it became the practice of certain purchasers of a concentrated dip solution to buy a few extra barrels each season for application to their trees. This dip was prepared by a Stock Food Company, of Omaha, Neb., who corroborated the practice by sending inquiries and samples for trial to several Experiment Stations, and since then they have been regularly marketing their solution as either a dip or insecticide, without modification so far as I have been able to learn.† And it is of interest to note, that although the home preparation of storable dips has long been known, it is only recently a storable insecticide has even been considered.

*For the utensils and practical details see "Appendix" at the close of this paper.

†Letters from Rex Co., June, 1909.

Concentrated lime-sulphur as we know it to-day is a water solution of lime-sulphur compounds, of a bright cherry red or reddish amber color, and of a density that practically may run from 1.20 to probably as high as 1.35 (about 24° to 38° Baume). It differs from the ordinary dilute lime-sulphur chiefly in its ability to be stored, in its freedom from objectionable sediment and solids, and in its availability as a summer fungicide.

Solutions of the densities named above solidify or "freeze" at about 17° F. for the lower density and somewhat below 0° F. for the higher. Our experiments indicate that this freezing is rarely injurious to the solutions, which nearly always recover completely without heating. Their causticity is distinctly less than that of the ordinary dilute material, though without apparent reduction in effectiveness. On continued exposure to air at ordinary temperatures a crust of solids may be formed, which sometimes becomes very thick and objectionable, and at other times remains thin and acts as a protection to the liquid against further solidification. This crust can be readily skimmed off with a fine screen and re-dissolved by heating either in water or in the mother liquid. We have prevented it entirely either by covering the solution with a film of oil, or by immediate storing in closed packages which are filled completely.

The Problem.

The problem of producing a storable lime-sulphur is essentially one of preventing crystal-formation at ordinary temperatures, and of securing a product sufficiently dense to resist freezing and be entitled to storage space. The details of this process are already available in a bulletin of the Pennsylvania Station, so that our purpose here is to present the more general phases of the process and to call attention to some of our reasons for the conclusions given in that publication.

The Materials.

The materials needed are sulphur and a high grade lime. Flour of sulphur is probably preferable to the flowers because of its reduced cost and lessened tendency to collect in pellets, and present indications are that the still cheaper powdered commercial sulphur, of at least 99½ per cent. purity, will be entirely satisfactory in the making of concentrated solutions.

The lime should be as rich in calcium oxid (CaO) and as free of magnesia (MgO) as possible. In our judgment, nothing less than 90 per cent. CaO should be tolerated, though it can be used if necessary, and a lime with 95 per cent. or better of CaO is undoubtedly safer and more satisfactory when it is obtainable. Chemical lime running from 90 per cent. to 95 per cent. is obtainable from the American Lime & Stone Co., of Tyrone, Pa., in lump form for $3.25 per ton in car lots. It can also be purchased in iron tanks or drums, which prevent deterioration, in less than car lots at $3.75 per ton. This is the lime used by us in our experiments and a random sample analyzed showed 95.57 per cent. CaO. Lime of similar quality may be obtained at other places in this State, e. g., the York Valley Lime Co., York, Pa.

The exact extent of the harmful effects exerted by magnesium is not entirely clear. But it is known to materially increase the sediment, and there is some evidence that its compounds are at least partly responsible for some of the very fine crystals that occasionally appear in the concentrate in spite of correct handling in other respects.

The Correct Formula.

After securing a lime of proper character, its amount in relation to the sulphur is of the greatest importance. It has been shown repeatedly in our experiments that the crystallization and most of the harsh sediment in the ordinary dilute material are due chiefly to excess of lime. It is interesting to note, also, that this excess of lime crept into the insecticide immediately after its discovery and apparently without sufficient basis in definite experiments. This may be shown by reference to the first formulas used in Calofirnia.*

	Lime. Lbs.	Sulphur. Lbs.	Salt. Lbs.	Sugar. Lbs.	Water. Gal.
1886, Original formula (sheep dip), ...	80	100	10	20	160
1887, I. H. Thomas, ...	135	100	75	0	300
1887, A. T. Covell, ...	250	100	75	0	300

Thus within a single year we find a rise in lime-content from an amount equal to four-fifths of the sulphur to as much as two and a half times its weight. The serious physical objections to this extra lime are evident and its insecticidal value may well be doubted when we note the success of clear solutions and recall the tests† of lime conducted by Macoun in Canada, in 1899, and by Piper in Washington, which against San Jose and similar scales resulted negatively in all cases.

Assuming then that the permanent clear solution of polysulfids is our objective point in the preparation of lime-sulphur, the first problem is to determine the correct ratio of ingredients for obtaining it. This may be done either by analyzing the product or by repeated series of trials. By the first method, we have found that 59 analyses of the solution of the present dilute material, collected from publications of Haywood, Penny, and Thatcher, show an average lime-sulphur ratio of 1 to 1.96; 12 analyses of our own and commercial concentrates, examined at the Pennsylvania Station by Penny and Rogers, show an average ratio of 1 to 2.443; and 65 analyses‡ of somewhat denser, commercial "dip" solutions analyzed by Emery of the Federal Bureau of Animal Industry, show an average ratio of 1 to 2.538. Thus, as judged by the composition of the product, a ratio of pure materials which is slightly narrower than 1 to 2 is obtained in dilute lime-sulphur while in the higher concentrates a ratio of about 1 to 2.5 is found. These figures show

*Quayle. Cal. Bul. 166, p. 6, with all the formulas reduced to 100 lb. of sulphur.

†Experimental Farms Report, Ottawa, 1900, pp. 122, 123; and Washington Station Bul. 56: 20, 1903.

‡Letters of Chief of Biochemic Division, May and June, 1909.

that a ratio of 1 lb. of lime to 2 lb. of sulphur in the ingredients is well within the limits of actual combination in the concentrated material.

The ratios given above are derived from the actual amounts of chemically pure materials in solution in the finished products. But practically one must deal with commercial limes and sulphurs, and also he must approach the problem from the viewpoint of original ingredients rather than final products. To determine the best ratio of ingredients under actual conditions of preparation, therefore, we tried eleven combinations of which ten are shown in Table I. The lime and sulphur used were commercial and the former contained: 95.57 per cent. CaO; 2.08 per cent. MgO; 1.45 per cent. Al & Fe. The lime, water and boiling periods were kept essentially uniform, while the sulphur was varied from an amount equal to the lime to two and one-fourth times its weight.

Because of the well-known difficulty in dealing with solubilities, of getting identical results even from two products of exactly similar preparation, the problem was dealt with by the method of repeated trials and the elimination of error through the plotting of curves from combined results. From these curves, deductions were made of the true values of the various combinations with results as shown in Table I..

TABLE I.

Approxiate Results Obtainable from the Use of Different Ratios of Sulphur to Lime.

Formula.			Boiling. Min.	Gallons of 1.03 Spray.	Waste,* 1% of Product.	Crystals, after 48 Hours.
Lime. Lbs.	Sulphur. Lbs.	Water. Gal.				
100	100	100	60	342	27	Abundant.
100	150	100	60	585	12.5–13	Abundant.
100	170	100	60	700	5	Many.
100	180	100	60	765	2.25	Few.
100	190	100	60	825	0.5	Trace.
100	195	100	60	843	.125	0, or trace.
100	200	100	60	860	.15	0, or trace.
100	205	100	60	865	.35	0, or trace.
100	215	100	60	860	1–1.5	Few.
100	225	100	60	800	2.6	Few.

From the results here shown, it is obvious that the optimum weight of sulphur for these quantities of water and lime, as determined by the volume of dilute spray and the amounts of waste and crystals, lies somewhere between 190 and 205.

The volume of diluted spray is highest at 205 pounds, but the rise in waste, accompanied by the appearance of slight quantities of free sulphur in the sediment, indicates under the conditions of the experiment at least that the optimum has been passed. The waste is smallest at 195 pounds, and from this one viewpoint it is

*The "waste" mentioned in the table was the part of the product that would not pass through a strainer of about 50 meshes to the inch, after 48 hours. It was composed largely of crystals and harsh residue. This does not take into account the very fine sediment that went through with the liquid.

best. But the waste is very slightly greater at 200 pounds, and from the viewpoint of freedom from crystals and waste, volume of spray, and simplicity of formula, 1-2-1, it is best. It is therefore recommended for general use in preparing concentrated solutions.

There is no serious objection, however, to any of the formulas with 180 to 205 pounds of sulphur, and where the material is to be used at once or if the purity of the lime is questionable, it may be desirable sometimes to approach the lower amounts.

Optimum Concentration.

With the proper ratio of ingredients determined, the next question is what is the most efficient or optimum concentration. In the home product, the greatest density that is obtainable and permanent is not our goal. We wish rather to obtain the concentration which best utilizes the materials and is of storable density. The best utilization is here considered to be that which obtains the most tree-spray of uniform density from a given amount of sulphur and lime. A storable density is considered to be one which will permit a dilution of at least seven volumes and will stand at least 15 degrees of frost (17° F.) without freezing.

In answering the question of optimum concentration for a formula in the proportions of 100 lbs. lime to 200 lbs. sulphur, we tested concentrations at intervals of about five gallons for volumes varying from 128 gallons of concentrate down to 65 gallons. The method of trials, curve-plotting and deduction was also used here with results as shown in Table II.

TABLE II.

Approximate Results Obtainable from Different Concentrations.

(Using 100 lbs. Lime to 200 lbs. Sulphur.)

L.-S. Lbs.-Lbs.	Water. Gal.	Boiling. Min.	Density at 60 Deg. F.	1.03 Spray. Gal.
100-200	128	20	1.182	780
100-200	125	25	1.198	825
100-200	120	30	1.223	896
100-200	116	35	1.233	904
100-200	115	36	1.234	900
100-200	112	40	1.238	892
100-200	110	43	1.240	881
100-200	105	50	1.243	853
100-200	100	56	1.347	825
100-200	95	63	1.252	800
100-200	90	70	1.256	771
100-200	80	85	1.269	718
100-200	75	94	1.276	690
100-200	70	104	1.284	663
100-200	65	113	1.293	636

From the results obtained it was apparent that the most efficient or optimum concentration differs with the demand. Under the conditions of the experiment, which were eccentially those met in practice, the best utilization of materials occurred at 115 or 116 gallons of concentrate.* This volume gave an average density of

*The lack of fuller utilization at the higher volumes of concentrate was evidently due to shortness of boiling periods at those volumes.

about 1.23, which permits a dilution of 1 to 7 2-3 for a 1.03 spray, and does not freeze above 15° F. It can be stored satisfactorily and is to be recommended where storage conditions are not exacting.

But where limited space and low temperatures are to be met, the densities found at 70 to 80-gallon volumes of concentrate are preferable. Higher densities may of course be obtained by greater concentration, 1.385 being twice reached in our experiments. But under orchard conditions, at least, these higher densities are all obtained at the expense of final volume of spray, and in some cases they have been difficult to maintain.

Thus for the home product, the best concentration is evidently a matter of viewpoint. For the best utilization of materials and fair storage qualities, 112 to 120-gallon volumes are preferable. For better storage and fair utilization of materials, 75 to 80-gallon volumes may be best. For average qualities of both utilization and storage, 100 to 110-gallon volumes are best, as well as simplest, and are accordingly recommended in this paper for general conditions.

With the commercial product, however, where freight rates and the cost of packages must be considered, we believe a density not less than 1.30 to be preferable. It is entirely permanent if properly made and protected from the air, and its ease of dilution in obtaining the principal sprays further recommends it. We have here a product of 1.336 density (or about 36½° Baume), which was made on February 1, 1909, and which amply proves the permanence of solutions even stronger than the 1.30 density recommended. Other requirements that will be met by the best commercial firms are that their product shall *contain clear solution only and have nothing but lime, sulphur and water in its ingredients.*

When we reach the actual boiling of the materials, the procedure is not greatly different from that followed in the making of the ordinary dilute material.* The utensils needed are a cooker, strainer, measuring stick, and hydrometer. Cookers made of iron or wood are preferable. If steam is used it should be in closed coils, rather than live steam, at least in the later stages of the process, since it is desirable that the final volume be under control and be decreasing rather than increasing. The strainer should have not less than thirty meshes to the inch and 36 or 40 are preferable. The measuring stick is so marked as to enable one to make the necesssary additions of water and get the final volume most readily. A hydrometer of the ordinary float type with a range from 1.000 to 1.35 is ample, and it may be fitted with both the specific gravity and Baume scales. Where but one scale is to be had, the former is preferable.

In making the concentrate, we have found it much more convenient, and at least equally effective, to add the dry sulphur to the slaking lime rather than adding it in the form of a paste. Care should be taken, however, to maintain a moist condition of the mass

*A detailed description of the utensils and process of making concentrated lime-sulphur is given by the writer in Bul. 92, of the Pennsylvania Station. (On p. 12, line 24 of that Bul. read "boil again to 50 gallons" instead of 60 gallons; also see "Appendix" to this paper.)

and to thoroughly mix it during the slaking, paying special attention to the breaking up of any lumps that may appear during the process of boiling.

Time of Boiling.

The material should be boiled until the sulphur granules are evidently dissolved. This fact is best determined by dipping and slowly pouring some of the material, under close observation. In many cases we have obtained as complete dissolving of the sulphur in less than 40 minutes of actual boiling as was obtained by any time up to 2½ hours. We know of no useful purpose to be served by continuing the boiling for any considerable length of time after solution has occurred, while on the other hand the amount of sulfites and sulfates, and therefore the sediment, is increased by unduly prolonged boiling. However, if a time of boiling were to be named, it is probable that a period of 40 minutes to one hour will be satisfactory, at least until the question can have further study.

The finished product, made by using 100 lbs. lime, 200 lbs. sulphur and 100 gals. of water, will have an average density somewhat above 1.24 (or about 28½° Baume). If the lime is good and the manipulation right, less than one per cent. of the product will fail to pass through a strainer as fine as 50 meshes to the inch at the end of 48 hours or more. The material that passes through, however, is not all clear solution. Along with the latter there is formed a very fine sediment or sludge which even after settling for some days usually permeates the solution from a fifth to about a third of its depth. This sludge is made up largely of sulphites and sulphates of calcium, together with some free sulphur and lime, and whatever impurities the lime and sulphur contained which were not removed by the strainer.* The magnesium, iron and aluminum, dirt, etc., are largely found in it. It is of doubtful value as a spray material * but the difficulty of its economic removal and the apparent lack of objectionable mechanical qualities have led us to disregard it in the home preparation.

If it is desired to obtain only the clear solution, however, this may be done by letting the product settle for about a day, drawing off the clear portion and straining the remaining liquid and sludge through a moderately fine cloth placed inside of the strainer. The sludge may then be washed free of any further valuable materials by pouring through it the water to be used in making the next lot.

The Process of Diluting.

Having now our concentrate prepared, its proper dilution becomes a matter of importance. In the application of any concentrate, either home-made or commercial, it is essential that a definite method of dilution be followed. Two solutions may look exactly alike and yet differ widely in density, so that any accurate method must be based primarily on the density of the concentrate that is being diluted. Moreover, we believe that recommendations based on the

*After the work of Bosworth & Parrott, Geneva Station, N. Y.

density of diluted spray are preferable to those based on the number of dilutions even when accompanied by a statement of the concentrate's density.

Accurate dilution is very simple and easily accomplished with the aid of a hydrometer having the specific gravity scale. Sprays of any desired density may be obtained from any concentrate by simply getting the reading of the concentrate and dividing the decimal of this reading by the decimal of the spray desired. For example, if the reading of the concentrate is 1.27 (about 31° Baume), to get a spray of 1.03 density we divide the .27 by .03 and obtain 9, which is the number of dilutions required, and which of course is obtained by adding *eight* volumes of water. In this we are simply applying the general fact that the densities of solutions heavier than water vary inversely with the number of dilutions.

The workings of the process may be seen further in the following:

(a) To determine number of dilutions.

$$\text{Formula: } \frac{\text{Decimal of concentrate}}{\text{Dec. of Spray Desired}} = \text{No. of dilutions.}$$

$$\text{Examples: } \frac{1.24}{1.03} = 8, \text{ or } \frac{1.25}{1.01} = 25.$$

$$\frac{1.30}{1.03} = 10, \text{ or } \frac{1.30}{1.005} = 60.$$

(b) To determine the density of spray used.

$$\text{Formula: } \frac{\text{Decimal of concentrate}}{\text{No. of Dilutions}} = \text{Decimal of Spray.}$$

$$\text{Examples: } \frac{1.26}{10} = .026, \therefore \text{ Spray} = 1.026.$$

$$\frac{1.27}{50} = .0054, \therefore \text{ Spray} = 1.0054.$$

This method gives final sprays of definite density and the importance of this is obvious when we consider the relatively small margins between safe and unsafe densities in the use of these solutions on foliage. It is also evident that any statement of dilution such as 1 to 40 or 1 to 60, without an accompanying statement of the density of the material being diluted is indefinite and correspondingly unsafe.

With Baume hydrometers, the dilutions are obtained indirectly, either by conversion into the Specific Gravity scale or by means of a special dilution table. In the latter case, however, a table is likely to be needed for each density of spray desired.

Use of Sulphur Sprays.

The range of usefulness of sulphur sprays is unusually great. Their value as contact insecticides is already well established, though

some of the egg-laying scales, such as the terrapin (Eulecanium) and sometimes the oyster-shell, are not as well controlled by the dormant applications as might be desired. The latter, however, was very easily killed with a 1.02 solution at hatching time which occurred on June 12 this year at the Pennsylvania Station. On the other hand, our results with a similar strength against the apple aphis after it had reached the leaves were unsatisfactory, owing to the difficulty in wetting the insects even when completely immersed. From the work of Gillette and Taylor in Colorado, however, these insects can be controlled in the egg stage by a spray of about 1.04 density, applied before bud-opening.

But it is in the capacity of summer fungicides that lime-sulphur solutions are now most promising. This is chiefly because of the severe damage often resulting from the use of Bordeaux, which has created a strong demand for an efficient fungicide that is free from its injurious effects. Especially is such a material desirable in controlling apple scab on varieties like Jonathan, Hubbardston, Gano and others whose fruit is often badly russeted by the Bordeaux spray. It is also very desirable in controllling the brown rot of stone fruits, whose tender foliage in many cases renders the use of Bordeaux impossible.

At the present time, the results of certain experiments indicate that lime-sulphur solutions properly diluted are likely to supply this need. It is not to be inferred, however, that they are to supersede Bordeaux entirely. The latter will undoubtedly remain our standard fungicide for many purposes, but with its limitations more sharply defined. And for special cases like those above, lime-sulphur solutions *of known ingredients* are now very promising.

Dilution for Different Uses.

The proper dilutions for various purposes, especially for summer use have not yet been fully determined. Two questions are evidently involved: (1) the strengths that the foliage will stand; and (2) the strengths actually required to control the pests. With these questions answered, it would be easy to decide upon the best practical orchard strengths. In attempting to approximate these strengths at the present time, we conducted foliage tests with our material and also considered all definite, available results with similar sprays elsewhere.

In our tests the spray was applied at ten different strengths, ranging from 1.005 to 1.020, to the foliage and fruit of apple, cherry, grape, peach, European plum and Japanese plum. The results from six of these strengths, applied June 12, 1909, are shown in Table III. No addition of lime was made. The sticking qualities of the spray were excellent, since in spite of abundant rains the spray was very evident on the leaves for several weeks after application. In the table, whenever two figures are given in the estimate of damage, the lower one comes closest to my own opinion as to the true extent of the damage, but the higher figure is added in order to be entirely safe.

TABLE III.

*Influence of Different Strengths of Lime Sulphur * on Foliage.*

No.	Density of Spray.	Per Cent. of Injury to Foliage. Estimated after Twelve Days.					
		Apple.	Cherry.	Grape.	European Plum.	Japanese Plum.	Peach.
1	1.005	0	0	0	5–10	5–10	10–15
2	1.009	0	0	0	10–15	10–15	10–15
3	1.012	5	..	0	10–20	40–45	25–30
4	1.015	15–20	..	0	10–20	50–60	40–45
5	1.018	5–10	5	5	20–30	80–85	40–50
6	1.020	10–12	5	5	.....	.....	50–60

As shown in the table, no injury of importance was caused to the first three fruits by any of the strengths used, excepting in No. 4, where a number of young apple leaves had been sprayed heavily on the under sides with a 1.015 solution. This showed a 15 per cent. to 20 per cent. reduction in foliage--efficiency.

In the case of the tenderer stone fruits, on the other hand, it will be observed that some leaf injury occurred even with the lowest strengths. And from our results it would appear that any protection of the fruit in the peach or plum is likely to be secured at some sacrifice in foliage. Our results indicate that solutions as strong as 1.009 may be used for a single spraying under normal weather conditions without exceeding a 15 per cent. reduction in foliage-efficiency. If this sacrifice is considered not too great for the sake of the fruit, we believe that such a strength can be used. But from results obtained by Wallace at Cornell, with much weaker solutions it is probable that such strengths are not really needed to control brown rot, and until further work is done it may be best to consider a density of 1.005 as the maximum for peach and plum foliage, with a minimum for trial as low as 1.003 or possibly even 1.002.

But a striking thing in the effects of the spray was the fact that many thoroughly sprayed leaves escaped injury even at the higher densities, while many others showed considerable injury at the lowest strengths used. This condition was partly explainable on the basis of location of the spray on the leaf, the under surfaces proving much more vulnerable than the upper. But, undoubtedly, the main explanation is to be found in the fact that when applied heavily the spray collects in drops on the leaves (especially on the margins), and by evaporation is concentrated to injurious densities. Thus the *density of the spray as applied* may not be the controlling factor in foliage injury, but rather it is the *density attained on the leaf before evaporation is complete.* This depends on (1) the abundance of the application; (2) the density of the material applied; and (3) the size and location of the drops retained by the leaves. The first two factors are easily modified, within certain

*It is not to be inferred that such results as these are regularly obtainable with the commercial solutions, because of the frequent presence in them of foreign materials such as salt, as shown by the Geneva Station, N. Y.

bounds, but the third is more difficult. If the spray could be kept more evenly spread over the leaf surface, or if the larger accumulations of liquid could be removed before drying, the trouble would undoubtedly be greatly lessened.

In the case of the peach, where the injury is most severe, the glaborous and slightly waxy foliage facilitates the collecting of spray into drops, which accounts for the prevalence of the "shot-hole" injury in the leaves. It also suggests the possibility of materially lessening the injury by jarring off the excess liquid shortly after spraying, since the pubescence on the fruit retains the spray needed. It is doubtful, however, whether this would prove commercially practicable, hence the need of further experiments and of caution among orchardists in dealing with these fruits.

From all definite results at present available, the following table of uses has been prepared.

TABLE IV.

Times and Strengths of Spray for Various Purposes.

Insect or Disease.	Spraying Times.	Densities of Spray.
San Jose Scale,*	Trees dormant, but best in fall or spring.†	1.03 for regular annual control.
Oyster-shell Scale,* ...	At hatching time,	1.04 in bad cases, especially on old apple trees.
Blister-mite,* Plant lice eggs, Peach leaf curl,	Just before buds open,‡	1.02. 1.03 to 1.04. Latter strength for aphis eggs.§.
Apple and pear scab, Apple worm, add arsenical in 2 and 3.	(1) Blossoms beginning to show pink. (2) Within a week after petals fall. (3) About three weeks later.	1.01. May be varied by .002 or either way as results direct.
Cherry leaf spot,	Three sprayings, a month apart, beginning with signs of infection.**	1.01, or slightly weaker.
Peach scab and brown rot of stone fruits. (Experimental as yet.)	(1)** Three or four weeks after petals fall. (2) Half-way between (1) and (3). (3) Two weeks before fruit ripens.	1.003 to 1.005. May be varied .001 either way, as results direct. On peaches and plums, limited trials only, testing effect on foliage by applying to a few trees several days before regular applications.

While it is believed that the densities recommended in this table will generally prove efficient and safe under average eastern conditions, yet we have observed occasional injury from third and fourth applications when the earlier applications of the same strength of spray had proved entirely safe. Also in connection with the addition of arsenicals, we have found that the decomposition which

*Also controlled by properly made miscible oils. (See Bul. 86, this Station, for preparation.)

†March sprayings showed a 41% advantage over those in January, in Forbes' results. Ill. Bul. 107.

‡See New York Geneva Bulletins 283 and 306.

§Colorado Bul. 133, p. 27.

**Times recommended by Scott for control with self-boiled lime-sulphur. (With slight modifications.) Bureau of Plant Industry, Circular 27, 1909.

follows the addition of lead arsenate and Paris Green, is practically avoided by the use of arsenite of lime and that the burning which usually accompanies the use of this material can be largely avoided with a slight modification of the Kedzie formula. This modification consists in reducing the sal soda to about one-fourth the amount in the above formula, and then using the clear arsenite-of-soda solution in slaking an amount of lime sufficient to render the arsenic insoluble. By this method, we have succeeded in reducing the soluble arsenic to a mere trace,—.013 per cent. after 30 minutes agitation in water with air bubbling through it.

A number of important questions still remain for further study in connection with lime-sulphur solutions. We are not now certain as to just what the active agents are, nor how they act either in the killing of insects, fungi, or leaves. Neither are we yet satisfield with our knowledge of the minimum practical strengths for fungous and insect control.

Appendix.*

Utensils.

The equipment needed for making and diluting concentrated lime-sulphur consists of a cooker, a measuring stick, a hydrometer, and a strainer.

The Cooker.—The cooking may be done either by fire directly, using an ordinary iron kettle, or by means of steam coils in vessels of either metal † or wood, but preferably not with live steam because of its addition of water instead of reduction. A cooker used by us and found very satisfactory is shown in Figure 3. Steam jacketed kettles, with mechanical agitators, are very satisfactory when steam is available.

FIGURE 3
A convenient cooker for use in making concentrated lime-water.

It may be obtained from the Farmers Supply Co., Philadelphia, or from Montgomery Ward & Co., Chicago, and the larger sizes are preferable if much material is to be made.

This cooker is valuable because of its economy of fuel, its disposal of the smoke, and especially on account of the easy control of the fire it affords by means of the door and damper. It might be improved by the addition of a spigot in the bottom, reaching through the jacket and thus greatly facilitating the removal of finished products.

The Measuring Stick.—This is for use in determining the volume of water in the kettle at any time by means of its height. It is of importance in order to know when the material is boiled down

*This is added for concise reference as to details. It is pages 10 to 14 (with slight modifications) of the writers Bulletin 92, of the Pennsylvania Experiment Station.

†Copper implements are objectionable in all operations with lime-sulphur and should be avoided.

far enough, and is also a convenience in adding the right amounts of water. It may be made by planing down a good lath to ⅜"x⅞" in cross-section and then accurately marking on it the heights reached in the kettle by 6, 8, 10, 12, etc., gallons of water. It is will to notch these marks with a fine saw, making those heights prominent that will be most used.

The Hydrometer.—This is an instrument very much like that used in testing acids in dairy work, but with a wider range, and is used in determining the density of the finished product preparatory to dilution. A convenient type of hydrometer for liquids heavier than water, is obtainable from George D. Feidt & Co., Philadelphia; or from Elmer & Amend, New York City; or Bausch & Lomb, Rochester, N. Y.

These instruments are made in two scales, the Specific Gravity and the Baume, both of which may be placed on the same instrument. Densities are expressed by the former in decimals and by the latter in degrees. The Baume scale is somewhat easier to read, but the other is more convenient to use, inasmuch as the required dilutions can be obtained more directly from it. The range desirable is from 1.000 to 1.35 on the Specific Gravity scale or from 0 to 36° Baume. Such instruments have been put up according to these specifications, and may be obtained from the firms indicated above. They are simple in use and indispensable for accurate dilution of concentrated solutions.

The Strainer.—Any ordinary lime-sulphur strainer of about 30 meshes to the inch will be satisfactory for this work. A satisfactory type is shown in Figure 5.

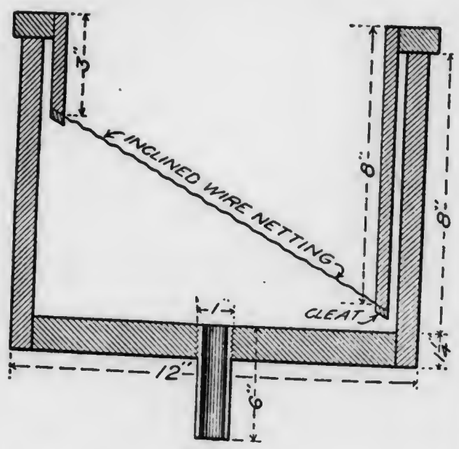


FIGURE 5
A satisfactory strainer easily made. Wire cloth for the screen may be obtained from Hall & Carpenter, Philadelphia.

It may be used for either lime-sulphur or Bordeaux, and the central portion lifting out greatly facilitates the cleaning.

If the strainer is to be used for lime-sulphur only, tinned iron wire will be best for the screen. If, however, it is used for both Bordeaux mixture and lime-sulphur, brass wire is best. If kept properly cleaned immediately after use (which should be done with all metallic implements when lime-sulphur is used), it will last indefinitely. An improvement might be made by sloping the upper surface of its floor toward the spout, and its size may well be increased where large quantities of material are to be strained.

Materials.

Sulphur and lime may usually be obtained locally in sufficient quantities and purity to meet the demands of concentrated solutions. In larger quantities, the sulphur may be obtained from: The Bergenport Sulphur Works, New York City; Powers-Weightman-Rosengarten Co., Philadelphia; or Thomsen Chemical Co., Baltimore. Prices vary from $2.15 to $2.60 per 100 lb., depending on the kind and quantities ordered. For best results the lime should in no case fall below 90 per cent. in purity and preferably not below 95 per cent.*

Bringing together and applying the foregoing considerations, we have the following method of preparation:

How to Make Concentrated Lime-Sulphur.

Materials:

50 lbs. best stone lime (90 to 95 per cent. CaO).
100 lbs. sulphur (flour or powdered commercial 99½ per cent. pure).†
50-55 gallons of water, *at finish.*‡

Directions.—Put 10 gallons of water in kettle and start fire. Place lime in kettle. After slaking is well started, add the dry § sulphur and mix thoroughly, adding enough water to maintain a thin paste, which requires about five gallons. After the slaking and mixing is completed, add water to the height of 50 gallons on the measuring stick, bring to a boil and stir until the sulphury scum practically disappears. Then add water (preferably, but not necessarily, hot) to the 65-gallon|| height and boil again to 50 gallons, if storage space is limited. If it is not limited, a little more water should be added the third time and boiling stopped at about 55 gallons. The material should be kept well stirred, especially during the early stages of the process, and any lumps of sulphur or lime should be thoroughly broken up.

The total time of actual boiling should be about an hour, though a ten-minute variation either way is not objectionable providing the sulphur is evidently dissolved. This fact is best determined by dipping and slowly pouring some of the material. The amounts of water indicated above are ample for one hour's fairly vigorous boiling, with the finishing volumes as indicated. If it is not at the desired height at the close, it may be made so by more water or more boiling, and either the amount of water in the third addition or the

*The lime used in all this work was commercial and contained: CaO, 95.57 per cent.; MgO, 2.08 per cent.; Fe and Al, 1.45 per cent.

†The sulphur may be reduced as low as 90 lb. to this amount of lime without unsatisfactory results, but the waste and tendency to crystallize is increased and the density is of course decreased for these volumes of finished spray.

‡This amount can be conveniently made in a 75-gallon cooker. Other amounts in proportion.

§This is more convenient than to previously moisten the sulphur and final results are as good or better, if the stirring is well done.

||If cooker is large enough, the whole amount of water may be added immediately after mixing in the sulphur, thus avoiding the check in boiling, though greater care is required to prevent boiling over.

vigor of boiling can be so modified in later trials as to enable the total to be brought to the desired height approximately at the end of the hour.

The finished product may be immediately poured or strained into a barrel or settling tank or into the spray tank. The straining is merely a safeguard to prevent any possible clogging because of imperfect materials or failure to break lumps in the sulphur. When properly made, the amount of sediment left in the strainer is insignificant, being less than 1 per cent. as shown in Table I, and may be thrown away. To avoid any considerable loss of materials, however, the sediment in the strainer can be washed with part of the water used in making the next lot, simply pouring the water through the strainer into the kettle, and any lumps of sulphur discovered may be broken up and used again.

If the straining is not done, the whole product may be put into a settling tank or barrel and the clear liquid drawn off later as required. This process, however, is likely to lose efficient liquids in the sludge, as well as the fine sludge itself, which may be of value in several ways, and is of no apparent hindrance in the spraying.

The crust which forms on the finished material, is prevented by immediately covering the solution with a layer of oil about an eighth of an inch thick, and avoiding unnecessary exposure to air in the transfer from kettle to storage tank. An ordinary paraffin oil was very satisfactory in our work, but there is reason to believe that any other oil, not injurious to trees nor likely to take fire at boiling temperatures, may be used with equal success.

The crust may also be prevented by immediate storage in tight, closed vessels, filling them *completely*. But partially filled vessels are likely to develop some crust, upon continued exposure.

The finished product should be protected in storage from unduly low temperatures, though solutions of 1.28 density (32.1° Baume) do not freeze above 5° F., and usually recover completely after they are frozen. Less dense solutions freeze at higher temperatures, with recovery similar. Lower temperatures, however, are not frequent within six weeks or so of bud-opening, so that little difficulty is to be expected. In case some objectionable crystals form, they are easily strained out and re-dissolved by boiling in a little water, and may then be either returned to the solution or to some other one and the first diluted as usual without them.

A Member.—Can you tell me where I can buy the lime?

Prof. Stewart.—From the American Lime & Stone Co., Tyrone, Pa., at about $3.25 a ton, in car lots. You can also get it from the York Valley Lime Co., York, Pa. I would get a lime that runs as high in calcium oxid as is possible in car lots, around 95 per cent. CaO if you can get it, and one that contains as little magnesia as possible.

A Member.—Do you mean to say, Professor, that there is a time when there is no sediment whatever?

Prof. Stewart.—No; there is always some sediment, but there is a time when there is the least sediment, which is soon after the

dissolving of the sulphur granules first becomes complete, and that is the time to stop boiling.

A Member.—About how long?

Prof. Stewart.—In some cases I have obtained as good a solution after forty minutes of actual boiling as at any time up to two and a half hours. In general, however, I should say that boiling from forty-five to sixty minutes should be ample to get the sulphur into solution. But I should consider that the point of evident solution of the sulphur is a better indicator of the time to stop boiling than any number of minutes.

A Member.—Do you put your lime and sulphur all in at the same time?

Prof. Stewart.—The sulphur is added to the slaking lime.

A Member.—Do you run live steam directly into it?

Prof. Stewart.—No; because in that way we can not so well control the final volumes. I should prefer bottom heat or steam jacketed kettles, or steam in closed coils.

A Member.—But if you are fitted up to do so, you can use live steam?

Prof. Stewart.—Yes; but I would not advise it.

A Member.—At what pressure?

Prof. Stewart.—Anything you like, so far as I know.

A Member.—From two to fifteen pounds?

Prof. Stewart.—Yes; though the latter would add less water in condensation after boiling started.

A Member.—When do you test it with a hydrometer?

Prof. Stewart.—When you come to dilute it.

MEETING OF THE EXECUTIVE COMMITTEE.

The Executive Committee was called together during the noon recess to receive a message from Dean Thos. F. Hunt, through Prof. Watts, assuring the Association of the willingness of the Pennsylvania Experiment Station to work for and with the Association in the Horticultural interests of the State.

He advised that plans were being made to put additional help on the work of Experimental Horticulture, having in view experiments with some other fruits. The Executive Committee was asked to designate what, in their opinion, would be the best line of investigation to pursue. After some discussion, the committee decided to recommend that careful work on one fruit would probably bring results of more value to the growers of the State than the same money and energy spread over several . It was their feel-

ing that peaches, being next in commercial importance to apples. should receive attention next, provided the important questions of peach culture were not found to be already under careful investigation by other states. In this case it might seem best to take up the study of some other of the stone fruits.

WEDNESDAY, JANUARY 12, 1910, 1.30 P. M.

President Hiester in the Chair.

The President.—The meeting will please come to order. We will now resume the discussion of Prof. Stewart's valuable paper.

A Member.—What arsenite would you recommend to be used with lime sulphur as a summer spray?

Prof. Stewart.—Personally, I should use arsenite of lime, prepared as indicated in our Bulletin 92. Arsenate of lead decomposes both itself and the lime-sulphur, besides being much more costly. It has been used with good results practically, however, so that we cannot condemn it completely.

Mr. Engle.—We have heard a great deal of the efficiency of the spraying, but is there anything to show when it has been applied? That is one of the chief defects of the sulphur solution. Can you not find something that will leave a mark on the tree to show where it has been applied?

Prof. Stewart.—The addition of six pounds of slaked lime to fifty gallons of water will give a marker and show where it has been applied. Its addition, however, is objectionable mechanically and also chemically. Some of our largest orchardists are abandoning the marker.

Mr. Engle.—"Never Scale" comes in a powder which is diluted and then applied the same as this. The agent was at our office recently and showed a twig to which it had been applied. It showed quite white where it had touched.

Prof. Stewart.—It ought to leave a good mark, inasmuch as its analysis shows a high content of lime.

Mr. Eldon.—Will the addition of lime paste tend to throw down crystals?

Prof. Stewart.—Yes; the addition of lime has a detrimental influence. When we add it, we increase the thiosulphates, and apparently decrease the proportion of higher polysulfids. We also increase the tendency to crystallize, and add to the amount of solids tending to clog the nozzles. Thus you see its addition is objectionable, but if you still want a marker you can use it.

Mr. Engle.—The trouble is that a great many people do not apply it thoroughly, and a marker shows where it has been applied and where not.

Prof. Stewart.—That is one argument in favor of the marker. The sediment in the home preparation partially relieves this difficulty.

Mr. Engle.—At the recent meeting of the Nursery Inspectors we heard some remarks by Prof. Headden on the danger of getting an excess of arsenic and injuring the soil by the arsenate in it. Would there be the same danger with the arsenite of lime?

Prof. Stewart.—That is a question I would not undertake to answer finally. It has not been shown that we are in any particular danger of arsenical poisoning here in the east. The question is being worked upon now by Prof. Quaintance and his men at Washington. From Prof. Headden's work I would say that there is just as much danger from arsenite of lime as from arsenate of lead where conditions are right for it, but we are not in the same danger in our soil as they are in the alkali soils of the west.

Mr. Engle.—He was quite positive in his opinion, and proved it by exhibiting branches of fruit that showed traces of it. He did say, however, that he thought no one could eat enough apples to get arsenical poison from them.

Prof. Stewart.—Yes; I have had some correspondence with Prof. Headden on this subject, though in particular connection with another point. It will be brought out in my orchard fertilization talk later.

The President.—We will postpone further discussion along this line until after Prof. Surface has made his address.

Mr. Estabrook.—I desire at this time to offer a resolution, which I will read:

"*Resolved*, That in view of the very helpful work that is being done at State College for the Horticulture of the State, that the State Horticultural Association of Pennsylvania do all in its power to obtain a Horticultural Building at State College."

Prof. Surface.—I move the adoption of this resolution by this organization.

Mr. McSparran.—I second it.

The motion was unanimously carried.

The President.—We are now ready to receive the report of the Committee on Nominations.

Mr. Walton.—The Committee on Nominations desires to make the following report: President, Gabriel Hiester; Vice-Presidents, William T. Creasy, Robert M. Eldon and F. H. Fassett; Secretary, Chester J. Tyson; Corresponding Secretary, William P. Brinton; Treasurer, Edwin W. Thomas.

Mr. McSparran.—I move the report be received, and the committee discharged.

Mr. Briggs.—I second that motion.

The motion was carried and the committee discharged.

The President.—The election of officers is now in order. Now, it is understood that you are not obliged to vote for these men selected by the committee. You can vote for any one you please.

Mr. McSparran.—Since there is only one ticket in the field, I move we make it a unanimous vote, and that Mr. Briggs be selected to cast the vote.

This motion was properly seconded, and carried. Mr. Briggs cast the official ballot, and the nominees were declared elected.

The President.—I want to take this occasion to thank you for your confidence in me, in re-electing me; I trust that I shall prove worthy of it.

We have been invited to exhibit at the meeting of the Live Stock Breeders to be held in Philadelphia in February. It strikes me that this would be a most excellent advantage for the men who are growing fruit commercially in Pennsylvania, and I would like to have an expression from the exhibitors before the close of our meeting. How many of you are willing to allow your fruits to be exhibited at Philadelphia? It would cost the Society but little, and the exhibitors nothing but the packing of the fruit. We would like to have the names of as many of the exhibitors as are willing to allow their fruit to go to Philadelphia.

Mr. McSparran.—I am a member of the Breeders' Association, and on that occasion, I think it is the 2d, 3d, and 4th of February, they will have a most excellent corn show, and our fruit exhibit would fit in very nicely with the corn show. I am sure the Breeders' and Dairymen will take excellent care of your exhibits, and see that they receive the proper publicity.

The President.—I am now going to introduce to you a gentleman who admits he is a crank on cover crops. You can decide that for yourself when you hear him. I have the pleasure of introducing to you Mr. Symthe, of Benton Harbor, Michigan, President of the Michigan State Association.

COVER CROPS.

By President R. A. Smythe, *Benton Harbor, Mich.*

No one has a right to leave this earth in a worse condition than he finds it, and it should be his pride to say when Father Time calls, that the world has been made better by his having lived.

True! we are not all Edisons, Marconis, Burbanks, or many others that I could enumerate. But each man is responsible for the one life given him, and must answer for the development of his individual talents. I am not stating this from a sentimental or spiritual standpoint, but purely from the material and practical side: I wonder how many of us think of this as we go on year after year robbing the soil of everything we can, without returning anything to improve and rejuvenate it. Now, is this just to ourselves or to the generations that are to follow us? No, I think not. Why is it we hear of the deserted or abandoned farms in many of the eastern states, where farms with good houses, barns, out buildings, and

other improvements can be bought for almost a song What is the reason? Some one must have made money enough on these same farms to have made these improvements, or they would not be there. But why are they abandoned? The land has become so impoverished by the continual cropping that it is worn out, and it is impossible to make a living on these farms. Can they be made again profitable? Yes! with proper cover crops and other fertilizers. Many people would prefer to go out west and take virgin land, and start anew, but I would rather not; I would stay with the old farm, with all the memories and associations connected with it, and bring it back to a profitable investment. The trials and discomforts of going into a new western home do not look attractive to me. If you have been robbing your land year in and year out—stop it, and begin to put something back, grow something on this land which can be plowed under, and will improve it every year, and in a few years you will have your farm in a fine condition and will be with your friends and relatives.

In my few remarks I cannot enumerate the many ways in which you can improve your lands with fertilizers, manures, clover, peas, beans, and other legumes—saying nothing of cultivation, drainage, etc. I will only endeavor to impress upon you the value of growing cover crops on all cultivated orchard and vineyard lands. When I say "cover crops" I do not mean catch crops such as oats, rye, barley, wheat, corn and other things that are planted late in the season and grow until frost comes; these are only grown to stop the rapid growth of the tree or vine, and help ripen the wood before heavy freezing comes, also to help catch and hold the snow in the winter. A "cover crop" is one that is planted in the late summer and grows and lives through the winter, coming out in the spring, making a large growth to be plowed under. The different clovers and vetches are the only cover crops of real value and as my experience has been more with vetch, I will confine my talk more closely to it.

From my own observation and what I can gather from all the State and United States Bulletins there is nothing quite equal to the hairy vetch as a nitrogen gatherer and humus producer. The terms "Winter," "Hairy," and "Sand" Vetch are synonymous, but as the plant is covered with a fine hairy growth, it seems the term "Hairy Vetch" is the most appropriate. There are a score or more of different Vetches, but only two varieties of value are grown in the United States, and really only one of value in the colder climates. Hairy Vetch was first introduced into America from Europe in 1847. It is a native of western Asia; at first it was thought of little value and received little attention, but later it became the subject of many experiments at the different Experimental Stations, and by private parties, both in the north and south. It was not long before its real value was determined, and now it has been cultivated for more than 15 years, and is being more and more used. Ten years ago it was not heard of in our community, and five years ago I only know of one or two other sowing it besides myself, and this year I know one party that sold a car load of seed in my immediate neighborhood. I have been growing it five years, and from the

greatly improved condition of the soil I am convinced it is of the greatest value as a cover crop and soil rejuvinator. My first experiment with it was on a high, sandy hill, where the sand blew badly, and where I found it difficult to get other cover crops to grow. I planted it about the middle of August; it did not make a large growth that fall—still, enough to hold the sand. It lived through the winter and came out in fine condition in the spring. By the time we were ready to turn it under there was a covering on the ground that was really something to see. After it was ploughed under, the soil spoke for itself, the color being several shades darker. We had set this piece of land with peach trees that spring before we plowed the vetch under. The trees made a splendid growth and were in fine condition until we had a very heavy frost in October, which killed many of the young trees; this was in the fall of 1906. The young trees that lived are now four years old and are in fine condition. I have been growing vetch every year on this same place. We have grown tomatoes and melons between the young peach trees and they have always been a profitable crop, except when injured by the dry weather. I always sow vetch seed when the melons and tomatoes are cultivated for the last time. We do this also on orchard and vineyard lands. When we planted melons and tomatoes on land where vetch had been plowed under, we found they did much better than on lands where we only fertilized with sheep and barn yard manures. I have found the greatest benefit in my grapes; where vetch has grown the vines made a larger growth and produced more fruit—also of a finer and better quality.

I believe that vetch is like all other leguminous crops, it grows better after the land has become inoculated. Every spring it makes an enormous growth, many of the vines being from seven to ten feet in length; it is a sight, and can be a terrible trial if you are deloyed in plowing it under. I wish I could give you some idea of the amount of green manure vetch will make, and am safe in saying many tons. My entire farm is covered with it this winter, and it never looked better. I have raised vetch where old trees are growing, and the trees are always much benefitted; the foliage becomes darker and the trees make a fine growth; others adjoining these (where no cover crop was grown) proved to me the value of vetch beyond a doubt.

A piece of land that had lain idle for a number of years and which I had been advised to leave undisturbed as it was of no apparent value, had been covered with a coarse grass, bitter sweet vines, weeds, etc. I cleared up the piece and sowed it to vetch, which grew beautifully, and now I have young peach trees growing there that are doing finely. The first season the vetch made growth enough that I pastured the cow on it during the fall months without seeming to injure the crop in the least.

The United States Department of Agriculture Bulletin No. 147 recommends planting vetch with winter wheat or rye if it is to be used for a forage crop. It also says vetch can be cut up and used for hay, afterward plowing under the stubble, claiming that this will be worth as much to the soil as plowing under the entire crop.

I think this statement can hardly be true, as the green crop turned under must be of greater value in adding humus to the soil.

The Department of Agriculture recommends sowing from one to one and one-half bushels of vetch seed per acre, but I find 40 lbs. a great plenty and 30 lbs. if sown with wheat or rye. The seed is expensive, selling from seven to eight cents per lb. and weighs about 60 lbs. to the bushel. The seed is very hard and a little smaller than sweet pea, which it resembles. It can be planted deep, which is a decided advantage over clover as it does not kill out in case of dry weather. I have always sown the seed broadcast, and cultivated or disked it in. Vetch re-seeds itself, and the seed may lie dormant in the ground for several seasons before springing into life again, for this reason it is not advisable to rotate vetch on grain lands.

I am indebted to a friend for the following information which bears witness to what vetch can do.

On the 17th of May, 1905, he measured a square yard each of vetch,—mammoth, medium, and crimson clover,—he dug, cleaned, and weighed each sample with the following result: the vetch weighed 12 lbs; mammoth clover 11 lbs.; medium clover 10 lbs.; and crimson clover 7 lbs. He sent these samples to the Michigan State Agricultural College for analysis, of which the following table shows the result:

		Green weight. Lbs.	Dry weight. Lbs.
1 square yard vetch weighed 12 lbs., ...	4,840 sq. yds. to an acre.	58,080	8,073
1 square yard mammoth clover weighed 11 lbs.,.		53,240	6,287
1 square yard medium clover weighed 10 lbs.,...		48,400	5,900
1 square yard crimson clover weighed 7 lbs., ...		33,880	1,446.68

	Dry Weight. Lbs.	Ash. Lbs.	Nitrogen. Lbs.	Phosphoric Acid. Lbs.	Potash. Lbs.
Vetch, ...	8.073	1,208.5	357.64	86.38	108.18
Mammoth clover, ...	6,287	1,073.8	177.81	49.67	73.57
Medium clover, ...	5.900	.....	148.04	27.75	59.59
Crimson clover, ...	1,446.68	265.77	31.6	5.21	15.33

The Department of Agriculture of Washington states that a crop of vetch plowed under is worth $16.00 to $45.00 of commercial fertilizer per acre. Of course it does not have the immediate effect of a fertilizer, but its fertilizing properties are felt for the entire season and much longer.

It seems to me, all things considered, there is nothing the fruit growers can better invest his money in than vetch, and I believe it will play a great part in rejuvenating our orchards and vineyards and bringing them into greater productiveness.

Mr. Roberts.—You talk about nitrogen; how much comes from the ground, and how much from the air?

Mr. Smythe.—We are told that it all comes from the air. How is it, Prof. Stewart?

Prof. Stewart.—I would not want to say how much, but it is a mistake to say that the legume plant gets it all from the air. It depends upon the amount put into the soil with the plant; if there is a large amount in the soil, a small amount will come from the air. It will absorb what is in the soil, and then take it from the air. See Dr. Penny's Delaware Bulletin on Crimson Clover. It all depends upon the percentage in the soil.

Mr. Roberts.—I did not mean to contradict the gentleman, but I wanted to bring out just that point. I might say, too, that in the sandy soil of New Jersey, vetch will grow where Crimson Clover will not.

Mr. Smythe.—I find it grows better year after year, so it shows that I am putting nitrogen into the soil, as well as taking it out. I think I am getting to the point, now, where I will have to use phosphoric acid.

Prof. Surface.—I would like to know whether this is the same as hairy vetch or winter vetch?

Mr. Smythe.—Yes, sir; it is the same. The spring vetch is not good for anything.

Prof. Surface.—Does it not become a weed?

Mr. Smythe.—Yes, it becomes a weed in grain land, but not in fruit land, which is cultivated.

Prof. Surface.—But doesn't it get in under the fences where it isn't cultivated, and become a weed in that way?

Mr. Smythe.—We have no fences in Michigan, and we try to keep the land thoroughly cultivated. I would not advise its use where there is no cultivation and there is any danger of its becoming a weed.

Mr. Fenstermaker.—Is it an annual or a perennial?

Mr. Smythe.—An annual.

A Member.—What amount of seed do you use per acre?

Mr. Smythe.—New land forty pounds; where it has been sown before, thirty pounds.

Prof. Surface.—When do you sow?

Mr. Smythe.—After the last cultivation. This year we had to keep up cultivation later on account of the drouth, so it was not sown until August; usually it is sown earlier.

Prof. Surface.—Do you sow before the cultivator, and then cultivate in?

Mr. Smythe.—Yes; we disk in our vetch, and then cultivate it and harrow it.

A Member.—Where do you get your seed?

Mr. Smythe.—From Chicago—the Vaughn Seed Co.; they also have a branch house in New York. I suppose any of the large seed houses handle it. This year we got our seed for about six cents; by the time it reached us it cost us about six and three quarter cents.

A Member.—Would it not have gathered more nitrogen if you had put phosphorous on the land?

Mr. Smythe.—How about it, Prof. Stewart?

Prof. Stewart.—It would have, if put on in limited quantities. If you have a sufficient amount of nitrogen to maintain the growth of the plant, it would not do any good.

Now, I would like to call attention to one point here. You will notice that the nitrogen is much more in the case of vetch than in crimson clover. That is very surprising to me, particularly on a sandy soil, but I think it is readily accounted for by the difference in growth. You see there is a growth of six times as much vetch on that acre as there is of crimson clover, and there was more than six times as much nitrogen. There does not seem to have been a very heavy growth of crimson clover.

Mr. Smythe.—Crimson clover does not do so well on our soil as on your heavier soils farther south.

Prof. Stewart.—We are using it to some extent on the heavier soils in the northern part of the State, but in the southern part, on the light soils, I like crimson clover best.

Another thing: in growing vetch in an orchard, it is a very interesting fact to me that vetch is a better preserver of moisture than anything else, and the good production of the orchard is undoubtedly due to two things—to the moisture which the vetch conserves, and to the nitrogen it produces. I think I would decide to use vetch wherever possible. What do you say, Mr. Roberts?

Mr. Roberts.—I would do the same thing; only we have a lighter sand than you have, and must take that into consideration.

Mr. McSparran.—I would say that we think a great deal of crimson clover in the southern part of Pennsylvania. We have ten or twelve acres of it, and get about three tons of hay per acre. I mix the vetch and the crimson clover, and turn it into a silo to feed my cows. In this way I get the advantage of the crops, and also the advantage of the nitrogen in the soil. Vetch, crimson clover, cow peas and soy beans grow luxuriously after they are innoculated. Legumes that grow nodules do not grow well until after they are innoculated, but once innoculated, they add to the value of

the soil, and if used as a forage crop, as found by the Experiment Station, it adds to the feeding value at least 50 per cent.

In regard to vetch growing as a weed, we have no trouble in that respect.

Mr. Case.—I would like to say that a number of years ago the Experiment Station at Geneva carried on quite a series of experiments on my place, with hairy vetch, medium clover, mammoth clover, crimson clover and cow peas, and it was found that for the southern shore of Lake Ontario where I am, there was nothing equal to mammoth clover. We were not especially pleased with the vetch. The mammoth clover grows very well with us, and I am not sure but that I am getting into the same position as our friend from Michigan, and must skip a year. I have had my soil analyzed and Prof. Hedrick thinks I have too much nitrogen in the soil, and it will produce too much heavy growth. I have four apple orchards, and Dr. Hedrick claimed I must not sow any more clover in them, in order to get color on my fruit. We sowed the clover about the 15th of June, and mowed it about the 20th of July and again the 1st of October. When we used oats, we proceeded the same way. The third orchard we sowed about the 1st of August, and mowed it about the 1st of October. The fourth orchard we sowed in oats, and mowed it about the 1st of October, and had much the best results. The orchard in which we got the best results of the four was the one that was sowed with clover on the 15th of June, and mowed the 20th of July, and then the 1st of October. We claim there is no cast iron rule in orcharding; we must each adapt ourselves to conditions as we find them.

Prof. Watts.—I want to say a word in connection with Mr. Case's remarks. It is a well-known fact that vetch and crimson clover succeed best in a light soil. Mammoth clover makes a heavier growth than red clover, and I think it should be used more extensively than either red clover or crimson clover. I know it from my own experience in Cambria County. Then why not use mammoth clover more extensively in the northern part of the State?

Mr. McSparran.—Is there any one here who has had any experience in growing sweet clover? I know that in Ohio it grows along the streets as weeds. I have seen it in the streets, along the wayside, for miles alongside our railroads and trolley lines, growing up to six or seven inches. This clover is identical with alfalfa, and if any one here has had any experience with it, I should like to know it.

Mr. Case.—The roadside along the lake shore is covered with it, but we have never used it as a forage crop.

Mr. McSparran.—It is almost equal in feeding value to alfalfa. The cattle do not like it at first, but they acquire a taste for it, and thrive on it.

Prof. Surface.—It will grow on the roughest kind of soil, where nothing else will grow,—a very economical point in its favor. As

it grows up before it goes to seed, it can easily be prevented from becoming a weed; it is a biennial plant, and takes one year to grow, and another to seed.

The President.—We will now take up the next number—a talk on "Recent Developments in a Chemical Study of Lime-Sulphur Wash," by Prof. H. A. Surface.

Prof. Surface spoke as follows:

RECENT DEVELOPMENTS IN A CHEMICAL STUDY OF LIME-SULPHUR WASH.

By Prof. H. A. Surface.

Mr. President, Ladies and Gentlemen: While I have an opportunity, I just want to say a word in regard to the demonstration orchards, which we propose to establish in all parts of Pennsylvania.

Mr. Herr, in the report of the General Fruit Committee, yesterday, says we have received more than thirteen hundred invitations, and we have arranged a plan whereby we can accept all of them. Those that are not taken as public meeting orchards, will be taken as orchards under our supervision. We will take four or five in each county as model orchards in regard to control of insect pests, pruning, culture, etc., the time and places of meetings will be duly advertised, and all information in regard to our plan will soon be given out.

Now I just want to say a word in regard to a clipping which Mr. Fenstermaker handed me to-day, regarding a case of poison from spraying with Paris green for the cabbage worm. I had a case reported to me last summer of a supposed case of arsenical poison from grapes sprayed in this manner. It went through all the papers, particularly in the South-eastern section of the State. If such a thing is true, it is very important that we, as horticulturists, shall know it; if it is not true, we should also know it. I got a sample of these grapes and had them analyzed by Dr. Frear, the State Experiment Station's chemist. He found that these people were not poisoned by the grapes. When such reports get into the papers, it is very important to us that we trace them and disprove them. It is my opinion that there is no such danger from any arsenical poisoning, but I do not want to express an opinion until we have obtained the proper chemical knowledge.

I should have preferred to entitle my talk "Some New Facts," or "Some Facts That Have Recently Been Developed in the Lime-sulphur Wash." I am not a chemist, but I have had a special chemist working on the subject in my office. I am gratified to know that Prof. Stewart is working so well along the same line. Dr. Van Slyke, of the State of New York, and Prof. Parrott, of the Experiment Station at Geneva, are all working along the same line, and reaching the same conclusions.

We stand at the beginning of a new era in regard to spraying, because of certain facts that are becoming established. These are:

First: Color of the lime-sulphur. Most of the facts are already in print in the November Bulletin from our office, but this has not yet been mailed, having been delayed through some error on the part of the State Printer. The copies have just been received at our office, and will at once be sent out.

Briefly, we conducted a series of experiments, making one solution of calcium oxide, a pure grade of lime, without magnesium in it. We had a double strength solution. In another there was about 31 per cent. of magnesium oxide—about one-third magnesia, and in it we obtained the red color of the liquid as in the former. Then we made another solution, in which iron was used with the lime, and that also had the red color, but in the sediment we had a different color. This was dark muddy green. Then we made another solution, in which manganese was used. In that also we had a red color of the liquid, and a dark color of the sediment, and we came to the conclusion that color can be no criterion as to the length of time of boiling. The liquid will always be a wine red. If you mix the manganese or iron with the lime that way, you will produce a dark olive green. If there is no union, it will still be red. So the color cannot be depended on to indicate the length of time of boiling. It does not depend upon the calcium oxide, notwithstanding what has been published in bulletins heretofore. I said in a bulletin some time ago that magnesium oxide would give it the dark color. That is not true; it is the iron or magnesia that gives it the dark color. The dark colored materials, which give it the dark color, are contained in the sediment, which is of no value to the spray material. The real value is in this red colored material.

The second point is the crystallization of the lime-sulphur wash. The home-made boiled lime-sulphur wash which is regarded as standard, consists of:

17 pounds sulphur,
22 pounds lime,
50 gallons water.

The exact proportion is not so necessary, but the more lime you have, and the more water you have, and more you form of a low sulphide, known as the oxide and the common sulphides. If you can keep that out, you form the poly sulphides.

Prof. Cordley, of Oregon, who has been experimenting along the same line as Prof. Stewart, writes in the "American Agriculturist" for January, 1908, for the first, that it is now possible to produce the lime-sulphur solution at home in concentrated and storable form. I recommend:

Sulphur, 125 pounds,
Lime, 60 pounds,
Water, 50 gallons.

At the conclusion of the boiling, it is to be up to 50 gallons. If some boils away, add more, and, as Prof. Stewart says, boil until the sulphur dissolves, which is 45 to 55 minutes. Flowers of sulphur will dissolve a little more quickly than flour of sulphur, but finely ground brimstone is all right. You can dilute this mixture 1-9 and spray it on, and it will be as effective as the old formula 17-22-50. When I make a positive assertion, like this, without any

qualification about it, there is no guess work about it. I am speaking of what I actually know.

Some of you know Eli Cocklin, one of the great horticulturists of the State of Pennsylvania, and the originator of the "Ida" cherry. His son came to my office a few weeks ago with a sample of this concentrate made by boiling with steam, which we had tested in the most approved way, and which gave us 33 degrees Baume. Our 17-22-50 formula cannot stand condensed without cyrstallizing like the concentrate. It does not have to be boiled with 50 gallons of water, but can be diluted to 50 gallons after boiling.

The 17-22-50 must be diluted to one-third if you want to keep it. If you want to keep it concentrated you can make it in solution, such as Prof. Stewart advocates. It is low sulphides in the solution which crystallize. To make it storable we must reduce the amount of water and lime in which it is boiled.

Third: Amount of lime needed, and composition of lime. Twice as much sulphur as lime can well be used. We made some investigations running as high as 15 per cent. or more, of magnesium oxide, and got a solution which was not only as strong chemically, but which stood the hydrometer test as well. You can get just as strong a lime-sulphur solution from a lime that has some magnesium or sodium in it, as you can from a pure quality of lime. If you have any sediment left after boiling it must be strained out.

Air-slacked lime, if air-slacked quite recently, is all right; but if of long slaking it will not do. If you wish to slack it for horticultural purposes, slack it immediately and keep water over it. One good friend in New Jersey uses it in this way, in a barrel standing down in the ground in a swamp, so the water stands always over it. He dips out three times as much of the lime paste as of the fresh burned lime.

The next point is, the need of a hydrometer. The time has come to test for specific gravity, and to do this a hydrometer is necessary. You will understand that the hydrometer will tell you only the strength of the materials. If sugar, or salt, or alum, is added, the hydrometer will not tell that. It can only give the specific gravity. You can have a chemical analysis made to find the presence of any other substance, or you can have the manufacturer give his guarantee that there is nothing but lime and sulphur in it.

The Secretary.—What point is there in putting salt in?

Prof. Surface.—It will add to the specific gravity, and make it look like a more efficient lime and sulphur. You take "Horicum," which is lime, sulphur and salt. The salt makes it look clearer, but adds to the specific gravity.

The Commercial Lime-Sulphur Solutions.

I need hardly tell you that all lime-sulphur is not of the same grade. One firm will make one grade, and another, another grade. You cannot tell whether it is efficient or not by looking at it. Only

the test will show that. We have analyzed the different brands of lime-sulphur wash, and taken their specific gravity; compared with the home-boiled, the amount of dilution would be as follows:

The 17-22-50 has about 14 pounds of sulphur with a 50 gallon barrel of the dilute material. The commercial brands generally recommend 1-11, 1-10, 1-9, 1-8, but we find from the analyses that those samples the following brands which we have analyzed should be diluted as I give them:

Snavely's Brand,	1-4
Lion Brand,	1-6
Niagara (clear),	1-7
Niagara (dark),	1-7
Niagara, later sample,	1-10
Orchard Brand,	1-8 plus
Rex Brand,	1-10
Snow's Brand,	1-6
Grasselli's,	1-9
Scaline,	1-10
Cocklin's Scale-clean,	1-10
Sherwin-Williams,	1-10

Now, there is a new material on the market called "Never Scale." It is in the form of a powder, to be boiled five minutes in water. We boiled it in the proportion of one-half pound to one gallon; we found this would not do, so we boiled it, three-quarters of a pound to the gallon, which gave us about the strength the home-boiled formula does, so the point is that "Never Scale" would be efficient as a scale-cide if boiled three-quarters of a pound to a gallon of water.

The Effects of Carbonic Acid Gas on Lime-Sulphur.

I feel that I should say something about the effect of carbonic acid gas on the lime-sulphur spray. We made a number of tests with it, and found that the sulphur in the solution was precipitated by the action of the gas, and as the sulphur was thrown down as a free sulphur, it became less efficient as a spray. We had 90 pounds of pressure in the first experiment, and the material was warm. We had the home-boiled, 17-22-25 and found that 37 per cent. of the sulphur was lost in the first five minutes; at the end of the next five minutes 43 per cent. had been lost, and at the end of the third five minutes, 53 per cent. had been thrown out. The next experiment, we had the cold, 17-22-50 standard, without sediment, and with agitation, and pressure of 90 pounds per square inch. At the end of the first five minutes we lost less than 1 per cent.; the next five minutes, 1 per cent.; at the end of twenty-five minutes 8 per cent., and at the end of 40 minutes, 20 per cent. We tried again with a solution with a sediment, and kept it agitated. At the end of the first five minutes we had lost 14 per cent.; at the end of the second five minutes, 16 per cent., and at the end of thirty minutes, 19 per cent. This showed conclusively that carbonic acid gas had a deleterious effect upon it.

I know where there have been some (only a very few) terrific failures with the lime-sulphur wash; some were due to the character of the spray (being too dilute), and some of them to the faulty method of applying (not thorough); some of them to the carbonic acid gas spraying machine.

Mr. Walton.—Isn't that rather hard on the fellows that have the carbonic gas machine?

Prof. Surface.—That is the reason why I think I should tell the truth. I can give you the names of men near Harrisburg, whom you know, whose failures are due to that very thing.

With the Bordeaux mixture we had no evil effects; only with the lime-sulphur wash.

Mr. Walton.—You are recommending now the use of the Bordeaux mixture instead of the lime-sulphur spray?

Prof. Surface.—No, I don't think so; I don't want to interfere with Prof. Stewart. We are working out the same principle along different lines—he as a horticulturist, and I as an entomologist.

Now, as to the effect of arsenate of lead added to the lime-sulphur. If you mix this and let it stand for seventeen hours, it precipitates, so as to form a lead and sulphur compound, which cannot yet be recommended. It weakens the lime-sulphur, and you are also using a stomach poison, consisting of lead sulphide. Whether the lead sulphide can take the place of the lead arsenate, remains yet to be seen. It did not appear to. The same change occurred as when we added the lead arsenate to the lime. It prevented the chemical action. Then we tried two other forms—arsenate sulphide and arsenate of antimony. They had no effect on the solution.

The need of a marker. This material (diluted lime-sulphur from the concentrate), sprayed on the trees will leave no mark, and a man going round the tree cannot tell where it has been applied. You can add a whitewash and apply it, just as soon as and easily as this alone is applied. If you add lime to your solution and let it stand many hours you will run down the strength of your solution.

Use of the sediment. It is not necessary to throw away this sediment. I have used it very successfully with a paint brush for peach tree borer (applied about June 15), and also for pear and apple tree borers, and to keep mice and rabbits away from the trees in winter time.

Mr. Fenstermaker.—How do you keep it?

Prof. Surface.—Put it in a barrel and keep it wet; and then add water and use it like whitewash. Take a hoe and loosen the ground around the tree and apply this sediment.

A Member.—What time of the year do you apply it?

Prof. Surface.—From the middle to the latter part of June, just before the peach tree borer lays its eggs.

A Member.—You have to apply it every year?

Prof. Surface.—Yes, sir; by using a short extension rod and small spray pump you need not change your position to reach around the tree. It is a good thing for the peach tree, and if there is any borer, it will kill him without injuring the tree. I have made about a hundred experiments of this kind with peach trees.

What to do with the lime-sulphur mixture. Use the liquid according to the hydrometer test. After you have boiled the crystals an hour and a half they will dissolve. Boiling longer than is necessary is bad, because it forms a low sulphide (reverted) which is not so efficient in killing the pests. Long boiling is at the expense of the beneficial higher sulphides.

You are going to be able to make your own concentrated lime and sulphur now. Go home and make it now, and put it in a barrel, and next spring when you want to use it, dilute it to 1-9. Add lime as a marker, and then follow with a retouching spray. You can have three barrels taken away to a steam engine and boiled at one time, and then have thirty barrels strong enough to kill the San Jose scale, and over a hundred barrels for the fungus diseases.

A Member.—If you open a barrel and do not use all of it, will it spoil?

Prof. Surface.—No; a little film will form over it. Run it through a spigot, and then run it through a strainer, thirty meshes per square inch, so that if it forms crystals, it will be easy to eliminate them. Mr. John Cocklin says he can make this for nine dollars a barrel, and allow a dollar for the barrel when it is returned to him, and it is a strong solution.

The problem is now solved. I don't say this to injure any other brand on the market. It is all right to buy it if you have the assurance that it is all lime and sulphur, and if you use the hydrometer test before you apply it, but this self-made concentrated solution can be made and kept on hand.

Mr. Leighton.—Did you ever spray for the oyster shell scale?

Prof. Surface.—Yes, sir; one pound of good, strong whale oil soap in four gallons of water, applied about the 15th or 20th of May in this locality. It must be done at the right time. The oyster scale all hatch at one time. They are not like the San Jose Scale, which hatches one brood after another, but not all at once.

Mr. Leighton.—I applied it twice, and it killed all the scale.

A Member.—How large a boiler is needed to boil this with steam?

Prof. Surface.—Twelve H. P. pressure will boil eight barrels at one time.

A Member.—A number of people have heaters in their cellars; could they use them?

Prof. Surface.—The amount of pressure is not so important as to get it to a boil. If they have enough pressure to send boiling steam through it, they can boil it all right, and they can also boil it in open kettles or over furnace fires.

A Member.—When you have enough steam pressure to boil the water is it necessary to have more than that?

Prof. Surface.—I don't know that it is necessary, but I do know that twelve H. P. will boil eight barrels at one time. I have not tried boiling it at a low pressure.

Mr. Eldon.—What does it cost to boil it?

Prof. Surface.—I don't know. Mr. Cocklin says he can make money boiling it at nine dollars a barrel. I can tell you what it will cost, as nearly as I can figure it out. What will sulphur cost you?

Mr. Eldon.—$1.80 for flour of sulphur. Of course, there is a difference in grades.

Prof. Surface.—I figure it out at $4.65. That makes from nine to ten barrels. Every man can figure out for himself what his material will cost him.*

Mr. Fenstermaker.—One question that is not quite clear to me. Which sulphur shall we use? Prof. Stewart said flour of sulphur—the commercial—which runs about $1.80 per hundred weight; flowers of sulphur runs about $2.60.

The President.—Prof. Stewart, what is your experience?

Prof. Stewart.—I used flour sulphur in all my work. The powdered commercial, however, is entirely satisfactory as I have reason to know from the experience of a certain commercial firm, which has started up since our bulletin was published. This sulphur runs about one-half of one per cent. impurities, making it 99½ per cent. pure.

Now, if I am entitled to make a few remarks—I worked very hard on this matter for more than six months, and my conclusions,

*Prof. Surface writes as we are going to press: "Since the meeting I have learned that it is made just as strong and satisfactory by using merely the finely-ground brimstone or 'ground sulphur,' which sells at only $1.50 per hundred pounds. In fact I have made a good solution with this and ordinary lime, only 85 per cent. calcium oxide."

I think, are backed by as much work as those of any one else. Prof. Surface and I agree on practically everything except the exact formula. This formula which he presents is one which was suggested by Cordley of the Oregon Station about a year and a half ago, but has since been discarded by him, in his article in "Better Fruit," of April, last year. I was acquainted with this formula when I began my work. I don't believe that it should be used in making concentrated lime-sulphur. It has more sulphur and less water than is desirable. 120 pounds of sulphur is all you can be sure that 60 pounds of commercial lime will take up. And if any variation is made from the 1-2-1 formula which I outlined this morning, it should be in the direction of a slight reduction in the relative amount of sulphur rather than in its increase. Cordley, himself, is now using only 110 pounds of sulphur to 60 pounds of lime. That is a very good formula and one that works well, but is not quite so simple as the 1-2-1 formula, and from my data given this morning there are also other reasons for preferring ours. The latter can be put up in any amount, merely noting that the pounds of lime and gallons of final product are the same, with the pounds of sulphur twice as many. It also gives a very satisfactory density, about 1.24, and utilizes the materials, the original lime and sulphur, somewhat better than any formula which calls for a relatively smaller amount of water.

Mr. Walton.—This morning you advocated boiling the material in the kettle, and not turning in the live steam. Prof. Surface says it is all right to turn in the live steam.

Prof. Stewart.—My point this morning was, and my point now is, that it is difficult with live steam to boil anything down. In making the concentrate it seems to me desirable to have the final volume under control and to have it decreasing rather than increasing. You can of course reach 50 gallons at the finish with live steam, by beginning at forty and going up. But I prefer coming down from sixty gallons to going up from forty. You see, if you start with 40 gallons and keep adding water there is a tendency for the material to keep getting less dense all the time instead of more dense. With the 40 gallon start you don't have an abundance of water to take up the sulphur, whereas, in starting at sixty, we are more certain to have the sulphur all taken up and held. That is my belief in the matter.

On the other hand, there is certainly no objection to any one's trying live steam if he wishes, and it is quite possible that after a little experience with it, very satisfactory solutions can be made, especially if one is not too particular about final volumes and densities. If it is used it will be well to remember that the higher pressure your steam has, the higher temperature it is, and the less likely it is to be condensed in the liquid after boiling begins. It will go in as live steam and get out before it is condensed.

Mr. Walton.—The higher pressure of steam, the hotter it is.

A Member.—Now, I want to know, is that so?

Prof. Stewart.—It certainly is. How do you get high pressures with steam except by additional heat?

Mr. Case.—Is it really any hotter, or does it move quicker?

Prof. Stewart.—It is hotter.

A Member.—I would like to know why you begin with forty gallons and get fifty?

Prof. Stewart.—Because to get fifty gallons at the finish in this way where live steam is being condensed at the time, you have to begin with less.

A Member.—Would not the evaporating of the water be equal to the addition of steam?

Prof. Stewart.—I can't answer that with certainty. It may be possible to arrange it so as to accomplish this.

A Member.—Now I have never had experience with boiling sulphur by steam, but I have boiled meat with it, and I have never noticed any material increase of the water with the meat.

Prof. Stewart.—Well, if you can do it that way, that is the way to do it. I am giving you my experience, and I would say, either use bottom heat, or steam jacket, or closed coils, but you can go ahead and use live steam if you wish. I do not think it is quite so good, but it is usually more convenient.

Mr. Eldon.—Can you boil it with a flame?

Prof. Stewart.—Yes; that is the way I have provided for regularly.

Mr. Walton.—Professor, if you had been boiling only with steam, would you change to a kettle?

Prof. Stewart.—No; if you are equipped to boil with steam, I would boil it in that way, making such modifications as I found necessary, and remembering that one can't boil the material down in that way.

Mr. Walton.—I acknowledge that you can't boil down, but we are equipped to boil with steam, and we have steam. It will simply take a few more barrels to hold the material.

Prof. Stewart.—Yes; that's it; that covers the point.

Prof. Surface.—There is another point: those of you who have the old-fashioned outfit for making the standard home-boiled

lime-sulphur can use it, only I would advise a sheet iron flame protector be added. I am certainly ready to recommend Prof. Stewart's formula, although I know another entomologist who has it up to 165 pounds of sulphur to 50 gallons.

The President.—Now that we have discovered that everybody can do exactly as he pleases, we will take up another subject and make room for another speaker. I am pleased to introduce to you Mr. Case, of Sodus, New York, President of the New York Fruit Growers Association, who will talk to us on "Orcharding in Western New York."

ORCHARDING IN WESTERN NEW YORK.

By President B. J. Case.

Mr. President, and members of the Horticultural Society: I did not come here with a set speech; I came here to have a heart to heart talk with you, and to learn what you are doing in the matter of growing fruit in the State of Pennsylvania. My talk will be governed largely by the questions you ask me.

Now I want to tell you how we are situated. As far as I am concerned personally, I am thirty miles east of Rochester, on the southern shore of Lake Ontario, about one mile from the lake. I grow all kinds of fruit trees. I used to grow berries, but have abandoned them of late years. I have now a hundred and sixty-five acres, or something like it, of fruit, 110 acres in full bearing. There are apples, peaches, pears, plums, cherries, grapes, and quinces and we sell them all readily.

There is one thing especially in regard to the Baldwin apple; I fully believe that we can make the Baldwin bear every year. It has been considered strictly biennial.

I believe in proper thinning and practice it with good results—I have just gathered in my sixth crop in succession. I have two orchards one of which was set out by my father in the fall of 1852, and the other in the spring of 1853. These old Baldwin trees—one was set about 33 feet each way and the other Father set 33 by 49½ ft. These trees generally bore from forty to fifty bushels of fruit, all great, big apples. They would bear every other year, with nothing to speak of during the odd year. I don't know whether you would like to know my plans with regard to these orchards or not.

A Member.—Tell us what you did.

Mr. Case.—Well, I am like Prof. Stewart; I must go back and explain a little bit. In the first place, the chemists tell us that the flesh of the apple is ninety-five or ninety-six per cent. water, only a trace of potash and phosphoric acid, and that the seeds of the apple are very high in potash and phosphoric acid, and that the less seeds you have, the less you strain the tree and exhaust the soil. It does not exhaust the soil or strain the tree to pump the water out of the soil to make the apple, but it does exhaust it to draw out the potash and the phosphoric acid to make the seeds. Now, we know that the tree wants a great deal of food during the incubative

period, from April to July, while it is struggling to form these apples, and these seeds, and the buds for the next year. There is a hard strain on the tree at this time, and I claim that while this is going on, there should be a great deal of readily available food for these little rootlets to get hold of, but if you keep up that stimulation after the 1st of July, you will turn the growth into wood growth instead of developing your fruit. That is the point I want to make before going any further.

We did a lot of experimenting during the commencement of our thinning fruit. We started about the latter part of August or beginning of September. That is the season we begin to evaporate apples, and undertook to save the apples that we pulled off. We are probably the largest evaporating section in the world. We have driven all the cider mills out of existence, except possibly just enough to furnish the farmers with vinegar. We started in to save these small apples, but we found we had no success, until we finished our thinning by Aug. 1. We thin our apples to about six inches apart.

Prof. Surface.—Hand-picking?

Mr. Case.—Yes, sir.

A Member.—Drop them on the ground?

Mr. Case.—Yes, sir; and they go to waste. I started out last summer to spend three hundred dollars thinning my apples. I succeeded in spending $160, and didn't get the job done as I wanted it; but there is no doubt that that $160 netted me $1,000. Don't you think so, Mr. Catchpole?

Mr. Catchpole.—Two thousand.

Mr. Case.—No, I don't want to make it so high; but if the other $140 had been spent, it would have made me another thousand. The trouble is that I can't get my help to agree with me. I have an old Holland Dutchman who has been with me for twenty years. I said to him one morning, "I want you to go down and thin those Pound Sweets and those Seek-no-furthers this morning." Next morning I asked him "How did you get along thinning those Pound Sweets?" He said, "If you want to have those apples thinned, you'll have to send some one else to do it." I asked him "Why?" He said, "I just could not do it, when I saw those big Pound Sweets I can't pull them off. You send some one else." "How about the Seek-no-furthers?" He said, "Oh, them little things? I could pick them all right." Now, I can't use a club on my men, so I'll have to go slow until I get them to see things as I do. You can't find any one of my regular help that does not feel as proud of my farm as I do. You ask anything of any one of my men, and he will feel just as much pride in showing you what he has done as the foreman does. Now, that is my trouble in getting these apples thinned, but my foreman has been convinced this last year, and after this I think I'll get good results.

The secret is that you must have plenty of potash and phosphoric acid in the soil.

The Secretary.—When you do thin, how can you see the results?

Mr. Case.—By the size of the apples.

Prof. Watts.—What is the cause of these defective specimens?

Mr. Case.—Well, insects and fungus growths. We are having quite a little trouble from the Tussock Moth. I don't know whether you have any trouble with it down this way or not.

Prof. Surface.—We have not had it this year.

Mr. Case.—Then we have the climbing cut worm, which cuts holes right out of the apple. It is like the coddling moth; we have never yet been able to completely wipe it out. In our section we have lots of people who do not believe in spraying. You know we are an evaporating section, and they shake the apples right down on the ground, although the last few years the tendency has been to hand pick them for evaporating, and the tendency is toward growing better fruit and selling much larger quantities in barrels.

Prof. Watts.—How often do you spray?

Mr. Case.—I usually spray about four times; this last year I did not spray but three times.

Then we have had a great deal of trouble with the Blister Mite, and even the entomologists did not know how to handle it. The Nursery Inspector found the San Jose scale in an orchard just opposite my yard,—well, you can imagine how I felt about it. We immediately set to work, and did such thorough work that a year ago last winter the inspector could not find but one live scale, and last year he could not find even a single one. A year ago last summer we found the Blister Mite was killed in this orchard. It occurred to me that lime and sulphur was a remedy for the Blister Mite. I drew up an estimate of the cost to spray my apples and pears with lime and sulphur. This I took to the horticultural meeting, and found no one there knew anything about it. Afterwards I took it to Rochester to the fruit show, and even the entomologists did not advise lime and sulphur. Neither the entomologist from the Experiment Station, nor the man from Cornell, nor the State Entomologist knew it, nor what to do for it. A little while after that the agent of the Niagara Spray Company sent me a barrel of the mixtrue, and I sprayed six rows with it. You should have seen the results. A blind man could feel the difference and could feel the leaves with his feet on the ground under the unsprayed trees.

Prof. Surface.—What time of the year was that?

Mr. Case.—The 13th and 14th of April, just before the buds open. I think I can safely say that 90 per cent. of the lime and

TIME CARD.

Gotten up and used by Mr. B. J. Case on his New York fruit farm. It was necessary to reduce the size here to accommodate printing space. The card contains a line for each day in the month and as many columns as you need for the crops you grow, and a few extra blank columns for the things you "forgot."

Date.	Hours worked.	Apples.	Peaches.	Pears.	Asparagus.	Raspberries.	Farm Ex.	Cherries.				Total for Day
1,												
2,												
3,												
4,												
5,												
6,												
7,												
8,												
9,												
10,												
11,												
12,												
13,												
14,												
15,												
16,												
17,												
18,												
19,												
20,												
21,												
22,												
23,												
24,												
25,												
26,												
27,												
28,												
29,												
30,												
31,												
Totals,												

Due ..... for work. Month ..... 19...

Total days ..... at ..... $.....

sulphur sprayed in our section was the direct result of my own efforts, and of the work done on my farm. We start in and put lime and sulphur on the bare wood, and then follow it with the Bordeaux, and then with another spraying in a few days. One of the great troubles with the farmer of to-day is that he does not keep any books. He does not know whether apples pays him, or pears or peaches. This is an arrangement I got up myself. The cards I use are about 8 inches across, and I think about 15 inches long. Here we run down with the days of the month, and I have a little red stamp with which I mark in the Sundays. Then we fill out the men's names, and each man's time for every hour in the day, and every day in the year. For instance, he gets $1.60 a day; he goes down at 16 cents an hour. Suppose he has worked three hours on the plums and four on grapes, and three on apples. Here it is set down and what it amounts to. This gives us his wages. We do the same thing with the horses. Then I have a little file in the office, and this is kept on the desk, open to inspection. Every man is expected to see that his time is kept properly. At the end of the month I don't want to go back to correct anything. It goes to the bookkeeper then. For instance, this man has earned forty dollars; the card shows just what his time has been devoted to. I think these cards cost me about one cent a piece, and you would be surprised to know how often we refer back to them. It enables us to keep a complete record of everything.

A Member.—Will Mr. Case kindly tell us how to stimulate these trees from April to June?

Mr. Case.—By cultivation and by feeding.

A Member.—What fertilizer do you use?

Mr. Case.—Generally cover crops. I don't use very much manure.

A Member.—Would you use it if you had it?

Mr. Case.—Oh, yes; a limited amount; but I don't have it, and would not use manure heavily.

A Member.—Do you use commercial fertilizer?

Mr. Case.—Yes; after experimenting on my soil I have settled down for my soil per acre to 112 pounds sulphate of potash, 200 pounds acid phosphate, and 400 pounds of bone meal.

A Member.—How is the fertilizer applied?

Mr. Case.—I sow it broadcast, just as early in the spring as I can sow it. My land is a little hilly—nothing but what can be worked easily—and when we come up to the top of the hill we double the quantity, and down in the hollows we cut it in half, in this way overcoming the effects of washing. The growth of the tree and the growth of the fruit will tell you whether it is properly fed.

Prof. Surface.—How close to the trunk of the tree do you sow this fertilizer?

Mr. Case.—I don't want it very close to the trunk of the tree, and I don't think it makes much difference whether this root over here gets it, or that one over there.

Prof. Stewart.—It depends upon the age of the tree.

Mr. Case.—They are old trees.

Prof. Stewart.—No fertilizer need be within three or four feet of the tree, because the roots are all interlocked.

Mr. Case.—Now, you all understand we are getting our potash from Germany.

Prof. Surface.—Kainit?

Mr. Case.—As I understand it. If I am not right, correct me. I am not a scientific man, only a fruit grower. As I understand it, the Kainit as it comes from the mine is about 35 per cent. *salt;* then by a certain process they produce the muriate, which is only 15 per cent. *salt.* Then there is another process which eliminates all the *salt*, and is called sulphate. Now, any soil is quite retentive or holds moisture readily, and that is the reason I want the sulphate. The reason I generally use 112 pounds to the acre, is that it comes in 224 pound sacks, and it is easy to say to my men to take half a sack of this, and one sack of the rock, and two sacks of the bone, and that is enough for an acre. Then we count the trees and spaces for each acre, and the amount for each. We have become so that we can easily judge it without weighing it. Then we go in with the wagon and distribute it. We drive the team right into the orchard. For instance you take our peach orchard, the trees are 16 ft. apart. We take five rows, I think—I am not sure from memory, and we have three men on each side.

Prof. Surface.—Sow by hand?

Mr. Case.—Yes, by hand; and then we have another team ready so that when one wagon is unloaded, we can go right on. It is no trouble to sow thirty or forty acres a day in this way.

The Secretary.—Do you think it would be cheaper to do it by machine?

Mr. Case.—I don't know; I don't think so.

A Member.—Have you had any experience with basic slag?

Mr. Case.—Yes; I got into trouble last year by what I said about basic slag. I had five tons of it year before last, and the results were not satisfactory. As I understand it, the basic slag comes from Germany, and is the product of their big blast furnaces, and is composed of iron and lime and phosphoric acid. Now, I believe that if you take that slag and put it on soil that is very rich in humus, or on land of alluvial formation, you will get some benefit, but up in our section we have a glacial formation, and I don't think it is very beneficial there. I made this statement last year, and brought the authorities down on me, and I also got a letter from The Coe-Mortimer Co., who are the agents in this country.

A Member.—I want to say that I represent the Coe-Mortimer Co., and I tried all the various fertilizers on the different soils. I used half timothy and clover, and in every case I got the best results with basic slag, regardless of the character of the soil.

Prof. Watts.—Now, what are the results of *salt* in the potash, do you really think it is injurious?

Mr. Case.—Yes; I am convinced that I do not want any salt on my soil. We very seldom suffer from drought if land is well-cultivated.

Prof. Stewart.—May I interrupt just a moment? I believe Mr. Case is right in objecting particularly to the chlorate in salt on the land, judging from the results at the Massachusetts Station. Results there extending over twenty-one years would seem to indicate that the sulphate is much better than the chlorate, and our third year in orchard experiments in this State seems to be bearing it out. That is, our sulphate effects have shown better results than the chlorine as a muriate.

Prof. Watts.—How much more does it cost in the form of a sulphate than as a muriate?

Prof. Stewart.—About six dollars a ton.

A Member.—I wonder whether the salt does not make the heavy clay soil harder rather than the sandier soil?

Prof. Stewart.—I can't tell you that; I am simply giving you the results that we are getting here and in Massachusetts. Their soil there was a heavy clay. Our soils varied quite considerably, but in every instance the sulphate was better.

Mr. Fenstermaker.—What kind of soil?

Prof. Stewart.—All kinds of soil.

A Member.—Light sandy soil?

Prof. Stewart.—Yes.

Mr. Engle.—Do I understand you to say that you would thin down to six inches?

Mr. Case.—Yes, sir.

Mr. Engle.—Do you ever, with the average commercial fertilizer find the same final beneficial results?

Mr. Case.—Yes, sir.

Mr. Engle.—It seems to me that I saw that at the Ohio Experiment Station the beneficial results were not sufficient to warrant it.

Mr. Case.—Perhaps they do not do it properly; we have had to teach the Experiment Stations some things.

Mr. Engle.—Your trouble in regard to getting your men to thin the fruit properly is the same trouble I have always had.

A Member.—How long does it take you to thin them?

Mr. Case.—I don't know, really. It is not the job you think it is. You may strike a tree that is loaded very heavily, and then, again, you may strike one that is not heavily loaded. If I remember correctly, the boys would thin five or six trees each in a day.

Prof. Watts.—How much smaller was the yield on thinned trees than on unthinned?

Mr. Case.—I think it was about the same. We want a strictly No. 1 apple, that will be a credit to us, and leave the tree in condition to give us a nice crop next year.

A Member.—Can't you thin before July?

Mr. Case.—I think you can as far south as this is. We do not thin them until we get through with the June drop, and see what that amounts to; sometimes we don't get that drop until July.

Prof. Surface.—What implements do you use for cultivating?

Mr. Case.—I use a Planett Jr. Orchard Cultivator, and Spring-tooth Harrow.

Prof. Surface.—Why not a disk harrow?

Mr. Case.—On account of the stones. The stones will hold the disks from going into the ground.

Mr. Engle.—You say you have abandoned small fruits; was that because it was unprofitable, or because the trees crowded them out?

Mr. Case.—The trees grew up and crowded them out.

Prof. Surface.—Did you have them between the trees?

Mr. Case.—Yes.

Prof. Surface.—How long?

Mr. Case.—Only a few years.

Prof. Surface.—When do you begin to cultivate?

Mr. Case.—Early in the spring.

Prof. Surface.—When do you stop?

Mr. Case.—We harrow all season; we plow only once—always before the 15th of May. You can't plow without cutting the hairy fibrous roots that stretch out hunting for something to eat. If you cut them off after May 15th you give the tree such a shock as it does not often get over.

Prof. Surface.—How often do you harrow?

Mr. Case.—Once or twice a week.

Mr. Engle.—After a rain?

Mr. Case.—Yes; never let the ground get hard. Now, as to cultivation, we believe that as between the sod mulch and the cover crops, clover gives better results than anything else. You have to watch your orchard; if it shows a large dark foliage, I give it a set back by seeding. If it shows that the trees are staggering under its crop I delay the seeding later. Usually commence seeding to clover about June 15.

A Member.—What is your system of apple and pear pruning?

Mr. Case.—I really don't know whether I can explain it to you or not. Our trees are all large trees. Now, when I get a new man on my place, I take him out to the orchard, and ask him where is the east—where does the sun rise? He points to the northeast; then I direct his attention to the northwest, and say to him, "Now keep this in your head," and remember that every leaf that the sun does not shine on at some time during the day is no benefit to that tree but actually a detriment. Now, you want to get that tree so pruned that the sun can get through it and shine on every leaf sometime every day." I am not a stickler for details, but I want men and trees that produce results.

I will stop right here. I thank you.

The President.—Mr. Case is to be followed by a peach man. We have a man here who is a very successful grower of peaches, and he will tell us something about them. Mr. Boyer will now talk to us on "Experience with Peaches."

EXPERIENCE WITH PEACHES.

By John F. Boyer, *Middleburg, Pa.*

Mr. Chairman and Members of the State Horticultural Association: I have been a member of this society for twenty-two years and always look forward to this meeting as a great school for the horticulturist because here I always meet the best of friends. I am sure I owe much credit to the members of this society for the success I have achieved as a fruit grower, my occupation for the last twenty-six years, having at one time forty-four thousand peach trees in cultivation besides apples, cherries, plums, pears and about ten acres of small fruit. I will endeavor to give briefly my method of peach culture in such a way as my experience dictates, with the understanding that I believe that the peach is the most critical crop man can undertake to produce.

I was never the owner of an ideal peach orchard because I had to own the one that produced crops the proceeds of which paid all the bills and allowed a certain per cent. towards the support of my family. Some growers boast of never having a failure of a crop. I can say that myself but some of the crops were so small that I had to throw my note into bank to get sufficient capital to carry on my business until another crop was marketed.

It is almost necessary for a peach grower to sleep with one eye open in order to keep abreast of modern requirements. Providence is a great factor in all lines of production but man must take a hand in it and assist nature in every possible way. Providential fruit culture is a thing of the past.

What are the requirements of a successful peach culturist today? These are many but chief among all is the man himself. Unless he has an iron constitution so he can stand reverses he will not keep courage enough to make a success of the business. This may explain why the peach belt is travelling from place to place.

Having a suitable man, next of importance is the soil and location. I will now describe my own location and soil. I am located fourteen miles west of Sunbury, Pennsylvania, on a ridge or range or mountains between the Juniata Valley and Middlecreek Valley. These hills are underlaid with bird-eye and black iron ore. Some places this black ore crops out, this is known as iron stone or iron stone gravel.

These hills have an elevation of from about eight to twelve hundred feet above sea level. This gives us a splendid air drainage for the production of all kinds of fruit and peaches grow to perfection in this soil if proper treatment is given them. I always try and buy the best trees I can secure and prefer a stocky three to four foot tree.

I plow the ground in the fall, or early spring will do; prepare the ground as for a crop of corn and furrow out the desired distance the trees are to be set, which with me is from fifteen to sixteen feet apart each way, depending on the slope of the ground.

I might say here that I do not grow my peaches on trees I grow them on bushes. I never in all my twenty-six years experience

owned or used a step ladder to pick peaches. We are too busy when fruit is ripe to fool with step ladders.

Having the ground ready to set the trees I take them from the box, with the inspection certificate on the outside and the trees and frequently the yellows and San Jose scale on the inside. The holes are dug deep enough to admit the trees to be planted about two inches deeper than they stood in the nursery. The holes should also be large enough to admit placing the roots in their natural position after all broken and bruised parts are cut out.

After the trees are set the branched top is cut away and leaves only a cane from eight to twelve inches high being governed somewhat by the set of buds which nature has put there to form the top.

Potatoes are grown the two first seasons, after that clean and thorough cultivation is given the trees as long as I consider the orchard profitable. I am frequently asked the question what crop could profitably be grown in a peach orchard after the third year, and the only answer I know to that question is, "A peach crop."

Each spring about one-half of the previous year's growth is cut away. Judgment must be exercised, however, so a well-balanced spreading top is secured. Always bear in mind that the peach tree is unlike the apple, it has no fruit spurs but bears its fruit on the previous year's growth; this annual pruning keeps a succession of new wood. The idea of stopping cultivation about the first of July is all a dream. I keep the cultivators going as long as it does not brush off too many peaches. I generally have a crop just as heavy as the other fellow has.

Enemies to peach trees are almost numberless and the only safe way to get rid of the borers is to dig them out and break their necks. The disease among peach trees known as the yellows proves even worse than the scale. The only remedy I know to hold this disease in check is to dig the diseased trees out and burn them as soon as discovered. San Jose scale: this pest can now be held in check by spraying although spraying is still an experiment to a very great extent. How glad we can be that lime and sulphur has been discovered, as before this was known we were told by the theorists that the only way to get rid of scale was to buy tents something similar to that of Barnum and Bailey's and fumigate with gas.

During the winter of 1904 I had the opportunity to visit the peach belt down in Georgia, and while I looked over thousands of acres in peach trees around Fort Valley I was very much surprised. I found there the growers with the small acreage were really making the most money while some of the largest growers were the owners of orchards that did not pay. Before I went there I had an idea the "big fish" would eat the "little" but after that visit I felt sure the "little fish" would eat the "big one."

I notice our worthy President and Secretary are appealing to the fruit growers of Pennsylvania. Let us as members of this Association appreciate their extra efforts and become more active, not just here in the meeting. Is it possible that a State like Pennsylvania with all her resources must have so few members in the State Association. Travel north, south, east or west, over and

through the State and you will find the best of markets. Thousands upon thousands of people depend upon the products of our Pennsylvania farms. Only a glance at the markets will reveal the fact that two-thirds of the products are shipped in from other states, all of which, except tropical products, could and should be produced in our own State. Eyes and ears have we but it seems to me sometimes that we hear not neither do we see.

Well we Americans are a funny class of people anyhow. It seems to me sometimes that we are pretty much like sheep; where one goes we all want to go. You can all recollect the time we Americans all wanted to go to Klondyke to dig gold, then came the German hare craze, then the Angora goat, then crimson clover, then ginseng, now alfalfa, and the price is way up on skunk hides. Next we will all want to grow skunks.

Knowing the requirements of a successful fruit grower as I do, Mr. Chairman, I fully realize that it is a waste of time to go into detail about peach culture to a class of men so bright and well informed as these here assembled. I further believe these men who compose the State Horticultural Association are the class of men who kept up an inspiration by demonstrating through their respective community to those who surround them and I further believe that were it not for these men Pennsylvania would have lost her fruit interests commercially before now.

A Member.—When trees are headed as low as you recommend, is it not difficult to get the borers out?

Mr. Boyer.—We don't let many of the borers get in, so there is no trouble to get them out.

The President.—How do you keep them out?

Mr. Boyer.—Oh, well, the foliage and the branches; they don't get in as bad as when trees are headed higher.

A Member.—But you have to go over them and examine them every year do you not?

Mr. Boyer.—Oh, yes; we do that.

A Member.—Do you plant northern or southern trees?

Mr. Boyer.—Both.

A Member.—Do you prefer the northern trees?

Mr. Boyer.—Not necessarily; the southern tree that stands outside is better than the northern tree that is kept in the cellar.

The President.—Do you plant in the fall?

Mr. Boyer.—No; the peach is only half hardy.

The President.—Another case where we can all do as we please; I plant in the fall, and always have good luck.

A Member.—How far apart are your trees?

Mr. Boyer.—About 16 ft., except on the steep hillsides, where I plant them 14 ft. apart.

A Member.—How do you get your peaches out of the orchard?

Mr. Boyer.—We carry them in baskets to roadways and then haul them out.

A Member.—How do you work these trees that are right down on the ground?

Mr. Boyer.—I don't do it when the branches bend over.

The Secretary.—Have you any special arrangement of the harrow to go under these low branches?

Mr. Boyer.—I use a spring-tooth harrow.

Mr. McSparran.—Don't you use any special arrangement?

Mr. Boyer.—No, sir.

Mr. Fox.—I wish to say that Mr. Boyer is one of the most successful fruit growers in the State of Pennsylvania. In 1878, being then one of the General Fruit Committee, I asked him for a report, and he not only sent it, but sent some fine fruit for exhibition.

A Member.—I would like to ask Mr. Boyer the names of the five or six best varieties that would stand our severe freezing up here.

Mr. Boyer.—What is the altitude?

A Member.—Less than a thousand feet.

Mr. Boyer.—In order of ripening, Mountain Rose, Crawford's Early, Stump, Old Mixon Free, Champion, Fox Seedling, Beer Smock, Common Smock and Salway.

Mr. Engle.—Why did you not mention the Elberta? If you were planting a thousand trees in a commercial orchard, would you not plant more Elbertas than anything else?

Mr. Boyer.—Well, yes; I planted a good many Ben Davis apple trees, and a good many Gregg raspberries; the Elberta is among peaches what the Ben Davis is among apples.

A Member.—Do you plant the Belle of Georgia?

Mr. Boyer.—No.

A Member.—Would you plant Salway here?

Mr. Boyer.—Not at an altitude of a thousand feet. Here I would use Smock.

A Member.—Ever try Crosby?

Mr. Boyer.—I did at first. They are a very high quality of fruit.

A Member.—How about the Rare-ripe?

Mr. Boyer.—Very good quality, but too shy.

A Member.—Chair's Choice?

Mr. Boyer.—A fine bearer; I had it for about ten years and had a fine crop.

Prof. Surface.—Is not the Crawford Early subject to rot?

Mr. Boyer.—Well, yes; it is sometimes, but it is a good grade of peach, and comes in nice and early.

Mr. Roberts.—Ever try the Waddell?

Mr. Boyer.—I have a few of them in bearing. When I started in twenty-six years ago, I tried too many varieties, and the result was, it did not pay me at all. I soon realized that, in buying, it was the early bird that caught the worm, and, also, that it was the early bird that was caught so I was careful in buying peaches, and I can always speak out of experience; that is all I know of peach culture. I was the first one that started in to grow peaches in our country, and while about ten or twelve years after I started, there were from ten to twelve thousand peach trees in cultivation, I don't think there are so many now.

Mr. Engle.—Of course, you don't recommend the Reeves?

Mr. Boyer.—No; I don't recommend it.

A Member.—Triumph?

Mr. Boyer.—I would not take a thousand Triumph trees for a gift.

A Member.—While we are on the subject, I want to say that I feel like taking up for the Elberta, in spite of what the gentleman

has said against it. I think that most of the prejudice is due to its being picked too early. If I could ripen them all thoroughly, I would grow nothing else.

Prof. Surface.—I feel very much like seconding that motion. I have been very much interested in attending horticultural meetings, and hearing the Elberta likened to the Ben Davis apple. I think it is a good bearer, and a good seller, and I don't think it is right to compare it with the Ben Davis apple.

A Member.—The Elberta made me more money than any other peach, and I had a good many.

Prof. Watts.—That is true of the Ben Davis apple.

Mr. Boyer.—There is no mistake about its being a good seller; it is a good, firm peach, coarse and sour, and it cans very nicely, but when it comes to quality, try some of the Stump the World, or Old Mixon Free, or Fox Seedling, and you will see that the Elberta does not compare with them.

A Member.—Well, the Elberta is certainly bringing in the dollars with me.

Mr. Boyer.—Oh, it is a good selling peach, and I am planting heavily of them, and also of the Ben Davis apple, just as I said, because they sell well. They have a good, firm flesh, but they are coarse.

Mr. Herr.—It is just the same with peaches as the anti-prohibitionist said of whiskey—all brands are good, only some are better than others.

Mr. Engle.—Just one word in reference to the Elberta; it is probably more largely grown in the south than any other peach, but it is picked before it is fully ripe and left to ripen enroute, but if you will let it ripen thoroughly on the tree, I don't think you will have any occasion to discount the peach on account of its quality. It is not up to the Susquehanna or the Crosby, but take it all in all, it is a pretty good peach.

The President.—I agree with you perfectly.

A Member.—I find it is better for the Elberta, and every other peach, to let them ripen on the tree.

Mr. Walton.—Mr. President, don't you think the reason the Elberta sells is because the public knows the Elberta's name. You take any other good peach and stamp it as Elberta, and the public will not distinguish between them.

The President.—Well, not exactly; I am in the local market, and I agree with the gentleman regarding the ripening. You let

it get fully ripe on the tree, and then pick it in the afternoon, and put it in your customers' hands in the morning, and you will find that they like it. Some of them know the difference. I have had them ask me "when are your Globe peaches coming in? I want to wait for them before I can any."

Mr. Walton.—They are educated; but the general public has heard so much of the Elberta without knowing what it really is.

Prof. Watts.—Nobody has said anything about the Elberta for home use; do you keep it for your own table?

The President.—We do, a great many times, for canning.

Mr. Engle.—They sell too well to keep them for home use.

Prof. Watts.—You don't keep them if you can get any others.

Mr. Boyer.—I am growing Elbertas, and I am sure we did not can any for the last eight or nine years.

The President.—Your taste requires a white peach; I see that from the names you have given; the market requires a yellow peach.

Mr. Fox.—Ninety per cent. of the peaches grown in Georgia are Elbertas—I would like to know how often the President gets a crop of Globe peaches—about once in five years?

The President.—It is one of the most productive peaches I have. I am now going to adjourn this meeting until seven-thirty, when we will have a little further discussion of this peach question.

Adjourned.

WEDNESDAY, FEBRUARY 12, 1910, 7.30 P. M.

President Hiester in the Chair.

The President.—The meeting will please come to order. The first number on the program this evening is a lecture on the "Life History and Habits of the Brown Tail Moth," by J. S. Briggs, of Norristown, Pa. This lecture will be illustrated. I have the pleasure of introducing to you Mr. Briggs.

LIFE HABITS AND HISTORY OF THE BROWN TAIL MOTH.

By J. S. Briggs.

The habits and life history of this insect should be well-known throughout Europe, for for a period of one hundred years, laws have been in operation relative to its suppression. Articles concern-

ing it have appeared in the papers and other publications of that country for nearly two hundred years.

Through international commerce, we are exposed, so to speak, to the introduction of many of the pests of foreign countries. For example, the Hessian Fly, San Jose Scale, and the Coddling Moth are now in our midst through this means, and, under our climatic conditions, multiply rapidly, and are inflicting great damage to our agricultural products. The Cotton Boll Weevil is another pest which came to us in our southern borders in 1894, and, from latest statistics, twenty millions of dollars are spent every year to keep it under control. I am frequently asked concerning the San Jose Scale, "When are we likely to accomplish its extermination?" and my answer has been "Never!" The word "extermination" is too strong a term to use in such cases. Extermination is impossible; we must be satisfied to control it; and so with other similar pests.

Our great trouble has been that these pests get into our country unnoticed, and are not discovered until some damage is done by them, and our attention is called to them. This has been the experience in each of the cases mentioned, and, I presume, why I am permitted to talk about this much-dreaded Brown Tail Moth at this time is to help us to a better knowledge of its external appearance in its different phases of life; to be able to recognize it, and to know how to destroy it.

May I here state that our Prof. Surface, with forethought, and with knowledge of our experience in the past, wisely concluded that one ounce of prevention was much better than a pound of cure, and gave the alarm about a year ago. From the February Bulletin of 1909, allow me to quote his words: "At the present time we are facing more grave danger of the introduction of the most destructive and objectionable pest in Pennsylvania than we have ever before experienced. It appears that the Brown Tail Moth, which is so destructive in Europe, and against which laws have been operative for nearly one hundred years, has suddenly occurred in immense numbers on nursery stock, rose bushes, and other plants sent from Europe to America. Our State law is adequate to take care of this just as far as legal provision can be made, but knowledge of the subject by all persons interested is necessary for that co-operation that is essential to secure proper results in preventing loss by these pests.

"After they are once introduced into this State, it will cost several times as much to exterminate them as to keep them out." (He will pardon me, I hope, for suggesting the word "control" instead of "exterminate.")

Immediately following this statement, the call was made for a number of men in his employ to proceed at once to inspect consignments of foreign goods which had reached our borders. This inspection captured (I think this is the right word to use in this case) current report says, about one hundred nests of Brown Tail Moths. Pardon me for mentioning the work of a department of which I am a member. I, personally, deserve no credit for any of this work. It was a case of "Betty and I killed the bear." I was not around when these moths were captured. It is due the department, however, that the public should know it, and it is also due the public that they should know what is being done for their good.

It was during the spring of 1897 that certain residents of Summerville and Cambridge, Massachusetts, discovered a strange caterpillar upon the unfolded leaves of their pear trees, and, upon closer investigation and inquiry, it was determined by Messrs Fernwald and Kirkland, reliable entomologists of that State, that the new enemy was that of a well-known species of Europe.

Still further investigation followed, and the fact became settled that this moth had been in Massachusetts since 1890, and from that time had been spreading slowly into unoccupied territory.

From the summer of 1897 to the autumn of 1899, quite a vigorous effort was made to repel the spread of this insect. The State appropriation had been limited to $6,000, and at the end of this time became exhausted. For five years nothing was done to prevent its spread, save that of the work done by the individual property holders. During this latter period it spread into all of the New England States save Connecticut. In this State it was not found at this time. Dr. Kirkland tells us that during the first three years of this latter period it added about six hundred square miles of territory, in which it did much damage.

The eggs are described as being about 1-30 of an inch in diameter and hatch in from fifteen to twenty days. In form they are more or less globular, and of a light yellow color. The masses of eggs are about two-thirds of an inch long and about a quarter of an inch wide, and are laid on the under side of the leaves about the middle of July in this latitude. The masses themselves are rather brown in color, and are covered with hair and many of them contain three hundred eggs.

The full grown caterpillar is about two inches long and of a reddish brown color, with a broken white stripe in each side, and with two red dots on the back, near the end. It is covered with tubercles bearing long barbed hairs. The tubercles along the back and sides are covered with short brown hairs in addition to the larger ones. These give the tubercles, when magnified, an appearance like velvet. The head of the caterpillar is pale brown with darker spots.

The very young caterpillar is of a very dark color, with reddish brown hairs, and the head is jet black; on the middle line of the ninth and tenth segments is an orange or reddish tubercle, which may be withdrawn into the body. After the second spring moulting, the brown tufts on the back become less prominent, and the white broken line becomes more noticeable, giving the appearance of the full grown caterpillar.

The full grown caterpillar or larva spins a cocoon of gray silk which is so thin that the caterpillar can be seen through it, and within this cocoon it is transformed into the pupa. It is about five-eights of an inch long, dark brown in color, with a conical spine at the end of the abdomen, bearing a cluster of minute hooks at the end. Smooth, yellowish brown hairs are found scattered over the abdomen, and in the top of the thorax. The cocoons are usually spun at the tips of the branches, and sometimes a dozen or more

larvae will spin a common web, within which each individual forms its own and transforms to a pupa. The cocoons are sometimes found under fences, and under cornices of houses.

The adult, or moth, is pure white, the end of the abdomen being slightly brown, and at the tip of the abdomen, more conspicuously that of the female, is a tuft of brown hair, almost globular in form, whence the name. There can be no mistake as to the identity, since it is the only insect in this country to which the description I have given applies. You will observe that the female is a little larger than the male.

The brown tail moth feeds upon all kinds of foliage: that of fruit trees as well as that of the ornamental shrubbery and forest trees, and as a dangerous and destructive insect is among the first in rank.

They begin to look for the moth in Massachusetts about the 1st of July in each year. (We hope we shall iot need to look for them in Pennsylvania, expecting to find them). As twilight approaches, they begin to fly. Their number gradually increases each hour, until at midnight, they seem fairly to swarm.

The moths seem to be attracted by the light, for they are seen in great numbers near electric lights at night, and it is at this time, and at this period in life that they spread so rapidly. The prevailing winds had much to do with their spread into the States of Maine, New Hampshire and Vermont. They have been discovered on the sides of vessels at sea, and on railway trains coming from infested districts. They are also carried from infested districts, in the caterpillar stage, on one's clothing, and ordinary road conveyances. Within a few days after they begin to fly they deposit their eggs upon the under side of the leaves. About a month later, the eggs are hatched, and the young caterpillars begin to feed upon the upper side of the leaf, first upon the one bearing the egg mass, and later reach out to the other leaves, but return at night to the leaf from which they were hatched. When first hatched they are about one-tenth of an inch long. They shed their first skin within a week from the time they were hatched, and are then about one-fifth of an inch long. Late in autumn, and generally within their winter webs, they shed their second skin.

Usually in September they begin to spin their winter webs, drawing a number of leaves together with a silk. In each of these many pass the winter. These nests are from five to six inches in length, and many times contain more than two hundred caterpillars.

They have a small opening in their webs, through which they pass in and out until cold weather; then the opening is closed, and they remain within during the winter. At this time they are about one-quarter grown.

There can be no mistake as to the identity of these webs. Any web of the character and description mentioned, and found during the winter, containing young caterpillars, is the web of the brown-tail moth. Webs of other insects found during the winter are always empty at that time.

In the spring of the year, as the buds begin to appear upon the fruit trees, the young caterpillars come out from their winter homes.

They have not increased in size during their long fast, and, naturally, they have excellent appetites. It is at this time in their lives that they do so much damage. Buds, blossoms, and later, the foliage, are consumed.

As the caterpillars fill themselves with the buds and leaves in the spring and summer season, so they correspondingly develop and grow and soon reach full size, when they begin to spin their cocoons. This is begun, usually, about the middle of June, and, as I have stated, in these cocoons the transformation to the pupa takes place. In this State they remain for a period of about twenty days, when the cycle of life is complete.

The hairs of the caterpillar of the brown tail moth are finely barbed, and when they come in contact with the human flesh, they reach the pores of the skin, and being quite brittle, sometimes break off, leaving a part under the surface, causing a very unpleasant itching, and in a number of recorded cases, persons have been severely poisoned. It is not necessary that the person himself come in contact with the caterpillar, for at the times when the caterpillar changes his skin, and at the time of the spinning of the cocoon, many of these hairs are loosened, and are carried about by the wind. In the summer of 1906 at North Saugus, Mass., in the parasite laboratory, two of the assistants who were obliged to handle a large number of these wintering nests, were poisoned to such an extent that their hands and arms were swollen to a considerable extent. Their eyes were swollen until they were almost closed, and the irritation of the hairs in the throat and nasal passages, was such as to cause alarm.

Many persons engaged in collecting and removing these nests, suffer from this brown tail rash as it is called, but to a less degree. These sharp brown hairs from the tubercles on the back and sides of the abdomen seem to produce the worse effect, and some of our native caterpillars, carrying similar hairs, also produce this itching effect. A very excellent prescription, which has been offered with good results, is this:

Menthol, ...	10 grains
Oxide of Zinc, ...	2 drams
Lime water, ...	8 oz.
Carbolic acid, ...	10 drops

for external application only.

Unfortunately, the brown tail moth has but few natural enemies; we have come to know, however, that some of our birds assist in checking the spread of this most destructive insect.

The Cuckoo and the Baltimore Oriole do their part in this great work, and the much despised Blue Jay contributes no small share in this service. These feed upon the insect in its caterpillar stage, while many other birds feed upon it in its moth stage.

Dr. Kirkland tells us that at one time, when the moths were emerging in great numbers from the sides of the fences, he observed whole flocks of English Sparrows following after them and devouring them.

Bats and toads come in for a share of this work, as the moths fly about electric lights and fall to the ground.

We wish now to consider some of the remedies for the destruction of this insect. Our best authorities have come to the conclusion that the most effective means of controlling the brown tail moth is the collection and immediate destruction of the winter nests, which are found after the leaves have fallen—we will say from October to April—in about this latitude. Each nest will contain two hundred or more caterpillars, and as we have stated, about one-quarter grown.

In Massachusetts some men make a business of collecting and destroying these nests, and are equipped with long ladders, climbing irons, etc., adapted for that purpose.

After the leaves come out in the spring, the caterpillars leave their nests, and at once commence devouring the foliage, and then our only remedy is to spray with some arsenate preparation, usually arsenate of lead in the proportion of two pounds to fifty gallons of water, when they are young; when they are older, a stronger mixture may be necessary, and we might double the proportion of arsenate of lead when they are fully grown.

One picture shows typical hair covered egg masses of brown tail moth, laid in July, 1899, on trees sprayed May 18th, 1899, with arsenate of lead. So well did the poison adhere to the leaves that the caterpillars died as fast as they were hatched. From a photograph taken at Malden, Mass., Sept. 30, 1899.

You will notice that the spraying was done in May, the eggs laids in July, and the photograph taken in September. And we are told that the work was a success.

Paris Green is sometimes used for this purpose, but it should not be used stronger than one pound to one hundred gallons of water, for fear of burning the foliage.

It is said that in some localities the services of school children have been secured by the payment of a bounty for each nest obtained, and much good has been accomplished in this way.

In Massachusetts they have a law which declares that the Gipsy and Brown Tail Moths are public nuisances, and suppression is required. A superintendent is appointed by the Governor, with the power of appointing agents and assistants in the work of suppressing these moths. Cities and towns, under the advice of this superintendent, are required, under penalty for neglect, to destroy the eggs, pupae and nests of the moths within their limits. In cases of failure to do this, the superintendent shall cause their destruction, and shall assess upon such properties the cost of so doing, to an amount not exceeding one-half of one per cent. of the assessed valuation of such land or properties, provision, however, being made for those who because of age or poverty are unable to pay the expense. To meet this requirement, during the years 1905, 1906 and 1907, the State appropriated $300,000, and for the purpose of experimenting, an additional sum of $10,000 for each of these years, making a total of $330,000 for this period. Any one who resisted, or in any way sought to obstruct the work of an employee lawfully engaged under this law, was subject to a heavy penalty, regardless on whose premises the employee might be at work.

With your permission, I will close by reading an article published in the Philadelphia Public Ledger in July last:

"New England is again at war. Her historic hills are ringing with the sounds of combat, and her verdant valleys are volleying defiance to a common enemy. But 'tis no hated redcoat that is charging the Eastern States in a taxicab to-day; no merciless minion of a plump potentate presents his scarlet uniform for the farmer's boys to pluck. The foe is dressed in brown velvet; he hides in the trees; is numbered in countless millions; is more voracious than the hungriest Hessian ever hired by King George, and the damage he has inflicted since he arrived on our shores is estimated to be ten times as much as all the wreck of fire and flood since the colonies were young.

The Brown Tail Moth is the invader that the farmers and scientific men of New England are battling, and, although the State of Massachusetts has alone spent more than $7,000,000 in the war against him and his terrible brother, the Gypsy Moth, the human forces have thus far met nothing but defeat. Like the Gypsy, the Brown Tail Moth works his havoc in the caterpillar state. Each mother moth lays about three hundred eggs, and each caterpillar converts several hundred leaves into skeletons in the course of a season. Nor are they at all particular what they eat: buds, blossoms and leaves, taste equally good to them."

I thank you.

The President.—Any questions you would like to ask Mr. Briggs? If not we will have a short talk on Peaches, by Mr. Smythe, who will give us some Michigan ideas on Peach Culture.

PEACHES.

By President R. A. Smythe.

Mr. President, Ladies and Gentlemen: When your Secretary requested me to give a short talk on the peach, he did not state what phase of the subject he wished me to discuss. As the subject was so well handled this afternoon by Mr. Boyer, I will not repeat what he so ably said; I will say nothing of pruning, spraying, cultivating, thinning, picking etc. I find it very hard to start peach trees where old peach trees have previously grown, and would not advise resetting in such places until the land has been cultivated for several seasons, and corn crops grown on them.

See that you get good trees. I am sure that much of the failure we have had in recent years in Michigan in starting trees has come from the nursery stock we have been getting; I know of cases where the little trees have developed Yellows the first season after they were set. The disease must have been either in the seed or bud. It is time we were making the nurserymen liable for the stock they are selling. Now, possibly you have in this country good nursery stock, but most all we have at our command comes from the eastern states. At our annual meeting at South Haven we had a discussion about the pit taken from a tree with the Yel-

lows, whether it will produce a tree or not. We have not heard any one say that it will not, but I think the chances are that it will not produce a healthy tree. Like produces like. If you grow your own trees, be sure to have good pits. In Tennessee, where most of the pits are gotten, they have the Yellows worse than any other place in the United States—so I am told.

The selection of buds is just as essential as the seed. If you have a good, vigorous tree, that is the tree from which to take your buds. That is not what a nurseryman does; he takes buds from the nursery row and as these trees are not bearing, he don't know what he is getting.

The "Little Peach" and "Yellows" we have,—I trust you do not have them here. Our Secretary, Mr. Bassett, told your President, Mr. Hiester, that we have eradicated the Little Peach and Yellows, but we have also eradicated the orchards in doing so. I am not satisfied with this, and still hope we will discover some way of overcoming these diseases without destroying our trees. Taking out the diseased trees is the only safe plan to follow.

I am sorry to come to Pennsylvania and learn that the Pennsylvania growers are packing the fruit as badly as we are in Michigan. Out there we find the top and bottom of the barrel all right, but the middle is not up to them. I am sorry to talk about this, but I gave you the credit of not doing this here. In Canada, under the Marks law, they have to pack and grade the fruit, as it is inspected; so it is up to every man to see that his fruit is standard grade; also he has to put his name on the package. I would like to go a little farther in the United States and state the fixed size of the package and make it uniform everywhere. We in Michigan have so many different sizes of bushel baskets,—I don't want to sell a full bushel for the same price that some other man is selling a snide bushel.

I don't think I will say much about our picking and packing. Most of our best fruits are packed in what is known as the "six basket Climax crate," which holds about three-fifths of a bushel. I find we make more money in this way than in any other package until it comes to the canning season. Then the demand is for the bushel.

I was very much interested in the varieties mentioned this afternoon. With most of them I am not familiar, except with the Elberta. This is our standard peach for shipping. The Elberta is a good shipper, but in my opinion, there is nothing quite equal to the Engle Mammoth. I never eat an Elberta when I can get anything else.

As to markets: we have a local market, and a man generally drives into town with his fruit. The buyer comes out, looks at the fruit and says to the man, "What are you offered for your peaches to-day?" The man says, "That is none of your business; what are you willing to pay?" The buyer don't seem able to discriminate, and the man who raises fine fruit gets no more for it than for ordinary fruit. I went out into the market this fall with Concord grapes, which are usually put up in eight pound baskets, and a man asked me "What is your price?" I named it, and he said, "I won't give it." I said, "But there is not a basket here that does not contain eight pounds." He agreed that was true, but it did not make any difference to him whether it held 6 pounds or 8 pounds, and said, "I won't pay any more." So we may pick and pack our fruit all right, but when we get to the market we fall down. We must study the market more. We have to ship to Chicago, and there the commission man takes out his commission, freight and cartage. It does not leave the grower a great deal. I think that where the Hood River people make such a success is by having their own market to depend on, and one man to look after their interests. We tried the packing house system, but is was not satisfactory; too many of the farmers were not honest and most of the fruit that came in had to be handled over again. In one case, out of four hundred bushels that came in, we sent one hundred and eight bushels to the cider mill. The man who was only picking and selling the best could not afford to co-operate with the man who brings in poor stuff. If we had a uniform standard of measure and grade it would be money in our pockets.

I am glad we have the San Jose Scale. It forces out of business the men who did not attend to their orchards, and we are glad of it. Since we are compelled to spray our trees, our orchards are looked after better, and consequently pay us better.

Now, I don't know anything more that I would like to say, except to thank you for your attention. If there are any questions, I shall be pleased to answer them if I can.

A Member.—A tree that grows very rapidly the first two, three or four years, how does that affect the future of that tree?

Mr. Smythe.—I don't know; we are not troubled in that way; our trees are grown rather slow.

A Member.—Do you think a slow growing tree will live longer?

Mr. Smythe.—I think so; some of our oldest trees are those which have been grown on old soil, and made a slow growth.

A Member.—Name three varieties that you consider the hardiest and best in Michigan.

Mr. Smythe.—The Elberta; it is not always a constant bearer —usually two years out of three, it will ordinarily bear, except where thinning is practiced; then it will bear every year. The Engle Mammoth is a very good peach. It is tender-fleshed fruit, but hardy in the bud, and is one of the best bearers. These are both yellow peaches. We don't grow a great many white peaches, except possibly the Lewis Seedling.

Prof. Surface.—Do you do anything to protect the tree against insect and fungus growths?

Mr. Smythe.—Yes, sir; we spray.

Prof. Surface.—What with?

Mr. Smythe.—Lime and sulphur.

Prof. Surface.—Is there any less brown rot on trees that have been sprayed when dormant?

Mr. Smythe.—The brown rot comes at a regular season with us. If we happen to have a humid spell in July, we have more brown rot then, than at any other season. I don't know how you feel about it here in Pennsylvania, but we feel that if we have good air drainage, we have no trouble with the brown rot.

Prof. Surface.—What do you do for curculio?

Mr. Smythe.—We are not troubled with it. I might say that the best peach we have for canning is the Gold Drop.

Mr. Engle.—I thought Hill's Chilly was the best peach grown in Michigan?

Mr. Smythe.—It is not so much grown any more; it is very wooly and not much used.

A Member.—How about the Kalamazoo?

Mr. Smythe.—An excellent variety and is being more set. We don't try to grow a peach that will get into market at the same time the peaches come in from the South. The Lewis Seedling comes in about the time the southern peach is going out. Then comes the St. John, but that is too shy. Then we follow it with something that will keep up a consecutive picking after St. John, then Fitzgerald; then follows the Engle Mammoth and the Elberta, and then the Kalamazoo. Of course, there are a great many other varieties, but these are the ones in general use.

Mr. Engle.—Your Lewis Seedling must be about the same time as our Mountain Rose. I am surprised that you do not raise the white peach.

Mr. Smythe.—The Chicago market does not care for a white peach; we do have the Old Mixen, but it is not a favorite.

Mr. Engle.—I heard a grower say that if he wanted wood and not peaches, he would grow the Old Mixen.

The President.—That was not within the last ten years.

A Member.—You have the New Prolific?

Mr. Smythe.—Yes, sir; it is a very good peach, but I don't think I would grow it if I could grow the Kalamazoo.

Mr. Boyer.—I would like to ask the gentleman why he does not eat the Elberta.

Mr. Smythe.—I don't when I can get the Mammoth. We grow the Elberta for size, but they are great big pumpkins, with very coarse flesh. For our own use we can the Gold Drop. We did can some Elbertas this year for the first time, and my wife says she never knew before that they were so good. Standing in the sugar improves the flavor of them.

Mr. Engle.—Do you grow the Salway or the Smock?

Mr. Smythe.—We grow the Smock, also the Salway. The Smock is a very brittle tree and splits badly.

Prof. Stewart.—The Crosby?

Mr. Smythe.—A very good peach with us, and especially hardy.

Prof. Stewart.—How about the Champion?

Mr. Smythe.—I don't know so much about that.

Prof. Stewart.—Beaucaire No. 3?

Mr. Smythe.—I don't know it.

Prof. Watts.—Do you grow any variety that is hardier than the Crosby?

Mr. Smythe.—The Elberta.

A Member.—The Susquehanna?

Mr. Smythe.—I don't know it; it is not grown there.

Mr. Fox.—How about the Iron Mountain?

Mr. Smythe.—I don't know of it; it may possibly be grown in the northern part of the State. There is a man up there growing peaches very largely. He has some forty kinds, and is trying out many varieties.

Mr. Roberts.—Do you know the Belle of Prussia?

Mr. Smythe.—No.

Prof. Surface.—The Carmen?

Mr. Smythe.—I am not familiar with it, but it is grown in Michigan, but not extensively.

Mr. Knuppenberg.—Do you lose many trees by frost?

Mr. Smythe.—In 1906 we lost 90 per cent. of the trees in our county. We, living along the Lake Shore, were the only ones that saved our trees, but our trees were better sprayed, had good air drainage, and were in a more vigorous condition to stand the cold.

A Member.—Does the Fitzgerald do well?

Mr. Smythe.—Fairly well; it is a fairly good, marketable peach, rather tender. You see we are on the west side of Lake Michigan, only four hours from Chicago by boat, so we can send our fruit pretty ripe, and can ship the more tender varieties.

Mr. Roberts.—How soon do you get your trees into bearing?

Mr. Smythe.—At about four years, but we do not get the best results until they are about seven years old.

Mr. Roberts.—Would you rather have them bear younger?

Mr. Smythe.—No; I think not.

Mr. Eldon.—I heard a gentleman speak of a new peach in Michigan; he said it was white, and had red cheeks.

Mr. Smythe.—And curly hair, and he called it "Marcia." This happened to be Mr. Bassett's little daughter, and she is pretty as a peach.

The President.—We will now have a report on Orchard Experiments by Prof. Stewart.

ORCHARD FERTILIZATION.

PROF. J. P. STEWART, *Department of Experimental Horticulture, State College, Pa.*

The problem of successful orcharding is to secure and maintain a balanced treatment. Many factors are involved,—moisture, plant food, light, protection (from enemies, frost and disease), correct varieties and location, and correct business management. None can be neglected without danger of loss, and it is the weakest factor that limits the crop. The limiters, therefore, must be found and corrected. Money and energy spent on factors already relatively strong are likely to be wasted, while on the other hand, the weak factors will respond to care. Hence, the finding and lifting of limiting factors, coupled with the maintenance thereafter of a balanced orchard treatment, is the correct policy and the keynote to success.

You are already acquainted with the scope and general character of our experiments along this line. But I would recall the facts that we have under experiment in various parts of the state 91 acres of orchard, 49 of which (including 2,219 trees) are in partial or full bearing. The yields from these experimental orchards in 1908 were somewhat over 164,000 pounds of fruit, and in 1909, the third year, they were 256,000 pounds. The data for the tables and conclusions which follow, therefore, cover a period of three years and are derived from something over 420,000 pounds of fruit. The exact locations, soil types and varieties involved are shown in Table I.

TABLE I.

Location, Soil, and Other Data on Experiments Away from the College.

Expt. No.	*County*	*Owner of Orchard*	*Soil*	*Varieties*	*Age 1909*	*No. of Trees*
215	Adams	Tyson Bros.	Porter's Loam	York Imperial and Stayman Winesap	Yr. 10	160
216	Franklin	D. M. Wertz	Mont Alto Fine Sandy Loam*	York Imperial and Jonathan	10	160
220	Bedford	Mrs. S. B. Brown	DeKalb Stony Loam*	York Imperial and Baldwin	11 & 21	160
217	Franklin	J. H. Ledy	Mont Alto Loam*	York Imperial and Gano	16	358
218	Franklin	J. A. Nicodemus	Hagerstown Clay Loam*	York Imperial and Albemarle	10 & 14	400
219	Bedford	J. R. Sleek	DeKalb Shale Loam*	York Imp., Jonathan Ben Davis and Gano	7	320
221	Wyoming	F. H. Fassett	Fine Sandy Loam†	Northern Spy and Baldwin	37	115
336	Chester	A. D. Strode	Chester Loam	Grimes, Smokehouse and Stayman Winesap	7 - 9	120 105‡
337§	Mercer	St. Paul's Orphans' Home	Volusia Silt Loam*	Northern Spy, Baldwin and Rome	2	180&180
338	Lawrence	J. B. Johnston	Volusia Silt Loam*	Baldwin	21	80 & 105
339	Bradford	F. T. Mynard	Upshur Loam*	Baldwin and Fallawater	15	120 & 1

The first three experiments, 215, 216 and 220, comprise what we call our straight fertilizer experiments; the next four are experiments on cultural methods, with and without manures; and the last four are a combination of fertilizer and cultural methods experiments. Each of the fertilizer experiments contains sixteen plots of ten trees each. The treatments are shown in Table II. The symbols N. P and K refer to nitrogen, phosphates and potash; and they are applied at the rates of 50 lb. N., 100 lb. P_2O_5 and 150 lb. K_2O per acre in all cases. Plots 5 and 6 compare the muriate and sulphate as a carrier of potash. Plots 11 and 12 compare acid phosphate and "floats" as a carrier of phosphoric acid (phosphorus pentoxid, more correctly). The manure is applied at the rate of 12 tons per acre and the lime at 1,000 lb. per acre. All applications are made annually.

The combined results to date of the first three experiments are shown in Table II.

*Soils un-mapped as yet, but probably closest to the types indicated according to the observations of C. F. Shaw and H. J. Wilder.

†This soil has received no series name but it is one that has been deposited in a lake bed formed by the temporary stoppage of the Susquehanna in cutting through the mountains.

‡In the two sets of figures in this and the following experiments, the first gives the number of trees under fertilizer treatment, the second those under differing cultural methods. In experiments 339, the latter includes only a sod mulch plot.

§Trees set out in connection with these experiments, hence, not yet in bearing.

TABLE II.

Influence of Fertilizers on Yield, Color and Growth.

Epts. 215, 216, 220.

Plot.	Treatment.	Yields 1908-9. Lb.	Yield Per cent. Benefit.	Yields 1909 Third Yr. Lb.	Yield Per cent. Benefit.	Per ct. of apples colored ½ or more.[1] 1908-9.	Color Per cent. Benefit.	Ave. increase per tree in trunk girth, in inches, 1907-9.	Color Per cent. Benefit.
1	Check	4643	....	1306	....	69.2	....	3.29—	....
2	N P	6887	78.1	1770	51.2	47.9	—22.5	3.54	8.9
3	N K	5653	82.8	1409	36.4	57.	—14.5	3.63	19.1
4	Check	2313	....	897	....	72.7	....	3.18	....
5	P K	3577	62.5	1441	56.5	69.8	1.7	3.34	3.8
6	PK_2SO_4	2773	32.	1664	76.3	67.2	3.6	3.43—	5.1
7	Check	1998	....	1067	....	59.	....	3.29	....
8	N P K	3847	67.4	1561	31.3	41.6	—20.3	3.97—	18.2
9	N	4709	81.2	2675	104.2	43.8	—21.1	4.08	19.4
10	Check	2898	....	1431	....	67.8	....	3.48	....
11	Acid P.	2833	6.26	2126	52.2	69.3	3.3	3.49—	—1.7
12	Raw P.	1548	—36.6	1073	—21.3	75.3	11.	3.29	—8.9
13	Check	2209	....	1327	....	62.5	....	3.68	....
14	Manure	4793	138.3	3423	178.5	56.0	— 9.1	4.30	21.6
15	Lime	1538	—21.7	895	—21.	66.7	— .9	3.73	9.6
16	Check	1843	....	1034	....	70.2	....	3.26	....

Striking things shown here are the strong beneficial effect of manure and of nitrogen on yield and growth, with an accompanying harmful influence on color. Plots 6 and 11 show surprising gains in the yields of the third year. Raw phosphate and lime continue to show deficits in every way except in color for the former and in growth for the latter. We can hardly see any reason for this harmful effect in the case of the "floats" and suspect that it is due to some temporary condition which will disappear later. The same may be true of the lime effect, though the reports of "Lime poisoning" made by Dr. Headdon in Colorado Bulletin 131 are worthy of consideration in this connection. It is also worthy of note that the plots which have made the best yield have also made the best growth, thus showing that reasonable amounts of yield and growth are not antagonistic but rather are associated.

A puzzling condition appears in the fact that wherever nitrogen has been applied in combination with other elements, the benefit decreases in a third year, while in plot 9 where it was applied alone the benefit in the third year increases distinctly. This is partly explainable in the larger yields of the former plots last year, thus bringing them more strongly under the operation of the biennial bearing habit.

[1]In all these tables, the effects on color and size of the fruit were obtained from random samples, taken from the fruit of each tree as it was weighed, the aggregate sample from each plot amounting usually to one or two bushels.

Also the difference in yield between 8 and 9 may be traced directly to a deficit of at least 1,000 lb. that occurred this year in plot 8 of Experiment 220. This deficit was not due to the absence of apples on the trees. On the contrary an excessive number of fruits were started on this plot, despite its heavy crop of last year, and this very fact, coupled with the excessive foliage and extreme drought of the current season, almost prevented development in the apples. Plot 9 of course was subjected to similar conditions, but to a lessened degree in every way. Its original set of fruit and its foliage were less and its moisture situation is hardly as severe as that of plot 8. Thus, while some of the present results are undoubtedly entitled to the rank of "posers," yet they are not entirely beyond partial explanation at least; and at any rate they should not be permitted to cloud the main facts, which are given in the paragraph above.

In Table III we have another set of results from the fertilizer portions of Experiments 336, 338 and 339, which have been running for two years only. The applications are the same as in the experiments above.

TABLE III.

Influence of Fertilizers on Yield and Color.

Expts. 336, 338, 339. (a) Yields in Pounds, 1908-9.

	1 Check	2 N P	3 N K	4 Check	5 P K	6 N P K	7 Check	8 Manure	9 Lime	10 Check
1908, 1st yr.	562	860	748	1118	846	2178	1067	2338	3111	2748
Per cent. Benefit[1],		15.1	-19.8		-23.2	100.9		46.7	42.1	
1909 Totals,	1087	6435	6367	2502	3803	7212	2436	4600	2349	1720
Per cent. Benefit.		312.7	213.6		53.3	193.4		109.7	19.9	
1909.	(b) Color per cent. of apples colored ½ or more.									
Ave. per cent. Color,	57.2	40.-	39.8	49.4	46.5	38.0	49.7	49.0	50.3	54.8
Per cent. Benefit,		-14.6	-12.2		-3.	-11.6		-2.4	-2.8	

In general, these results corroborate those in Table II. The nitgoren plots show remarkable increases in yield; and the ill effects on color are less evident than in the earlier table. The lower benefit on yield in plot 6 is due apparently to the relatively large yield on this plot the first year, coupled with a harmful influence which potash seems to be exerting in this series of experiments. Manure shows itself to be slower in action than nitrogenous commercial fertilizers. The absence of any well-defined effect of fertilizers on the crop of the first year, is evident here as usual. The

[1]The results of the first year were obviously unaffected by the fertilizer treatments, but they are included for the light they throw on some of the results of the second year, notably those in plots 2, 3 and 6.

lime again shows a very weak influence, and the relatively slight benefit that appears is probably due largely to a favorable location in one of the experiments, as explained later.

In Tables II and III we have had results from various combinations of fertilizer elements, as well as some from certain materials used singly. Those results being direct from the trees may be considered a close expression of the values thus far of the various combinations used. In many cases, however, we may wish to know which is the more active element in a given combination and approximately what values are to be assigned to each of the elements in it. For example, in plot 2 of Table II we find a benefit of 78.1 per cent. resulting from an application of nitrogen and phosphate. Here the question arises as to how much of this effect was due to nitrogen and how much to phosphate. Any answer to this can be of course only an approximation of the truth and hence the values obtained and shown in the following table are not to be taken too literally. They are the nearest approach to the correct values, however, that we are able to obtain at this time and they were derived in the manner indicated in the footnote to the table.

TABLE IV.

Influence of Fertilizer Elements on Yield, Color and Growth.[1]

Estimated Per Cent. of Benefit.

Expts. 215, 216, 220.	Yield.		Color.	Growth[2]
	1908-9.	1909	1908-9.	1907-9.
Nitrogen, In Combination, ...	49.2%	15.55%	—19.35%	12.1%
Nitrogen, Alone, ...	81.1	104.2	—21.1	19.4
Ave. Influence of Nitrogen, ..	65.2	59.9	—20.23	15.8—
Phosphate, In Combination, ...	28.9	35.65	— 3.13	— 3.2
Phosphate, Alone, ...	6.2	52.2	3.3	— 1.7
Potash, In Combination, ...	33.6	20.85	4.85	7.0
Manure, Alone, ...	138.3	178.5	—9.1	21.6
Lime, Alone, ...	—21.7	—21.	— .9	9.6

Expts. 336, 338, 339.	Yield.	Color.
	1909 (2nd year).	1909.
Nitrogen, In Combination, ...	236.5%	—11.9%
Phosphate, In Combination, ...	76.2	— 2.7
Potash, In Combination, ...	— 22.9	— .3
Manure, Alone, ...	109.7	— 2.4
Lime, Alone, ...	19.9	— 2.8

[1]The results here given are calculated or taken from Tables II and III. For example, the value of nitrogen in combination was obtained by following the formula $\frac{NP+NK-PK}{2}$. In other words, the per cents of benefit obtained in plots two and three were added, from this sum was deducted the per cent of benefit in plot 5, and the remainder, divided by 2, is considered to be the value of nitrogen in the combination. The other values in combination were obtained similarly.

[2]Per cent of increase in trunk girth.

These results, being derived from those in tables II and III, are naturally not materially different, as a whole, but the values of the individual elements stand out more sharply.

Nitrogen and stable manure show striking beneficial effects on both yield and growth and characteristically harmful effects on color. The effect of the manure is greatest in the third year of the first three experiments, while that of the nitrogen is astonishingly great in the second year of the three later experiments.

Phosphates are showing considerable value on yield, especially when used in combination with other materials. Their effect on color and growth is apparently undecided, as 3 per cent. variations from the normal are readily attributable to limitations in our methods of determining values. Potash, in combination, has shown fairly good effects on yield and growth in the first experiments, but has apparently proved rather distinctly harmful in the second three; and considering the results in all six experiments its value in improving color is very questionable.

Lime in the first three experiments shows a distinct deficit in yield, and no advantage in color, but apparently a fair increase in growth. In the other experiments an apparent benefit in yield is shown. This, however, is due to an unusual increase on the lime plot of experiment 339, an increase which was due probably more to a favorable moisture situation this year than to any effect of the lime. It is surely a significant fact that in five out of six places thus far, lime shows either no effect or a distinct deficit in yield.

It will be noted that practically none of the treatments have materially improved color while a number of them have distinctly decreased it. This reduction in color is undoubtedly associated with *delayed maturity* and a *diminished light supply to the fruit,* the latter being due to an increase in the density of foliage following the application of the fertilizers. The value of sunlight in developing redness in apples is scarcely appreciated. In a test conducted during the fall on York Imperial apples it was found that exposure to sunlight after picking increased redness by over 35 per cent, while apples confined in the dark, or exposed to electric light and under identical conditions otherwise, showed practically no increase in redness. *Maturity in sunlight* on the trees is undoubtedly the great influence affecting redness in fruit, and when soil ingredients apparently affect it, their effect is produced indirectly through a modification in the main influence.

Some of the plots as they appeared in the field during the past season are shown in Figures I and II.

Fig. 1. Plots 14 and 13, Expt. 220.

Stable Manure, 3rd yr., 373. 8 bu. per acre. Nothing 3rd yr., 27. 9 bu. per acre.

Fig, 2. Partial view of plots 1 and 2, Expt. 338,

Nothing, 2nd yr., 156. 4 bu. per acre. Nitrogen and phosphate, 2nd yr., 721. 5 bu. per acre.

The variety in Fig. I is York Imperial, and in Figure II it is Baldwin. The results here shown and others are further considered in Table V.

TABLE V.

Financial Value of Fertilization.

Expt. 221, 1909 (3rd Yr.)	Yield Lb.	Bushels Per A.	Value at 50c.	Cost of Fertilizer.	Net Gain per Acre.
Unfertilized, plots 4 and 7, ...	19448	194.5	$ 97.25	$	$.....
Com. Fertilizer, plots 6 and 9, ...	47028	470.0	235.00	13.00.	124.75
Manure, plots 5 and 8, ...	48550	485.5	242.75	15.00	130.50
Expt. 220, 1909, (3rd year).					
Unfertilized, plots, 13 and 16, ...	291	27.9	$ 13.95	$	$.....
Manure, plot 14, ...	1947	373.8	186.90	15.00	157.95
Expt. 338, 1909, (2nd year).					
Unfertilized, plots 1 and 4, ...	2607	156.4	$ 78.20	$	$.....
Com. Fertilizer, plots 2 and 3, ...	12026	721.5	360.75	15.00	267.55

It is to be noted that the net gains are obtained after deducting both the cost of the fertilizer and the value of the unfertilized crop, also the fruit here is valued at 50 cents per bushel, while the actual prices obtained for it varied from 50 cents to $1.25 per bushel; and any increase in the appraisement of the fruit of course will proportionately increase the net gain. It is also to be noted that variations in the factors of tillage, spraying and pruning produced no material effect on the size of the crop, since the treatment of all plots in these respects was uniform.

Such striking results as these of course are not to be expected everywhere. They evidently occurred here because plant food was the crop limiter in these orchards. For any given case this can only be determined by experiment. These orchards are on three diverse soil types. The soil in one case was evidently "run down"; in another case it was in average condition; and in the third the soil condition was apparently above the average. These orchards are from 21 to 37 years of age, and they are the only ones under experiment above 20 years old. Age, however, is not a sure index of the need of plant food, as one of our youngest orchards, a seven-year old, is responding strongly to fertilization, while some older ones have proved unresponsive. The big fact is that when such results as these are obtainable anywhere, it raises a strong suspicion that similar benefits may be obtained in many other orchards. And these results show beyond peradventure that in some orchards apple trees, like other plants, respond strongly and directly to applications of plant food.

Experiments on Cultural Methods.

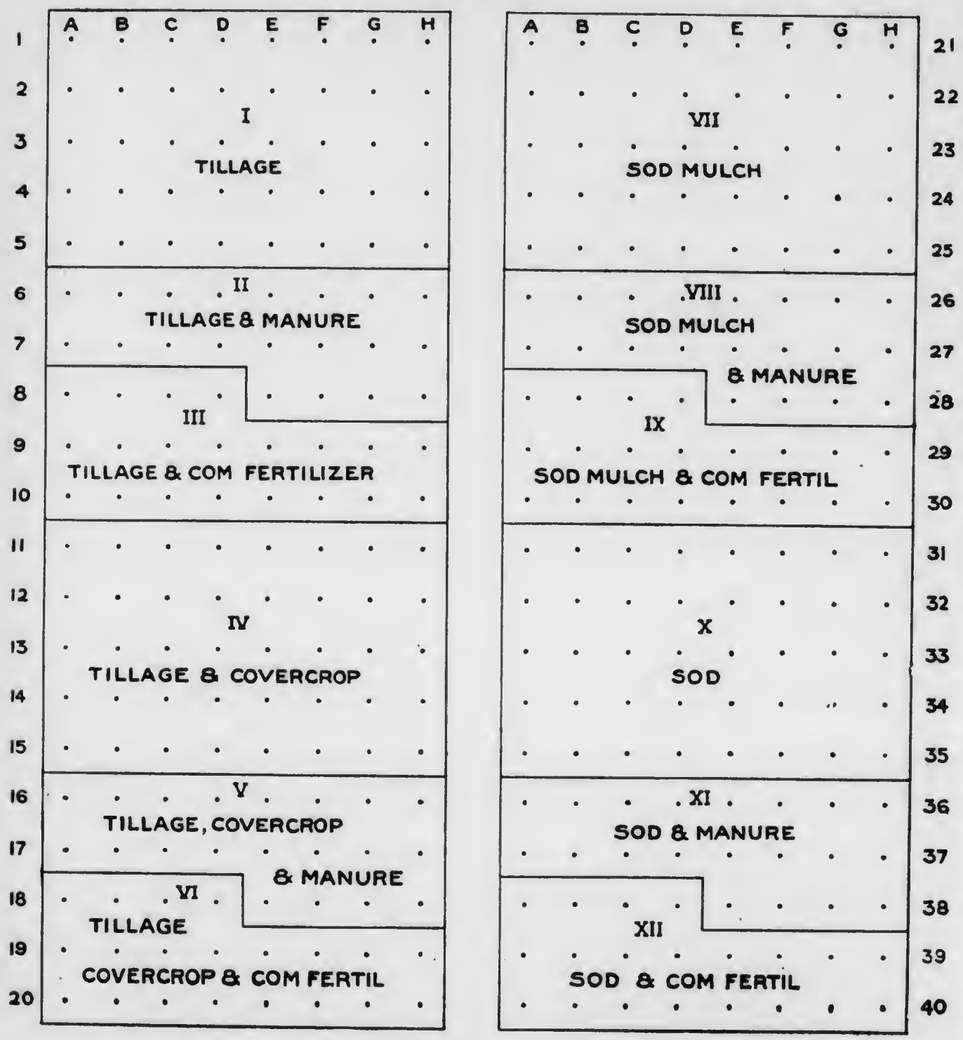
Closely associated with the question of plant-food, is that of soil moisture. It is the available moisture that determines in a large measure whether or not apples shall attain their proper size; and it

is largely to modify moisture supply that the various cultural methods are followed. The plan of our experiments comparing these methods is shown in Figure I.

Plan of Experiment on Cultural Methods and Manures.

As shown in the figure, this experiment tests four methods of soil management, viz.: clean tillage, tillage and cover crop, sod

Figure 2.



mulch, and sod. Each treatment occurs both without fertilization and with it. The stable manure is applied annually at the rate of 12 tons per acre; and the commercial fertilizer at the rate of 30 lb. of nitrogen (N), 60 lb. phosphorus pentoxid (P_2O_5), and 100 lb. of potash (K_2O).

On the mulch plot all herbage remains in the orchard, the first cutting being raked to the trees as a mulch, and an additional mulch

of old straw, swamp hay or buckwheat straw at the rate of about three tons per acre is applied annually. In this latter respect it differs from the so-called "Hitchings plan," and as a conserver of moisture it is undoubtedly very much better than that plan. On the sod plot, the first cutting of herbage is removed from the orchard and the second is left where it falls. The tillage plots are all cultivated until early in July, when those receiving the cover crop are seeded to crimson clover, hairy vetch or medium red clover and alsike, either singly or in combination. The results to date are from the unfertilized plots of the young orchards, and are shown in Table VI. These results and those in later tables on young orchards have been obtained by combining the results from three orchards, whose age as noted in Table I ranges from seven to sixteen years.

TABLE VI.

Effect of Cultural Methods on Yield, Color, Size and Growth, Without Fertilization.

Expts. 217, 218 and 219. Young orchards. (a) Yield.

1907-9.	I. Clean Tillage.	IV. Tillage and Cover Crop.	VII. Sod Mulch.	X. Sod.
Totals, 3 years, ...	15048 lb	16057 lb	17776 lb	13880 lb
Ratios, ...	108.4	115.7	128.1	100.
	100.	106.7	118.1	
		100.	110.7	
1909 (b) Color. Per cent. Apples colored ½ or more.				
Avrage per cent., ...	75.4	81.	81.5	85.6
Ratios, ...	100.	107.4	108.1	113.5
1908-9. (c) Size. Average weight of Apples.				
Average weight, ...	4.5 oz	4.74 oz	4.91 oz	4.69 oz
Ratios, ...	100.	105.3	109.	104.2
		100.	103.6	
1907-9. (d) Growth. Increase in Trunk-girth.				
Average increase, ...	4.38 in	4.14 in	4.29 in	3.58 in
Ratios, ...	122.3	115.6	119.8	100.
		100	103.6	

In these results, the mulch system is first in yield and size of apples, second to sod on color, and second to clean tillage by a slight margin on growth.[1] It has surpassed the cover crop method on every phase and in total ranking is plainly first thus far in the combined results of this group of experiments. Reserving judgment on the relative merits of these systems for the present we will turn to consider the data from a similar experiment in an older orchard,—that of Mr. Fassett, in which the trees are now 37 years old. The results from the unfertilized plots in this orchard are shown in Table VII.

[1]The margin is really slighter than appears in the table, as the 1909 measurements in the mulch plot of experiment 218 were taken a little higher on the trunks than those of 1907, owing to the presence of screens on the trees at the later date.

TABLE VII.

Effect of Cultural Methods on Yield, Color, Size and Growth Without Fertilization.

Expt. 221, Mature Orchard. (a) Yield.

1907-9.	IV. Tillage and Cover Crop.	VII. Sod Mulch.
Totals, 3 years,	34269 lb	23294 lb
Ratios,	147.1	100.
1908-9 (b) Color. Per cent. Apples colored ½ or more.		
Ave. per cent. of color,	57.4 %	87.5 %
Ratios,	100.	152.4
1908-9 (c) Size, average weight of apples.		
Average weight,	4.75 oz	5.04 oz
Ratios,	100.	106.1
1907-9 (d) Growth, Increase in Trunk-girth.		
Average increase,	2.9 in	1.32 in
Ratios,	219.7	100.

From the above results it will be noted that, in the mature orchard, tillage with a cover crop for three years has been far superior to sod mulch in yield and growth, having borne nearly one and a half times as much fruit and showing more than double the increase in growth. In color, the mulched fruit excels by more than 30 per cent.,[1] and in average size of apples it excels by about 6 per cent. This last fact is undoubtedly connected with the smaller crop on the mulched trees.

The results of Tables VI and VII are apparently contradictory. They are all explainable, however, on the bases of soil moisture and age of trees. In the young orchards, with the herbage and three-ton addition of straw, an effective mulch of sufficient extent was maintained, while in the old orchard we were unable thus to cover more than probably half the root area. In the latter case the term *sod* mulch was distinctly appropriate since at least the outer half of the roots was under a typical sod and often in dust-dry condition.

The results in Table VI indicate that, even in trying seasons, such as the last two have been, the moisture in orchard soils may be conserved more effectively by a good mulch than by tillage. This conclusion is corroborated by moisture determinations made by Shutt, of Ottawa, Canada, in 1905 and 1906.[2] He also has found that leguminous plants, particularly those of dense and matted growth like hairy vetch, are much less severe in their drain on soil moisture than the grasses; and that the shade of the growing vetch is a better moisture conserver than the mulch formed by cutting and leaving it in place. In other words, the loss by capillarity and sur-

[1]Really the mulch excels in color by 52.4 per cent, using the amount of color on the cover crop area as a base.
[2]Central Experimental Farm. Report of the Chemist, p. 151, 1906.

face evaporation from the practically bare ground was greater, under the conditions at Ottawa, than the transpiration through the legume.[3]

The cover on our mature orchard is grass only, while on the young orchards a scattering growth of alsike or medium red clover has been maintained in addition.

In further explanation of the difference in effectiveness of the mulch and cover-crop methods in Tables VI and VII, we may call attention to the hastening influence on bearing, which sod undoubtedly exerts under favorable conditions. This was shown in our results of last year,[4] where sod on these same three orchards surpassed clean tillage in yield by 13 per cent. It is also shown here later, especially in the sod-manure plot of Table IX. But the fact that this sod influence can be easily overdone and made to disappear under unfavorable conditions, is clearly shown in our results from the unfertilized sod plots of Table VI.

The next table is introduced to show the effect of adding fertilizers to the four cultural methods. All unfertilized plots are excluded from this table, and the yields given include both the manured and commercially fertilized plots under each method.

TABLE VIII.

Influence of Cultural Method on Yield, With Fertilization.

Expts. 217, 218, 219. Young Orchards.

	2 & 3. Clean Tillage	5 & 6. Tillage and Cover Crop.	8 & 9. Sod Mulch.	11 & 12. Sod.
1908 Yields,	9193 lb	9512 lb	11203 lb	10351 lb
1909 Yields,	14554	12443	12571	12823
Totals,	23747	21955	23774	23174
Ratios,	108.2	100.	108.3	105.6
Expt. 221, Mature Orchard.				
1908 Yields,		6684	10351	
1909 Yields,		28297	22545	
Totals,		34981	32896	
Rations,		106.3	100.	

As compared with Tables VI and VII, these results show a marked leveling effect from addition of fertilizers. In other words, the applications of plant food have tended strongly to reduce or even nullify the differences due to cultural methods. This effect was also very distinct in the appearance of the trees in the field.

A consecutive increase in productiveness following the addition of plant food has been very marked in some cases. For example, the mulched plots of Experiment 221, receiving manure and commercial fertilizer, in 1907 produced 3,050 pounds of fruit; in 1908, as seen in the table, they produced 10,351 pounds; and in 1909, 22,545 pounds. And this occurred on plots receiving no tillage.

[3]Ibid, 1904, p. 158.
[4]Pa. Bul. 91 : 15. 1909.

Fertilization for Different Cultural Methods.

The question often arises as to what is the best form of fertilizer to accompany different cultural methods. This question is partially answered by the data in Table IX.

TABLE IX.

Effect of Manures on Yield.

Expts. 217, 218, 219.

Season 1908-9 (2nd & 3rd Yr.)	Unfertilized.	Stable Manure 12 T. per Acre.	Com. Fertilizer, 30-60-100 Lb. per Acre.
Clean tillage,	13698 lb	21605 lb	23022 lb
Tillage and Cover Crop,	14550	20582	20681
Sod Mulch,	15702	23678	20408
Sod,	11706	24772	17929
Totals,	55656	90637	82040
Ratios,	100	162.8	147.4
		110.5	100.

Expt. 221.

Tillage and Cover Crop,	33119	31924	35502
Sod Mulch,	21091	35396	28370
Totals,	54210	67320	63872
Ratios,	100.	124.3	117.8
		105.4	100.

This table shows the influence of manures[1] on yield when used in connection with different cultural methods. It will be observed that in every case except one, the yields from the fertilized plots have surpassed those from the unfertilized. And in the one exception the yields on the corresponding fertilized plots this past year were more than double the yield on it. In total effect, considering all treatments, the fertilized plots show a nice per cent of increase over the unfertilized; and the stable manure at the rates applied shows a small gain over the commercial.[2]

Examining the data still more closely, we see that in every case on the tilled plots commercial fertilizer has surpassed the manure, while on the untilled plots the reverse is true. In other words, the present data indicates that, from equal values of manure and a proper commercial fertilizer the best results are obtained by using the manure on sod or mulch areas, and reserving the fertilizer for use in connection with tillage. Either material, however, may be used satisfactorily and it is very probable that in any case a more or less regular alternation can be made more successful than any thing else.

[1]The complete commercial fertilizer is here included under the term "manure."

[2]Twelve tons of average stable manure are estimated to contain about 120 pounds each of nitrogen and potash (K_2O), and about 80 pounds of phosphorus pentoxid (P_2O_5). The relative cost per acre, as applied, is about $15 for the manure and $13 for the commercial fertilizer.

TABLE X.

Effect of Manures on Color, Size and Growth.

A. Expts. 217, 218 and 219. (a) Color. Per cent. Apples colored ½ or more.

	Unfertilized.	Stable Manure.	Com. Fertilizer.
Average per cent.,	71.2	61.9	62.4
Per cent. benefit,		—9.3	—8.8

(b) Size. Average weight of apples.

Average weight, ounces,	4.71	4.99	5.25
Ratios,	100.	106.	111.5
		100.	105.2

(c) Growth. Increase in Trunk-girth.

Average Increase, inches,	4.12	4.3	4.43
Ratios,	100.	104.1	107.5
		100.	103.

B. Expt. 221. 1908-9. (a) Color. Per cent. Apples colored ½ or more.

Average, Per cent.,	72.5	68.1	73.5
Per cent. Benefit,		—4.4	1.

(b) Size. Average weight of apples.

Average weight, ounces,	4.89	5.42	5.33
Ratios,	100.	110.8	109.

(c) Growth. Average Increase in Trunk-girth.

Average increase, inches,	4.22	5.86	4.92
Ratios,	100.	139	116.6
		119.1	100.

Table X shows the effect of manures in both young and old orchards on color and size of fruit and on growth of trees. The effects have been fairly distinct in all cases,—reducing the color with one exception, and apparently increasing size of fruit and tree-growth.[1] In all cases, the color is least on the plots receiving stable manure. In the old orchard, manure shows some advantage over commercial fertilizer in wood growth and in size of apples, with effects reversed in the young orchards. The greater effect of commercial fertilizer in the young orchards is probably connected with the smaller area over which it is distributed, thus giving relatively stronger applications.

The above data are obtained from extensive work through a short period. In Table XI, we have data from the reverse conditions,—one experiment continued over 21 years.

[1]We say "apparently" increased the size of fruit, since the matter of size is undoubtedly primarily dependent on soil moisture and number of fruits on the tree. Thus any fertilizer effect must necessarily be indirect, as in the case of color.

TABLE XI.

Massachusetts Experiment on Apples, 1889-1910.[1]

Treatments and Total Yields per A., to Date.

Plot.	1	2	3	4	5
Annual Treatment.	Manure, 10 Tons.	Wood Ashes, 1 Ton.	Check.	Bone & K Cl 600 & 200	Bone & Low G. Sulfate, 600 & 400.
Average Girth, Ratios, - - -	38.25 in. 136.7	33.23 in. 118.8	27.98 in. 100	32.27 in. 115.3	37.02 in. 132.3
Yields, lb., - - Ratios, - - -	24934 632.8	12841 325.9	3940 100	14453 366.8	21863 554.9
Color and Size.	4	1	5	3	2

These results are similar to those recorded in the preceding tables with the differences in some cases even more distinct. In every respect the treated plots have proved superior to the untreated. Manure leads in yield and growth but falls next to the check in quality. It is closely followed in yield and growth and much surpassed in quality by plot 5, which received ground bone and low grade sulphate of potash. The superiority of 5 over 4, which differs only in the carrier of the potash is very interesting. Whether it is due to the magnesia in the sulphate or to a harmful effect of the chlorine accumulating from the muriate, or to a soil difference, cannot yet be stated. It will be recalled that our results of the third year corroborate it, in plots which compare only sulphate and muriate.

The practical point, however, is that with such differences as these existing, even though unexplained, the safer policy is to apply potash in the sulphate form. The difference in cost is small, and if so desired it can be readily met by a reduction in the amount of potash applied. This would be justified by our present results, which indicate that the usual recommendations of this material for orchard use may be reduced to advantage.

Summary and Practical Suggestions.

From a general view of the results as a whole, we see that there is more than one way of securing good results in orcharding. In other words, there is more than one way of varying the limiters after they are found. For example, we can conserve moisture either with tillage or mulch, or we may secure apparently the same net results by proper fertilization. This gives opportunity for choice and permits the grower within certain bounds to determine his course on the bases of relative expense and practicability.

[1]Data furnished by Dir. Wm. P. Brooks, of the Mass. Expt. Sta., December, 1909.

In most cases and especially in bearing orchards, this choice will result in tillage, either every year or one year in every two or three. The tillage will be supplemented by leguminous or other proper crops, and will receive additions of plant food when needed. But the relative cost of labor, mulching material, and manures, varies with the locality. And where labor is scarce or costly, or the land too sloping or stony for tillage, the grower need not lose heart. But with a good mulch properly supplemented with plant food, he may grow apples equal to the best,—apples in many cases more satisfactory than those of the man who depends entirely on tillage.

When we come to the application of fertilizers, the best test for their need is in actual trial or experiment. The appearance of the trees after all other factors are apparently right, may afford some evidence, as may also soil analyses. But the only sure evidence comes from careful trials, remembering that fertilizers can have little if any effect on the current year's crop.

Pending actual results, if it is desired to use fertilizer, our present general advice is to apply one carrying about 30 lb. nitrogen, 60 lb. phosphorus pentoxid (P_2O_5), and about 50 lb. potash (K_2O) per acre.[1] This should be accompanied by green cover crops or alternated with stable manure, ten tons per acre, at least once in three or four years.

The time of application is important. For soluble and transient materials like nitrate of soda, the best time is when the need is greatest, which is probably immediately after the supply of stored food is exhausted, or some time after petal-fall and before the first of July. The other more permanent material may be applied at the same time, or like stable manure they may be applied in early spring or in late winter.

For either temporary or permanent covers, leguminous plants are best both because of their nitrogen product and their lessened drain on soil moisture, especially the matted and dense growing kinds, such as hairy vetch.

Mr. Roberts.—Is that Massachusetts experiment with a low grade sulphate?

Prof. Stewart.—It is with kainit; it is between low grade and high grade. It has not a large amount of muriate or chlorate.

Prof. Surface.—Was it two hundred or two hundred and fifty pounds ground bone?

Prof. Stewart.—Two hundred and fifty. It will take that to give you sixty pounds of phosphoric acid. As the trees advanced, I cut it down.

[1]Such amounts could be obtained by mixing either of the following combinations of high grade materials. (A) 100 pounds each of nitrate of soda, dried blood, and sulphate or muriate of potash (former safer); and 250 lbs. steamed bone meal. (B) 100 pounds each of nitrate of soda and sulphate or muriate of potash; 120 pounds dried blood, and 400 pounds acid phosphate.

The President.—At the sugestion of Dr. Hunt, a committee consisting of our Secretary and Mr. Fassett visited these orchards during the last fall, and we would like to have a report from these gentlemen. Mr. C. J. Tyson will please report.

The Secretary.—As most of you are aware, Dr. Hunt came to State College a little over three years ago from Cornell, where he held a professorship in Agronomy, with no special knowledge of, or perhaps interest in, the subject of horticulture. He is a very broad-minded man, however, and soon realized the importance of horticulture in Pennsylvania, and saw what was being done in this State along that line. He had had no opportunity to become acquainted with our requirements, so he came to this Association three years ago this winter, and asked that we designate the course of work that would be most beneficial to us as fruit growers, and requested an outline of some work that the Experiment Station could do for us. The matter at that time was taken up by the apple growers, and the work Prof. Stewart has been carrying on since that time was outlined then. Prof. Stewart has been telling you some of the results this evening. He made a preliminary inspection trip late in the summer. Some marked results were beginning to show. He then went back to State College (I am guessing at some of this) and made a report to Dr. Hunt. Dr. Hunt realized that when some of the things Prof. Stewart had told him, were brought before the Association, they were so unusual that there might be some doubt in the minds of the members. He decided it would be well to have some corroboration, and this committee was appointed to visit a few of the experimental orchards.

We visited three of the orchard experiments, namely those located with Mr. J. B. Johnston, of Lawrence County, Mr. F. H. Fassett, of Wyoming County, and the S. B. Brown Estate, in Bedford County. We made a report of our observations to Dr. Hunt, giving the details of what we saw in each place. There is no need for us to go into these details at this time. I simply wish to say that the things we saw corroborate the things which Prof. Stewart's figures indicate, but figures and words fail to give a clear idea of the striking differences we found between treated and untreated plots.

Much to our surprise, in all cases the application of nitrogen showed decided benefit in the matter of fruit production and the quality of fruit produced, to say nothing of the advantage we expected to find in the greatly improved foliage.

The past treatment of the soil in the fertilizer experiments has not been such as to store up either vegetable matter or fertilizers in any form. From the experimental point of view, however, this has been an advantage, approaching as nearly as possible to ideal conditions. To my mind, just here lies the difference between the results of this experiment and the results of some other similar experiments tried on soil which was already plentifully supplied with nitrogen, and which was kept supplied through the life of the experiment by leguminous cover crops, which were not considered.

We were not able to see any advantage from lime in any of the experiments.

In the report made to Dr. Hunt, I think both of us very earnestly recommended that this work be continued. We feel that this work is along the right lines, and of great importance to the horticultural interests of the State.

The President.—Mr. Fassett, have you anything to add?

Mr. Fassett.—Nothing, except to emphasize what has been said by Prof. Stewart and Mr. Tyson. These things are a revelation to us—this nitrogen in the growing of apples. It is all so new to us, because we have been applying potash to our trees, and these experiments have been conducted on the same varieties of apples we have been growing for years back. It was certainly a high compliment to us to be able to go to see the fruit growers of Pennsylvania, and I think we are exceedingly fortunate in having a man like Dr. Hunt at the head of our Experiment Station, and I hope that these experiments will be carried on for the next ten years under the wise management of the present time.

The President.—I think it would be well for our Committee on Resolutions to commend the work of the Experiment Station in these fertilizer experiments and we trust it will be continued.

A Member.—Is this nitrogen applied to pear orchards, too?

The President.—The experiments have been entirely on the apple. Dr. Hunt's idea was to commence with one thing, and do that well. That is why it was said this afternoon that there would be, in all probability, another man put on this work, and, after a while, a third. In the course of the next few years we will have the whole Experiment Station working for us.

The President.—Any further business? If not, we will stand adjourned until nine o'clock to-morrow morning.

Adjourned.

THURSDAY, JANUARY 13, 1910. 9 A. M.

President Hiester in the Chair.

The President.—Is the Auditing Committee ready to report?

Mr. Fenstermaker.—Mr. President and friends of the Association: We would report that we have examined the accounts and found them correct. We would, however, recommend a change in the manner of keeping the accounts, without, however, reflecting in any way on the Secretary or Treasurer, both of whom we believe to be honest men; we make the recommendation simply to make the work easier. We recommend that all monies received and paid out be handed to the Treasurer. With a proper voucher and check sys-

tem, it will be an easy matter to audit, and also make it easier to keep the accounts.

The President.—What shall be done with this report?

Mr. Eldon.—I move that this report be accepted and the committee discharged.

This motion was properly seconded and carried.

The President.—We have with us Mr. Gould of the Department at Washington. We are very glad to have him with us. I have been a member of this Association for forty years, and do not remember that we have ever had the pleasure of having him with us before. He will talk to us this morning on "Apple Varieties: Old Ones that Are Good, and New Ones that Seem Promising," and the Secretary suggests, on anything else that he has to say to us on this matter of fruit growing. I have the pleasure of introducing Prof. Gould.

APPLE VARIETIES: OLD ONES THAT ARE GOOD AND NEW ONES THAT SEEM PROMISING.

By H. P. Gould, *U. S. Department of Agriculture, Washington, D. C.*

Mr. President and Members of the Pennsylvania State Horticultural Association: It is not without some feeling of embarrassment that I come before you at this time to talk about apple varieties. You have your own variety experts like Dr. Funk, your worthy President, Mr. Hiester and others, beside of whom I feel like a pigmy from the variety standpoint. Furthermore, the great number of varieties which are grown in your state that are doubtless of value and concerning which but very little is known, serves still more to complicate matters. If I am able to say anything that will interest you along the line of my subject,—which by the way was chosen for me—it will be because of the somewhat wide range of conditions under which I have been able to study some of the varieties that I shall mention. If later on, I am permitted to introduce to you some strangers among varieties which give promise of meriting your intimate acquaintance, it will be a pleasure to do so.

The problem of varieties is an old problem and it is a great one. I fancy it will always remain a great one. As long as there are varying conditions under which fruit is grown and as long as there are different tastes to suit and different purposes for which it is desired, the problem will continue to be an unsettled one.

When, in retrospection, we consider the varieties of apples that have contributed to our pomological history, and contrast them with the varieties that we think of to-day as new sorts, we cannot help asking the questions "What real advancement has been made from the variety standpoint?" and "Whither are we bound in the line of varietal progress?"

Surely that apple must have been an enticing thing, which in the Garden of Eden, caused the trouble that has ever since been the heritage of the human race. We would like to know the variety. The good people down in Albemarle County, Virginia, are quite sure it was Yellow Newtown (Albemarle Pippin). And the apples which in ancient days could comfort Solomon in all his wisdom and glory when he was sick of love, and for which he sighed, must indeed have been better eating than Ben Davis—our most abundant market variety.

Before taking up the matter of varieties, I must say a few words about the factors that influence the behavior of varieties as we see them growing in different places.

BUSHEL HAMPERS
A Package much used in Shipping Summer Apples

We often speak of a variety as if it were fixed and invariable, when in reality a variety is largely the product of the conditions under which it is grown—that is, its environment. And as environment is changed, so is the variety changed—sometimes beyond the point of recognition even by the best experts.

In order to give greater significance to what I may say about varieties, I want to mention somewhat briefly the more important factors that make up the environment under ordinary conditions of orchard culture. To say that a variety is good or otherwise in a

tem, it will be an easy matter to audit, and also make it easier to keep the accounts.

The President.—What shall be done with this report?

Mr. Eldon.—I move that this report be accepted and the committee discharged.

This motion was properly seconded and carried.

The President.—We have with us Mr. Gould of the Department at Washington. We are very glad to have him with us. I have been a member of this Association for forty years, and do not remember that we have ever had the pleasure of having him with us before. He will talk to us this morning on "Apple Varieties: Old Ones that Are Good, and New Ones that Seem Promising," and the Secretary suggests, on anything else that he has to say to us on this matter of fruit growing. I have the pleasure of introducing Prof. Gould.

APPLE VARIETIES: OLD ONES THAT ARE GOOD AND NEW ONES THAT SEEM PROMISING.

By H. P. Gould, *U. S. Department of Agriculture, Washington, D. C.*

Mr. President and Members of the Pennsylvania State Horticultural Association: It is not without some feeling of embarrassment that I come before you at this time to talk about apple varieties. You have your own variety experts like Dr. Funk, your worthy President, Mr. Hiester and others, beside of whom I feel like a pigmy from the variety standpoint. Furthermore, the great number of varieties which are grown in your state that are doubtless of value and concerning which but very little is known, serves still more to complicate matters. If I am able to say anything that will interest you along the line of my subject,—which by the way was chosen for me—it will be because of the somewhat wide range of conditions under which I have been able to study some of the varieties that I shall mention. If later on, I am permitted to introduce to you some strangers among varieties which give promise of meriting your intimate acquaintance, it will be a pleasure to do so.

The problem of varieties is an old problem and it is a great one. I fancy it will always remain a great one. As long as there are varying conditions under which fruit is grown and as long as there are different tastes to suit and different purposes for which it is desired, the problem will continue to be an unsettled one.

When, in retrospection, we consider the varieties of apples that have contributed to our pomological history, and contrast them with the varieties that we think of to-day as new sorts, we cannot help asking the questions "What real advancement has been made from the variety standpoint?" and "Whither are we bound in the line of varietal progress?"

Surely that apple must have been an enticing thing, which in the Garden of Eden, caused the trouble that has ever since been the heritage of the human race. We would like to know the variety. The good people down in Albemarle County, Virginia, are quite sure it was Yellow Newtown (Albemarle Pippin). And the apples which in ancient days could comfort Solomon in all his wisdom and glory when he was sick of love, and for which he sighed, must indeed have been better eating than Ben Davis—our most abundant market variety.

Before taking up the matter of varieties, I must say a few words about the factors that influence the behavior of varieties as we see them growing in different places.

BUSHEL HAMPERS
A Package much used in Shipping Summer Apples

We often speak of a variety as if it were fixed and invariable, when in reality a variety is largely the product of the conditions under which it is grown—that is, its environment. And as environment is changed, so is the variety changed—sometimes beyond the point of recognition even by the best experts.

In order to give greater significance to what I may say about varieties, I want to mention somewhat briefly the more important factors that make up the environment under ordinary conditions of orchard culture. To say that a variety is good or otherwise in a

particular place means but very little fundamentally, except as such statements are interpreted in terms of environment.

This is not the connection in which to discuss in detail even if I could do it, the conditions that prevail in the different sections of your State but reference to the factors of influence should assist in making the necessary applications in each individual case.

In a rough analysis of environment, the factors of influence fall into two groups—climate and soil. Cultural conditions constitute a most important factor in the case but this is so primarily, because of their relation to and effect upon the soil factor of environment.

Though the climate may effect the roots of our trees, its greatest influence, generally speaking, is on the part above ground. The soil on the other hand is not without its influence on the top, but as generally considered it determines the environment of the roots.

Going still further in reference to the climate, we may say that the climate of any place consists of:

1. Atmospheric pressure.
2. Temperature.
3. Rainfall and snowfall.
4. Time and frequency of frosts.
5. Extremes of heat and cold.
6. Direction and velocity of the wind.
7. Amount of air that flows from the different points of the compass.
8. Amount and intensity of sunshine.
9. Humidity and transparency of the atmosphere.
10. Electrification of the atmosphere.

Without entering upon any discussion of these elements of climate in their relation to fruit growing, the enumeration of them serves to indicate that the climatic influences are exceedingly complex. I feel reasonably certain that a better understanding of them would explain many things that are now seemingly past our comprehension.

The soil factors are also complex in their relationship to fruit growing but, personally, I am much inclined to attach less importance than some do, to the extreme distinctions that are sometimes made regarding soil types and soil influences in relation to fruit growing. In fact, some of the factors that are commonly grouped with soil influences and which are exceedingly important, do not belong with the soil factors at all when rightly considered. For instance, we say a soil is too wet for a fruit soil. We commonly think of this as a soil characteristic and from one standpoint perhaps it is. It is true that soils which differ in their physical condition may and do also differ with regard to their moisture or water content. But generally speaking in the case of a soil that is too wet for fruit growing it is a matter of location or a matter of drainage—not a matter of soil, per se, at all.

Again the amount of humus in a soil will greatly modify its physical condition and consequently its suitability for fruit growing. But the humus content of soils is very largely a matter of soil management and is not characteristic of one type of soil more than another, except perhaps as conditions of location and past history are such as to produce what is commonly called "muck" or some other type that is composed almost entirely of decaying vegetable matter rather than being made up largely of decomposed rock or other inorganic substances.

Do not misunderstand my position with regard to the importance of soil conditions. I would not minimize the importance of the soil factor in the least. But I would emphasize the relative importance of climatic and cultural conditions. As to the latter, you all know very well how strikingly good cultivation, pruning, fertilizing, spraying, etc., affect the behavior of varieties in contrast to conditions of neglect. But these operations are not factors of environments. Rather they modify or control environments. I need not spend any time on this point.

A word more, however, about the climate is in order. The elements of climate have already been enumerated. These elements as they prevail in any place are modified by several factors that we often overlook. Among them there are:

(a) Topography, both local and continental.
(b) Proximity to large bodies of water.
(c) The latitude of the place.
(d) Its elevation, both actual and relative.

We all know the desirability of a relatively high location for fruit growing. But perhaps it does not often occur to us that a high location is preferable because of the influence of elevation on local climatic conditions.

Just one more word about the soil in order to say that the soil features which I believe is inherently the most important, is one that is commonly very largely overlooked. I refer to the subsoil. In speaking of the condition of the soil, we ordinarily refer to the few inches that the plow turns over and do not go much deeper in our consideration of it. I believe that the condition of the soil or rather the subsoil, three feet or five feet and perhaps even at a greater depth is vastly more important in its relation to fruit growing than the usual surface conditions and the upper subsoil possibly that we are accustomed to talk about and to consider. I feel confident that many of the apparent mysteries that we very often find in fruit growing have their explanation buried in the soil much deeper than our considerations usually take us.

With these cursory remarks about some of the factors that affect the behavior of fruit varieties and determine their adaptability to particular conditions, I turn to the real subject of my paper. It should be remembered, however, that Pennsylvania is a large State and represents a wide range of all the conditions that influence the behavior of varieties. Very few varieties are equally valuable throughout the State. The northern part of the State is in what is sometimes called the Baldwin-Greening-King belt, while the southern part, especially the southeastern portion is in the Ben Davis-York Imperial-Winesap belt.

Old Varieties That Are Good.

Of course in this consideration, we must include the varieties just named, though by the exact terms of my subject, I have no real right to refer to Ben Davis. It is an *old* variety to be sure, but not a *good* one. I know there are many who say that it is their best money-maker. But will you be offended at my frankness if I say that such a claim comes very near being a self-incrimination. Perhaps this variety *does withstand* the conditions of neglect that prevail in some orchards better than many varieties do. Is that why it is relatively the most profitable sort? Sometimes this is undoubtedly the case.

But the situation with regard to Ben Davis is simply this: A brand of any commodity in general use, it matters not what it is, that is of poor quality in comparison with other brands, and is put on the market in large quantity, is a detriment to the trade in that commodity and restricts its use. Ben Davis corresponds to a brand of goods of poor quality that is put on the market in large quantity. I firmly believe it restricts the consumption of apples. The great trouble with whiskey is that it *creates a taste for more*. If it wasn't for this fact there would be no whiskey and no temperance problem. Ben Davis apples *never in the world created a taste* for more apples. On the other hand, when a consumer to whom the name of a variety means nothing—and this is true of the mass of people who are supplied by the retail trade—gets a half-peck or peck of nice looking Ben Davis apples and attempts to eat them, he concludes forthwith that he doesn't care much for apples. And who can blame him? His appetite for apples is satisfied and it's a long time before he orders more. But when a supply of really choice apples is obtained the tendency is for it to be renewed as soon as it is exhausted. In other words, a *taste for more is created* and the consumption of apples is increased thereby. The demand for them is increased likewise. And you come right back to that old law of supply and demand as a price regulator.

In this line of argument I am sure my logic is sound and I do not believe my conclusion can be successfully contested. If this be true, then every barrel of Ben Davis apples that goes into the retail trade is a detriment to the trade because of its influence on the demand for increased supplies of fruit. I speak of Ben Davis as if this was the only offender. It is the chief one because of the relatively large quantities of it that go into the trade but all varieties of poor quality are guilty of the same charge of which I accuse Ben Davis.

Some very discriminating varietal critics say that Baldwin barely escapes this charge and with all due respect to the prejudice which loyal Pennsylvania fruit growers may have in favor of York Imperial because of its place of origin, that variety isn't any too good in quality.

Having now cleared the varietal atmosphere in this way, I can proceed with my subject. Reference to other varieties is made about in the order in which they ripen.

Yellow Transparent.—For a very early sort this has few if any equals. It is grown throughout a remarkably wide range of country, and there are few sorts that are so well adapted to so many different conditions as this one. Its season in this State is probably from the first to the middle of July, depending upon the location. While the tree has some faults, they are not as a rule serious. It bears very young and is sometimes used as a filler. It was formerly considered too tender fleshed for a market variety but experience has demonstrated that when properly handled it is very valuable for commercial purposes.

YELLOW TRANSPARENT

One of the best of Early Summer Apples. Note the heavy load of fruit.

Early Ripe.—This variety closely follows Yellow Transparent and in the early apple growing section of Delaware, it is considered one of the most valuable sorts.

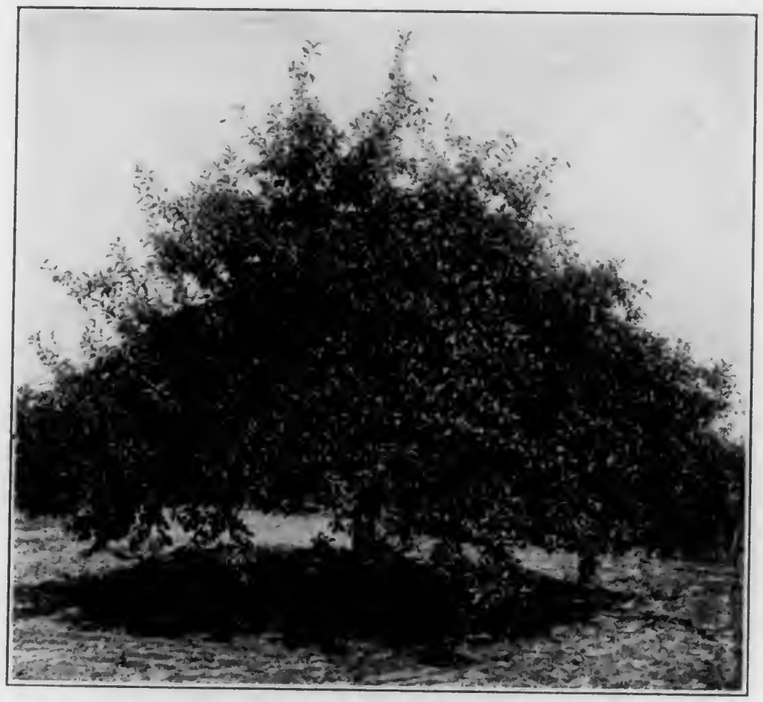
Red Astrachan.—This is another variety that is very widely grown and generally with fair satisfaction. It has some faults and would probably be discarded if there was a good red variety of its season to substitute for it.

Williams. Williams Favorite, Williams Early Red.*—This is a most excellent variety to follow Red Astrachan. In central Delaware its season begins from July 15th to 20th. It is of good size,

*Yearbook U. S. Dept. of Agr. 1908, p. 476.

beautiful in appearance and of fairly good quality. It does well under a wide range of conditions and would probably be valuable for its season in many sections of this State both for market and home use. Some confusion exists in Delaware and New Jersey regarding this variety. Sops-of-Wine, a variety much inferior to it, has in some cases been planted for it under the synonyn, *Williams Early Red.*

Early Cooper.—This is another early variety of much value in some regions. It is frequently found in the orchards of Oklahoma and Kansas as well as in other states. Its importance in some sections of the Middle West together with its good quality, suggests its possible value in some parts of this State.



WILLIAMS' EARLY RED
A very satisfactory Red Apple for early summer

Maiden Blush.—This is a standard for its season which follows Williams in good sequence. In most parts of this State it probably ripens during August. It is widely and extensively grown in many parts of the country.

Gravenstein.—This is a good running mate for Maiden Blush. Possibly it is more easily influenced by its environment than that variety is but where it does well, it is of better dessert quality, and an excellent variety for culinary purposes.

Wealthy.—This is a variety of growing importance. It is of good quality and fine appearance; not over-sensitive to the influence

of conditions, it can be made to fill a place in season and otherwise that is not filled by many other sorts.

* * * * *

There are many other early varieties of much merit which would doubtless prove valuable in some parts of this State, both for home use and for market but time permits reference to them only by name. Some that I would especially mention are: Benoni, Jefferis, Early Joe, Oldenburg, Chenango, Fanny, Red June, Primate and Starr the latter an early apple of growing importance in New Jersey and elsewhere. Other varieties might be named which would perhaps be equally valuable as the above but the list cannot be extended indefinitely.

Passing to the mid-season or fall varieties, there are fewer candidates for favor.

Bonum.—I do not know what this variety would do as far north as this State. In the Piedmont region of Virginia it is a most excellent variety. Highly colored, medium size and of excellent dessert quality. It is a very satisfactory variety in that region for a September trade. For a personal market, a hotel or some other special trade it could not fail to be a "reputation maker." Perhaps it would not be as valuable as far north as Pennsylvania as it is in Virginia.

Mother.—This is an apple of exquisite dessert quality and ought to be planted for home use much more commonly than it is. The tree is rather small but of moderate growth. Probably it is improved by top working on a stronger growing tree such as Northern Spy. I am told it is doing well in Harford County, Maryland. Its high dessert quality commends it for very thorough trial.

Celestia.—While this is an old variety, it is not much grown. Perhaps it is better known in Ohio and some other parts of the Middle West than elsewhere. Its color which is rather greenish and not altogether attractive is against it but its quality is such as to commend it very highly to many growers. For a fall variety, it is worthy of consideration in this State, at least for home orchards.

Smokehouse.—This old variety does credit to your State in which it originated. It is not being grown as extensively as its merits justify, though it is found in many sections from here south to Virginia and occasionally elsewhere. Possibly it does not come into bearing quite as early as some sorts but it is worth waiting for.

Grimes. Grimes Golden.—It is doubtful if this variety would be as valuable in the northern as in the southern part of the State, but in the latter portion it would probably do well. And as an apple of high dessert quality, it has few superiors. Some markets do not take a yellow apple as readily as a red one, so this is perhaps not as widely grown as it would otherwise be. When well-grown, it could hardly fail to prove satisfactory during the fall and early winter for a personal market where the grower comes in direct contact with the consumer. It is generally considered a short-lived tree. Probably the most satisfactory way to grow it is to top-work on some strong growing sort.

Jonathan.—This is a most excellent red "running mate" for Grimes and it is much grown in some of the regions where Grimes

is extensively planted. It probably does not have as wide a range of adaptability as that variety has and might not be generally desirable in this State, yet is worthy of careful consideration. In quality it compares favorably with Grimes and is about the same in season. Its value as a storage apple is not generally recognized. At the Louisiana Purchase Exposition at St. Louis in 1904, cold storage specimens of this variety of the crop of 1903 were displayed in the Missouri exhibit in August of the Exposition year, which were apparently in as perfect condition and as good in quality and flavor as when they were stored.

Only a small number of the longer keeping varieties will be mentioned. I would call attention to the following:

White Pippin.—If this were a red apple it would doubtless be a leading candidate for popular favor. I have recently seen most excellent specimens of it from Maine, from New Jersey and from Missouri. It is apparently doing well in all of these widely separated regions. It is better in quality than most of the more common commercial sorts. The tree is vigorous, fairly productive and by many it is considered a profitable sort. It is a fairly good keeper. Occasionally it is mistaken for Yellow Newtown.

Esopus. Esopus Spitzenburg.—This is one of the varieties that has helped to make Hood River famous. It is grown some in New York and several times I have seen very fine specimens of it from Virginia. While not considered a particularly heavy bearer and more or less subject to scab, its very high dessert quality and its beautiful appearance commend it wherever it can be successfully grown. It is worthy of a thorough trying out in this State. There may be sections here where by good cultural methods it could be made very profitable.

Rome Beauty.—This variety belongs in the Ben Davis-York Imperial-Winesap belt rather than in Baldwin country. It is very popular in some parts of Ohio and it is a candidate for favor in Virginia, though not yet much grown. Delaware produces some grand fruit of this sort; it is also grown some in the northwest, and on the Pacific Coast. While not of the highest quality, it is fairly good. Frequently said to do especially well on sandy soil.

Dickey.—This is another old variety from Ohio that is but very little known. It is of medium size, fairly good color, a good keeper and in dessert quality it is considered by some to be entitled to a higher rating than almost anything in the apple line that ever existed. It originated in Ohio many years ago, but like so many other old varieties of merit, it has never had a sponsor who could talk about it enough to win public favor and general recognition for it.

To stop here with the winter sorts in which you are doubtless all more interested than you are in the earlier varieties, is not to do justice to the long keeping varieties, but time forbids further consideration of them. Besides it would weary you too much. I merely mention by name a few other sorts which because of their high quality or their merit in other particulars should be given consideration as of possible value to Pennsylvania fruit growers. A few such varieties are: Roxbury, Hubbardston, Tolman (Tolman Sweet) Swaar, Westfield, Evening Party, perhaps Winesap in some

DELICIOUS APPLE.

THE SACKETT & WILHELMS CO. N Y

localities and I would add Arkansas if it was not generally such a shy bearer, and so on—almost ad infinitum. Not all of these would be desirable, commercially, but I consider them all varieties of merit for one purpose or another, and worthy of consideration by fruit growers in this State.

New Sorts That Seem Promising.

Turning now to some of the newer varieties, I must mention them with only a few comments. In passing I might say that it is difficult in this connection to make any very formal distinction between a variety of merit that has been recently introduced and an old sort of apparent value that has remained in obscurity all its days.

Wilson June.—This variety, though originating in northwest Arkansas 40 or 50 years ago, remained unknown outside of that section until a few years ago when it was propagated by one of the well-known nursery firms of the Middle West and by them extensively advertised. The statement in the catalogue of this nursery company, however, that it is identical with San Jacinto and Mrs. Bryan is surely erroneous. It is a rather rich, sweet or nearly sweet apple of the Red June type in external characteristics, considerably larger, perhaps not quite as early, but of good quality and very attractive in appearance. Worthy of testing generally as an early sweet sort.

Summer Champion.—This is another early sort from northwest Arkansas that early apple growers should keep in mind for trial as it appears to be promising, though but little known.

Florence.—This is likewise a northwest Arkansas variety. I know of but one commercial orchard of it. It is about the same in season as Jonathan. It is a beautiful red apple of fairly good quality but not as choice as Jonathan. The tree, however, is a strong, vigorous grower and does not possess the weakness that Jonathan often shows. So far as I know it is not in cultivation outside the region of its origin. Worthy of being thoroughly tested.

*Magnate.**—This is a seedling that was grown by the late Dr. Stayman of Leavenworth, Kansas, who also produced Stayman Winesap. It is attracting some attention. It is a beautifully colored apple, medium to large in size, about 10 days earlier in season than the Jonathan, though it is said to keep till December. In dessert quality it is rated as very good. It is supposed to be a Winesap seedling and is considered promising in Winesap growing territory.

Rabun.†—This is a chance seedling that was found in northern Georgia about 1890. The fruit is large, beautifully colored, washed with mixed red, splashed and striped with bright crimson. Subacid, good to very good in quality. In northern Georgia, season is November to March. How this variety would behave in Pennsylvania is a question, but worth finding out.

Stayman Winesap.‡—Perhaps this variety has now been known to fruit growers too long to group it with new varieties, still I do

*Yearbook U. S. Department of Agriculture, 1906, p. 355.
†Yearbook U. S. Dept. of Agr., 1906, p. 359.
‡Yearbook U. S. Dept. of Agr., 1902, p. 470.

D.G. Passmore

DELICIOUS APPLE.

THE SACHETT & WILHELMY CO. N.Y.

localities and I would add Arkansas if it was not generally such a shy bearer, and so on—almost ad infinitum. Not all of these would be desirable, commercially, but I consider them all varieties of merit for one purpose or another, and worthy of consideration by fruit growers in this State.

New Sorts That Seem Promising.

Turning now to some of the newer varieties, I must mention them with only a few comments. In passing I might say that it is difficult in this connection to make any very formal distinction between a variety of merit that has been recently introduced and an old sort of apparent value that has remained in obscurity all its days.

Wilson June.—This variety, though originating in northwest Arkansas 40 or 50 years ago, remained unknown outside of that section until a few years ago when it was propagated by one of the well-known nursery firms of the Middle West and by them extensively advertised. The statement in the catalogue of this nursery company, however, that it is identical with San Jacinto and Mrs. Bryan is surely erroneous. It is a rather rich, sweet or nearly sweet apple of the Red June type in external characteristics, considerably larger, perhaps not quite as early, but of good quality and very attractive in appearance. Worthy of testing generally as an early sweet sort.

Summer Champion.—This is another early sort from northwest Arkansas that early apple growers should keep in mind for trial as it appears to be promising, though but little known.

Florence.—This is likewise a northwest Arkansas variety. I know of but one commercial orchard of it. It is about the same in season as Jonathan. It is a beautiful red apple of fairly good quality but not as choice as Jonathan. The tree, however, is a strong, vigorous grower and does not possess the weakness that Jonathan often shows. So far as I know it is not in cultivation outside the region of its origin. Worthy of being thoroughly tested.

*Magnate.**—This is a seedling that was grown by the late Dr. Stayman of Leavenworth, Kansas, who also produced Stayman Winesap. It is attracting some attention. It is a beautifully colored apple, medium to large in size, about 10 days earlier in season than the Jonathan, though it is said to keep till December. In dessert quality it is rated as very good. It is supposed to be a Winesap seedling and is considered promising in Winesap growing territory.

Rabun.†—This is a chance seedling that was found in northern Georgia about 1890. The fruit is large, beautifully colored, washed with mixed red, splashed and striped with bright crimson. Subacid, good to very good in quality. In northern Georgia, season is November to March. How this variety would behave in Pennsylvania is a question, but worth finding out.

Stayman Winesap.‡—Perhaps this variety has now been known to fruit growers too long to group it with new varieties, still I do

*Yearbook U. S. Department of Agriculture, 1906, p. 355.
†Yearbook U. S. Dept. of Agr., 1906, p. 359.
‡Yearbook U. S. Dept. of Agr., 1902, p. 470.

not believe it is as generally known to fruit growers in middle latitudes as it should be. The tree is a fine grower, and a good bearer and the fruit possesses every quality to make it valuable both for market and home use. While the fruit often lacks color on young trees, this difficulty disappears as a rule as the trees attain a little age. I consider it to be one of the most valuable varieties for middle latitudes of recent introduction and look upon it as one of the sorts most likely to put Ben Davis "on the run."

*Delicious.**—This variety has been too much advertised during the past few years to call for extended comment at this time. It is of too recent introduction, however, for much actual information to be available at the present time relative to its range of adaptability but so far, indications point to its being adapted over a wide range of territory. It is of sufficient promise to warrant a thorough test of it throughout middle latitudes and well into the north. It may join honors with Stayman Winesap in routing Ben Davis and its allies.

King David.—In general the comments about Delicious apply to this variety. In season it is about the same as Jonathan and it admits of comparison with that sort perhaps better than with any other one.

Ensee.†—This is a chance seedling which originated in southern Ohio about 1880, but it is only slightly known outside the region of its origin. It is a productive, regular bearer. Fruit of large size, surface washed with mixed red, splashed and brokenly striped with bright crimson. It is an apple of fine appearance, rich, sub-acid flavor, and very good in quality. In southern Ohio its season is late fall and early winter, keeping well in storage.

Carson.‡—While this is really an old variety, it remains practically unknown to most fruit growers. It is another Ohio variety originating in the northern part of that State. It appears to have a rather unusual record for productiveness and regularity of bearing. It is a beautiful apple of good size and rated "very good" in quality. It keeps until March in northern Ohio. It would appear to be a promising variety for testing especially in the northern part of this State.

Bloomfield.§—This variety first came to notice as a chance seedling in Montgomery County, Maryland. It has been slightly disseminated in Maryland and Virginia but is generally unknown. It is a large smooth apple, yellowish, washed with crimson and striped with darker red. The flesh is tender and juicy, rich sub-acid, good to very good in quality. Its season in the region of its origin is September to November. Its good appearance and high quality together with its other desirable characteristics recommend it for trial in this State.

Some other varieties that are either new or but slightly known and which might be of value to the apple industry of Pennsylvania

*Yearbook U. S. Dept. of Agr., 1907, p. 305.
†Yearbook U. S. Dept. of Agr., 1907, p. 307.
‡Yearbook U. S. Dept. of Agr., 1905, p. 497.
§Yearbook U. S. Dept. of Agr., 1904, p. 399.

are Coffman, Ingram (a), Doctor (b), Virginia Beauty (c), and Bennett (d). Many others might be mentioned but these are the "cream of the lot" that have come to my attention. There are also many unnamed seedlings of excellent quality that have received more or less notice and which appear to possess a good deal of merit.

Now I have mentioned just a few of the many old varieties that are good and a number of new ones that are promising. Perhaps many of you have in your minds the names of varieties of great value and have been wondering if they would be mentioned in the present connection. Perhaps some of you are saying to yourselves: "How could anybody fail to name this variety or that one?"—some sort which you know possesses particular merit. And you possibly are a bit disappointed because of the omission. I have only to say that this is by no means intended as a complete list of good or promising varieties for your State. I have merely attempted to call to your attention a few varieties which I believe to be of better quality than the bulk of the apples that are marketed and which are valuable in other respects either for commercial purposes or home use, and if as a result of this discussion of varieties, there is developed a desire even on the part of a single individual to test some of these little known sorts of high quality, and that desire is not satisfied until the testing is undertaken, I shall feel as if I had sown a grain of mustard seed which may sometime grow into a good sized tree. I wish every State Horticultural Society in the country could maintain trial orchards in representative sections of the several states for the purpose of testing a large number of varieties of different fruits which are likely to prove valuable in those sections. Within the lifetime of a generation the variety lists would be very greatly changed and improved by such a course.

The Secretary.—How about the Primate?

Prof. Gould.—An excellent apple, but a little tender, and not very much grown for commercial use.

A Member.—Twenty Ounce?

Prof. Gould.—A little later, but an excellent apple for the northern portion of this State; very much grown in New York, and profitably. Whether it would be very satisfactory in the southern portion of the State, where the York Imperial and Winesap do well, I am not so certain.

The Secretary.—Have you left out the Summer Rambo?

Prof. Gould.—I have left it out. I didn't attempt to make a complete list. It is of excellent quality, and widely grown, and

(a) Yearbook U. S. Dept. of Agr., 1901, p. 382.
(b) Yearbook U. S. Dept. of Agr., 1904, p. 400.
(c) Yearbook U. S. Dept. of Agr., 1905 p. 495.
(d) Yearbook U. S. Dept. of Agr., 1908, p. 475.

probably should have been included in a list of this kind. There are few varieties of this sort that are of as high quality.

The Secretary.—Leave the Gravenstein out, and put in the Summer Rambo.

Prof. Gould.—Yes, I know the Gravenstein is not so popular. It is rather more susceptible to conditions favorable or unfavorable.

Mr. Fenstermaker.—The Carolina Red, and the Everbearing Red?

Prof. Gould.—The Everbearing Red I don't know. The Carolina Red originated in North Carolina, and has a whole lot of synonyms that would reach across a page. It is generally called the "Early June," is a good bearer, is of high quality, and can be easily grown in this State.

Prof. Watts.—Grown northward in this State?

Prof. Gould.—I don't know it north of New Jersey, and not very much in that State. In some portions of this State it would probably be all right.

The Secretary.—Is it of good size?

Prof. Gould.—Rather small; that is one difficulty with it as a commercial apple, although some growers find it very profitable. One apple grower in Missouri has quite a number of trees, and I am informed by him that he finds it about as profitable as any variety he can grow, regardless of the season. Throughout North Carolina, where the variety probably originated, and where it has been grown for a great many years, there are a good many different varieties which are closely similar to Red June. In all probability they are seedlings of it, although there is no proof of this. All information regarding their origin is wanting, but there are a number of varieties that are quite popular through that section and I am quite sure that some of them are better than Red June itself.

Prof. Watts.—Where does the Jonathan succeed best—on what kind of soil, and under what kind of climatic conditions?

Prof. Gould.—I don't know that I can tell you where it succeeds *best*, but I can tell you where it succeeds. Through the Mississippi Valley generally, as far north as Central Illinois, it does very well. Through the Ozark region it reaches good size, is magnificent in color, has good keeping quality, and is as satisfactory as any of the varieties grown there. In fact, I have seen a fairly good crop of Jonathans where other varieties had failed. In a good many sections where the climatic influences are favorable to it, this variety has proven a very satisfactory variety both for home use and commercial purposes.

ENSEE APPLE.

THE SACKETT & WILHELMS CO., N. Y.

Prof. Watts.—Is it a standard variety for planting widely in this State?

Prof. Gould.—That is probably a matter to be determined. I would not recommend it as a variety to plant widely; there are other varieties that I think are better for extensive planting in this State. I notice in the exhibit of Mr. Wertz—his orchard is near Waynesboro—a plate of Jonathans. I don't know whether these trees received special attention or not. Where they can be grown to the perfection of those specimens it is worth the effort. It has been grown in New York State, in fact it originated in New York, and is grown some in the Hudson River Valley, but the tree is a little weak, and so is the foliage, and it is quite susceptible to cedar rust. That is my objection to it.

Prof. Watts.—What kind of soil does it grow best on?

Prof. Gould.—I have seen it grown on a wide range of soils. In the Ozark region the soil is somewhat rocky, quite porous and very deep; you could go a great many feet in depth and still find that same kind of soil for the roots to penetrate. Then, I have seen it grow in the black loam of the prairie, and in the Shenandoah Valley of Virginia it does fairly well, though not yet of much commercial importance in that section. There are several orchards of it on the famous "apple pie ridge," which is a soapstone soil, containing quite a good deal of small rock fragments, and has a porous subsoil of great depth.

The Secretary.—How does the quality of the Magnate compare with the Stayman Winesap?

Prof. Gould.—I think it is fully as good. Many of you know the Stayman. There are some fairly good specimens on exhibition here, although they look as if they grew on young trees.

The Secretary.—What do you think about the market in general for such a mild flavored apple as the "Delicious"?

Prof. Gould.—I think there is a splendid opening for the Delicious. I have seen some grown in New York that would be classed as sweet, but I think the mild, delicate flavor of Delicious from most sections is pleasing to people generally.

Mr. Engle.—Is the skin not very tender, and does it not bruise very easily in the handling?

Prof. Gould.—I don't think so; I think that with proper handling it will compare favorably with other varieties of high quality for a shipping apple.

Mr. Engle.—Excuse me, but how do you spell the Ensee?

D. G. Passmore

ENSEE APPLE

Prof. Watts.—Is it a standard variety for planting widely in this State?

Prof. Gould.—That is probably a matter to be determined. I would not recommend it as a variety to plant widely; there are other varieties that I think are better for extensive planting in this State. I notice in the exhibit of Mr. Wertz—his orchard is near Waynesboro—a plate of Jonathans. I don't know whether these trees received special attention or not. Where they can be grown to the perfection of those specimens it is worth the effort. It has been grown in New York State, in fact it originated in New York, and is grown some in the Hudson River Valley, but the tree is a little weak, and so is the foliage, and it is quite susceptible to cedar rust. That is my objection to it.

Prof. Watts.—What kind of soil does it grow best on?

Prof. Gould.—I have seen it grown on a wide range of soils. In the Ozark region the soil is somewhat rocky, quite porous and very deep; you could go a great many feet in depth and still find that same kind of soil for the roots to penetrate. Then, I have seen it grow in the black loam of the prairie, and in the Shenandoah Valley of Virginia it does fairly well, though not yet of much commercial importance in that section. There are several orchards of it on the famous "apple pie ridge," which is a soapstone soil, containing quite a good deal of small rock fragments, and has a porous subsoil of great depth.

The Secretary.—How does the quality of the Magnate compare with the Stayman Winesap?

Prof. Gould.—I think it is fully as good. Many of you know the Stayman. There are some fairly good specimens on exhibition here, although they look as if they grew on young trees.

The Secretary.—What do you think about the market in general for such a mild flavored apple as the "Delicious"?

Prof. Gould.—I think there is a splendid opening for the Delicious. I have seen some grown in New York that would be classed as sweet, but I think the mild, delicate flavor of Delicious from most sections is pleasing to people generally.

Mr. Engle.—Is the skin not very tender, and does it not bruise very easily in the handling?

Prof. Gould.—I don't think so; I think that with proper handling it will compare favorably with other varieties of high quality for a shipping apple.

Mr. Engle.—Excuse me, but how do you spell the Ensee?

Prof. Gould.—The Ensee was originated on the farm of Nelson Cox, and either he, or one of his sons, took the initials and spelled them out to make the name.

The President.—Any further questions?

Mr. Case.—Do you know the Longfield?

Prof. Gould.—I have seen it quite a good many times, but am not intimately acquainted with it. It is grown in some portions of the Mississippi Valley, Iowa, and that section of the country, more than anywhere else. Probably a very good variety in a section where hardiness of tree is a consideration.

Mr. A. R. Tyson.—The Coal?

Prof. Gould.—That is a variety which is commonly found in the mountainous region of Tennessee, and some other southern sections. I was rather surprised to see some as far north as Pennsylvania. There are some good specimens over there in the exhibit.

The President.—How about the quality?

Prof. Gould.—Not very good quality. There are enough varietties of better quality for this part of the country.

A Member.—Stewart's Golden?

Prof. Gould.—One of the old varieties that some of you probably know better than I do. I am not very familiar with it. Some growers in the northern fruit belt find it very satisfactory. Whether it would prove profitable in this State, I am not able to say. I do not know enough about the variety, about the quality or its requirements, to be able to tell much about it.

A Member.—Wolf River?

Prof. Gould.—A great big variety; if you want to grow monstrosities in the way of size, it might be all right, but I think there are other varieties that are better for general cultivation.

A Member.—Is the Doctor you mentioned the same as the Red Doctor?

Prof. Gould.—I don't know; I saw some specimens in the exhibit labeled "Red Doctor," but did not recognize them as "Doctor." I have seen it exhibited as "Newby," and where it is not called the Doctor, it is generally known as the Newby. It is an old variety that was re-discovered some years ago by Thomas Newby of Carthage, Indiana. One severe winter when other varieties froze, it did not, and in that way it attracted his attention, and after a long time, and many efforts, it was identified as an old variety known

as the Doctor. It is of fair quality, but not the highest. In one of Mr. Taylor's Year Book articles it is recommended for trial from Maryand north.

Mr. Case.—The Boiken?

Prof. Gould.—I know nothing about it in particular. It is one of the Russians, however, and they are mostly lacking in quality.

A Member.—What is the difference between the Gano and the Ben Davis?

Prof. Gould.—Well, if you take a good specimen of each, and pare them, then attempt to distinguish one from the other, I don't believe you could do it. Gano is solid red in color while Ben Davis is more or less striped.

Mr. Smythe.—Steele's Red or Canada Red?

Prof. Gould.—Of very excellent quality, and grown in some of the oldest New York and Michigan orchards. I don't believe it is grown very much in the newer orchards. It is late in getting into bearing, if I remember correctly, but when you get it, it is thoroughly fine.

A Member.—What do you think of the Wagner as a commercial apple for southern Pennsylvania?

Prof. Gould.—I don't know very much about it as a bearer. I think it was Mr. Lewis who said it was bearing well in his orchard, and if the tree makes any pretensions to being a good bearer, it should be an excellent apple. It is of high quality.

The Secretary.—It is generally so exceedingly productive that it is no good without thinning.

Prof. Gould.—That is a very good characteristic; if you can get them on the tree, you can get them off.

A Member.—The McIntosh?

Prof. Gould.—Showing up very nicely in some sections. Many growers tell us that it needs high culture and thorough spraying to bring it up to its best. For a choice commercial apple of high color, I presume in some sections of the State it would be very satisfactory.

A Member.—The Tetofski?

Prof. Gould.—About the same in season as Red Astrachan; one of the early apples, and quite satisfactory so far as productiveness is concerned, but I think there are other varieties that are better. It is very poor in quality.

A Member.—How about the Starr?

Prof. Gould.—I think I am not giving away any New Jersey secrets when I say that over there they think they have a mighty good thing in the Starr, but they are not saying much about it. Many of these apples are marketed as soon as they get large enough for culinary purposes. It holds to the tree well, however, and it can be left until fully matured if market conditions call for it.

A Member.—York County Cheese?

Prof. Gould.—I don't know that variety.

A Member.—There are quite a few samples of them in the hall, and the man that raised them thinks a great deal of them. I should like to know whether this is simply a local name, or a general name.

Prof. Gould.—I am not familiar with it.

A Member.—The Aiken—do you know anything about it?

Prof. Gould.—Nothing in particular. It is a good-sized apple of fairly good quality. I don't know whether it would be desirable to grow it in this State, but possibly it is worthy of a trial.

Mr. Engle.—A few years ago at a horticultural meeting in this State, I heard a gentleman speak of an apple that has not been mentioned here, but before which, he said, all other qualities paled; it may not be very well known here, but it is known in England, and is called Cox's Orange.

Prof. Gould.—It is of very fine quality; the great difficulty we have in this country with it is lack of productiveness; we don't often see it in any of our orchards, however, but it has an exquisite flavor.

The President.—Now, we are very glad to have some one here who can tell us all about the varieties, and I know we could keep Prof. Gould busy all day, telling us about quality and variety; but we have several other able men who must go away this afternoon, and we must go on with our program in order to gain time.

I am now going to call on Mr. Catchpole to tell us about "The Apple Industry; Its Present Condition and Future Possibilities."

THE APPLE INDUSTRY; ITS PRESENT CONDITION AND FUTURE POSSIBILITIES.

By E. W. Catchpole, *North Rose, New York, President, Cornell Horticultural Union.*

Mr. President, Members of the Pennsylvania State Horticultural Association, and Friends: It is a great pleasure to me, a grower of apples from western New York, to be with you at this

time. I bring you the fraternal greetings of several organizations of the Empire State. I am deeply interested in the enthusiasm manifested and I am sure your efforts are bound to bear much fruit.

This is a period of many changes in the apple industry in this country. Everywhere, from coast to coast, the one aim is to raise the standard of our product. As a typical example of this new era in the fruit industry, allow me to refer to conditions in western New York.

In 1865-70 the apple orchard of western New York consisted of from two to four acres, the trees had no definite character and the varieties were many. Any profit coming from these orchards was regarded as so much money found. Owing to disease, neglect and decay many of these old orchards are rapidly going out. A large portion of these older orchards that are now bearing, are producing fruit, at best, of only medium quality and little of it is being barreled. Some years later, after the west had begun to develop its resources in the production of grain and the western New York farmer was even loosing money on the poorer land, some of the more prosperous farmers tried the planting of apples in a moderate way.

In many cases through better care and proper soil selection the profits in after years were considerable. These few profitable commercial orchards set progressive men thinking. The result is the enormous planting of the past few years. In the west, however, this planting fever did not have the gradual development there was in the east. All at once there came the desire to plant. Owing to climatic conditions and perhaps to some extent to other conditions, they have had very few good crops. In the Ozark region, I am told, they have had but two paying crops since 1897. In our own State we have had other large crops, but they have not been profitable owing to over production. Considering the fact that the average age of a commercial orchard in the west is but twenty years, you can see they are facing a serious condition.

We should consider the question of over production, together with the effect it will have on future planting. The history of our section, the reports of earlier fruit meetings held more than forty years ago, all show that over production was seriously considered and its results feared. The question of the extent of future planting now receives less consideration than it has at any time in ten years. On the other hand we thumb over the proceedings of the meetings of years gone-by to find much fear and doubt as to the ultimate ability of the markets to care for increased production. Many of us recall the catastrophe of 1896, when the government tells us that there were over sixty-nine million barrels produced. This record has never been approached since. In 1908 the production was only thirty-eight million barrels. Cannot this difference be accounted for on the assumption that these little old three-acre orchards of grandfather's time are things of the past in the production of barrelable fruit?

The tendency now is to give better attention to the orchard. Fruit growers realize now that an apple tree is a business proposition. To succeed, the utmost care must be taken in the selection of

varieties adapted to the soil. Judgment must be used in the maintaining of fertility and the conservation of moisture. Economy in harvesting and shipping might be called a business in itself. In fact the money end of the game needs the man behind the gun.

We are all asking the question—What about the West? We admire with envy, the glare of the advertising their publicity press agents are spreading broadcast. When papers like the Saturday Evening Post will give them the next thing to free advertising we will surely have to admit that they are progressive. We have a right to view with alarm their invasion of our eastern markets. In New York we are raising fruit fully as fine as that of the West, but we have never been able to get it before the public in that attractive way. As a result of all this advertising, the public has come to believe that size means quality, and the western fruit is better than ours. At our recent banquet both western New York and Pacific coast Spitzenburgs were served at every plate and there was a unanimous verdict in favor of our native apple. The boxing seems to produce a favorable impression on the public and I will suggest that some of you try boxing your fruit in a small way the coming year.

Just now we are not in right in the marketing end of the deal. The grower is not getting his share of the consumers money. The consumer is not getting the quality he pays for with his good money. Mr. Hale said at our banquet that we will never have a satisfactory market until the distribution is controlled by one man, and one man only. He is probably right.

The railroads in our State are taking a deep interest in the growing of fruit. Under former methods the higher officials depended almost entirely on reports furnished them for information regarding crop and fruit conditions and the freight tonnage in sight for each season's business. Leading growers and shippers were not known personally to the officials. A feeling of antagonism existed between shippers and transportation companies. Some one suggested that the "Big Ones" of the R. R. Co. be invited to visit our fruit belt on the South Shore of Lake Ontario. As a result they came, they saw and were made members of the "Apple Consumers League."

As to results—A recognition of the fact that each have interests in common; that the proper handling and transportation of orchard products would stimulate the planting of new areas—the development of new territories where land is cheaper but just as well adapted to fruit culture as the present well-known but high priced areas.

The Growers and Shippers exchange, with headquarters at Rochester, N. Y., was organized last July with a capital of $40,000 in $100 shares, and duly incorporated under the laws of the State. It has a board of fifteen directors, business manager, and sales manager, acts as a clearing house for local associations, growers, and shippers associated therewith, charging 5 per cent. for selling and distributing products. Salaried agencies are maintained in the leading market centers with security bonds for all persons holding positions of trust.

Six local associations, each holding stock in the parent organization, have been organized. One of these, with a membership of

one hundred, has handled the crops of its members and since the close of the season has nearly doubled its membership. Local associations or members may establish brands or retain brands and identity but will be held sponsor for quality. Local co-operative packing is encouraged by the exchange that a large quantity of uniform and properly packed fruit will be available for shipment. Organization and co-operation are absolutely necessary that the products of our orchards and vineyards may be grown, packed and distributed,—that the consumer may be educated that neither size nor color necessarily mean high quality,—that if necessary, retail stores be opened in large cities, and stocked with the best at a reasonable prace. At present far too many fruit stores push the sales of tropical fruits while holding our own products at exhorbitantly high prices.

Delegates to the Farmers' National Congress at Raleigh, N. C., were shown the results of applying science to Pomology, the effect of soils on varieties.

The future offers great opportunities to the individual or corporation fully equipped for this work. Soil, varieties, management, fertilization, harvesting, packing and marketing—each and all must be carefully studied under varying conditions. Eliminate the limiting factor and success should be yours.

You certainly are ahead of the times, and I want to say to these good people here who are not members of this organization that they should not leave the hall without becoming members, and those of you who while enrolled as members, are not active members, it is your duty to do all you can in aiding to grow the apple in the Keystone State. I thank you.

The President.—Mr. Catchpole has given us a sufficient number of good things to keep us busy thinking; while we will not elaborate on them, I would suggest that we take fifteen minutes, at least, for the consideration of the subject he has presented. If any one has any questions to ask, Mr. Catchpole will be pleased to answer them.

A Member.—I would like to have Mr. Catchpole tell us more fully about their Fruit Growers' Market Association.

Mr. Catchpole.—Our Association was formed last July. The plan is briefly this: The local organizations are feeders for the parent organization. They take over 50 per cent. of the stock. The Candaigua Association has been doing a good business, and have a membership of one hundred, which they hope to increase to two hundred. The other local organizations, also, have done fairly well, our manager and sales manager taking the stand that we could not afford to send any but perfect fruit, perfectly packed to market.

A Member.—Does the organization attend to the packing, or only to the selling?

Mr. Catchpole.—Only the selling. It has been suggested that the local organizations take up the packing end, in this way making the individual responsible for the quality of his fruit.

A Member.—Can he put his name on it?

Mr. Catchpole.—If he wishes. We have written eleven thousand letters, covering the entire United States, letting the people know that we were doing business, and briefly outlining our plan of organization. I have here our Constitution and By-laws; if any one would like to have copies, we can supply them.

Mr. Fox.—I desire to elaborate on one point, and that is the co-operation of the railroad company, the carriers in this matter of transportation. In years past the railroads in our State of Pennsylvania did all they could to discourage the apple industry by their treatment of the shippers and their freight charges. They are now beginning to realize the folly of their course through the decline of their freight traffic.

Then the results of co-operation are seen in counties like Adams and Franklin, where the railroads are co-operating with the shippers. Twenty-five hundred carloads were shipped last fall out of that district, chiefly Adams and Franklin Counties, with perhaps a few from northern Virginia. This means business for the railroads, and they are co-operating with the Associations, and with the Department of Zoology in running demonstration trains. Prof. Surface has been in correspondence with them, and last winter these demonstration trains were visited by thousands of interested spectators. We held sixty demonstrations, which were attended by more than six thousand people. It is planned to repeat these demonstrations this winter; the railroads realize the importance of standing by the fruit growers of the State.

The President.—Any other questions? If not, we will proceed.

SOME NEW SPRAYING MIXTURES AND THEIR VALUE AS FUNGICIDES.

By M. B. Waite, *Pathologist in Charge Fruit Disease Investigations, U. S. Department of Agriculture.*

For over twenty years bordeaux mixture has been the leading fungicide. Its early successes in the treatment of grape diseases were followed by similar triumphs in the control of apple scab, apple leaf-spot, pear scab and leaf-blight, and finally the dreaded bitter rot. The apple blotch of the Southwest, curl leaf of the peach and the gumming fungus of this fruit on the Pacific Coast gave way before this remarkable fungicide. Following its discovery in 1883 or '85 for a period of about ten years,—that is from 1885 to '95, many efforts were made and much experimenting was done in the hopes of finding a better copper compound. It was hardly thought possible that the best copper spray had been hit upon at first. These efforts to find a better copper compound did not succeed. On the other hand, they placed this mixture at the head of the list of fungi-

cides. Practical use by orchardists in the protection of their fruits by spraying still further strengthened the status of this fungicide until it had come to be regarded as the only great fungicide for general use in the orchard in the summer time.

General use of this mixture, however, both by experimenters and orchardists, began to develop certain weaknesses. It was soon found to be a complete failure on the peach and the Japanese plum, injuring the foliage so badly as to be ruinous. It also injures the foliage of a number of other plants. In recent years it has been found to cause serious russeting of the fruit of the apple and sometimes a similar russeting and deforming of pears. This russet damage apparently has been increasing, for reasons entirely unknown to the writer. For instance, in 1899, I carried on experimental sprayings on the Newtown in Virginia, with no noticeable injury to the fruit. Furthermore, the foliage of the sprayed trees remained sound and bright instead of being seriously injured as has been the case in the last few years.

Various recommendations were made last season to avoid this fruit russeting and foliage injury. One was to dilute the copper to 2 lbs. and add an excess of lime, using such a formula as 2 lbs. of blue stone, 3 lbs. of lime to 50 gals. of water. Another was to use the self-boiled lime-sulphur, then coming rapidly into prominence through the experiments of Mr. W. M. Scott, of the Bureau of Plant Industry. Mr. Scott developed this self-boiled lime-sulphur as a summer spray for the peach, the most susceptible to copper poisoning or spray injury of any fruit. He also found it harmless on the apple.

It was a question, and still is for that matter, whether the self-boiled lime-sulphur will serve all the purposes as a fungicide, of bordeaux mixture. Notwithstanding, therefore, the possible ways out of the difficulty it was felt, at the beginning of last season, that the whole system of apple spraying by the old method with bordeaux mixture was open to serious question. On the other hand fungous diseases appear to be rather on the increase, especially the apple leaf-spot or leaf-blight, cedar rust, and the danger of bitter rot and apple scab is always so great, not to speak of the insect troubles, as to compel thorough spraying of the orchards. All will admit that spray we must to get high percentages of sound, marketable fruit. What to spray with, therefore, and not introduce a new disturbing injury, was the question. Something had to be done to get further light on this problem. What the orchardist needs is a fungicide which can be combined with a good insecticide, like arsenate of lead or possibly Paris green, or some other arsenate, that will do thorough work in the prevention of the diseases and at the same time be absolutely non-injurious to both fruit and foliage.

The ideal fungicide not only protects the fruit through various stages from the attack of fungi, but combines readily with an arsenical and leaves the skin bright and smooth with all the style and finish that it is possible for the given variety of apple to develop. With the leaves, it should not only protect them completely from all attacks of fungi, but should permit or even stimulate full de-

velopment of the foliage so that every leaf, or at least a very high percentage (90 per cent. or more) should be on the trees at the time the fruit is picked. They should even persist for a considerable period thereafter. You all know how far short of this condition has obtained in the use of Bordeaux mixture during the last few years.

In order to study this matter thoroughly a rather elaborate series of experiments was carried out at Winchester, Virginia, during the past season (1909). Nine different fungicides, that is counting arsenate of lead used alone as one, were included in the test, which, together with a control plot at the beginning and end, made eleven plots. The object of this test was to bring into careful comparison standard Bordeaux mixture, with various modifications of the same, and with self-boiled lime-sulphur and other sulphur compounds. These were the most promising fungicides known to the writer. Among the number, two new fungicides were invented and subjected to test, namely, a new copper sulphide mixture and a new iron sulphide mixture. Rather to our surprise these two mixtures have proved to be remarkably good and interesting. One of them, the new type of iron sulphide, may have a promising future.

The plan of the principal experiment carried out in Mr. S. L. Lupton's home orchard was as follows:

Purpose.—To find a spray mixture which will satisfactorily control fungous diseases but which will not injure the leaves and fruit of the most susceptible varieties of apple.

Carrying Out of the Experiments.—In carrying out this plan two main series of experiments were tried:

Series I.—On the S. L. Lupton Home Farm. This block contained the whole eleven plots of the experiment. Each plot consisted of 4 Ben Davis, 4 Newtown and 2 York Imperial trees, except where they were missing in the orchard, all of which were fourteen years of age. In other words, the orchard was planted in strips of 4 rows each of Ben Davis, Newtowns and York Imperials. The fungicide tests were run across the strips including all three varieties.

Application of the sprays was at the rate of 45 to 50 gals. to each plot of 10 trees, applied through ordinary fine nozzles by means of a hand barrel pump. The dates of application were the three ordinary applications for the apple required for codling moth and other insects, combined with the treatment of apple leaf spot, cedar rust, and ordinary fruit spots. This did not fully cover the early treatment for apple scab, which was not expected and did not occur in the orchard, nor one late treatment for bitter rot.

The first application was made May 11-12, shortly after the petails had fallen; the second application was made June 11-12, just a month later; and the third application was made July 19. The first application was made in time to fill the calyx cups with the arsenite and in season to catch early infections of cedar rust and leaf blight on the young fruit. It is also a good application to protect from apple scab though not always safe for the first treatment of this disease. The second application, on June 11, was probably

a little late for best results. June 1 to 5 would probably have been better. It is intended to catch the codling moth at the time of hatching and feeding, and as the trees are just in full leaf, is the best time to spray for apple leaf spot, and perhaps also cedar rust. It is doubtless the most important single treatment. The third application, on July 19, also possibly a week later, is an excellent date for last summer treatment for fruit spots and leaf diseases and is timely for second brood codling moth and lesser apple worm. These dates were arranged in conference with Prof. A. L. Quaintance of the Bureau of Entomology, who is responsible for the insect information in this paper.

Series II.—S. L. Lupton orchard (Barker Farm.) As the trees in Series I carried but a light crop of fruit, a supplemental experiment, or a duplicate, was carried on in Mr. Lupton's "Baker" farm, selecting the more important or more promising of the fungicides. Unfortunately we left out the iron sulphide as we did not consider it, at that time, especially promising. This series was located in a block of Ben Davis trees, 14 years old, larger and better cared for than the home farm and carrying a fine crop of fruit. Each plot consisted of 4 Ben Davis trees. The spray dates, May 12, June 14 and July 17, were within a day or two of the other series.

Series III.—A supplemental series was also carried out in the orchard of Mr. Stuart Bell, using about the same dates of treatment, but selecting only the self-boiled lime-sulphur and the copper sulphide mixture for comparison.

Series IV.—P. H. Gold farm, Winchester, Va. Another supplemental test on York, and Ben Davis trees, using also about the same dates of treatment, was carried on on Mr. Gold's place, comparing the self-boiled lime-sulphur with standard Bordeaux mixture.

To all these gentlemen our thanks are due for offering their orchards for experimental purposes. We feel that special thanks are due Mr. S. L. Lupton, because, on account of having the right varieties, suitable location, age of trees, etc., his orchards were made to carry the brunt of the experiments. We are indebted to Mr. Lupton for many courtesies, not only in facilitating the spraying work, sacrificing his fruit to these tests, but in helping in taking down the results and in storing the fruit and exhibiting it for our study.

I am also indebted to my assistant, Mr. F. V. Rand, for much painstaking help in carrying out the spraying work and in attending to the details of result taking.

Results.

We began note taking on the results at the time of the second treatment on June 12. Interesting things began to happen at that date. All the copper sprays began to show more or less serious injury to both fruit and foliage. Notes were taken separately on the leaves and fruit of every plat. On Series I, of Mr. Lupton's home farm, there were eleven plats with the two controls, and three varieties on each mixture, making thirty-three distinct plats. Notes

were taken as to both fruit and foliage, making sixty-six notes for this series. The same thing was done at the "Baker" farm and on the other series. These notes were taken June 12, July 4, August 5, and September 8 and 21, and at picking time. Further notes were taken January 5, after the fruit had been in cold storage.

All the fungicides protected the trees very nearly completely from fungous diseases. In the note taking, therefore, except on the unsprayed plats, it became almost wholly a question of per cent. of injury to foliage by the spray itself, and in the same way on the fruit it was a question of per cent. of russeting or spray injury. I have all the data in my hand of these different percentages, including final notes, and per cents. of first and second-class fruit, drops and culls, at the picking time, but of course you do not wish this mass of detail.

Let us pick out from the whole the most interesting and instructive portions. The final notes of the condition of leaves and fruit on each of the plats, taken September 21, a few days before picking, may be of interest.

Series I.—S. L. Lupton's home farm. Percentages indicate amount of damage estimated.

Plot I.—Control, unsprayed. Ben Davis, 4 trees:

Plot I.—Control, unsprayed. Ben Davis, 4 trees:

Leaves—
- Fungus, ... 60 per cent.
- Spray injury, ... None.

Fruit—
- Insect and fungus, ... 90 per cent.
- Spray injury, ... None.

On the Newtown and the York Imperial there was a slightly less serious injury.

Plot II.—Bordeaux Mixture 3-3-50. Ben Davis, 4 trees:

Leaves—
- Fungus, ... 1 per cent.
- Spray injury, ... 30 per cent.

Fruit—
- Fungus and insect, ... 2 per cent.
- Spray injury, ... 60 per cent.

Newtown, 4 trees:

Leaves—
- Fungus, ... 3 per cent.
- Spray injury, ... 80 per cent.

Fruit—
- Fungus and Codling Moth, ... 2 per cent.
- Spray injury, ... 30 per cent.

York Imperial, 2 trees:

Leaves—
- Fungus, ... 2 per cent.
- Spray injury, ... 25 per cent.

Fruit—
- Fungus and insect, ... 2 per cent.
- Spray injury, ... 3 per cent.

It will be observed that standard Bordeaux mixture injured the fruit by russeting from 60 per cent. on the Ben Davis to 30 per cent. on the Newtowns to 3 per cent. on the York Imperials. The foliage, on the other hand, was most injured—up to 80 per cent. on the Newtowns. All the other copper compounds injured the fruit of the Ben Davis with the exception of neutral Bordeaux, however, all of the modifications of Bordeaux, by adding other materials, reduced the injury.

As the whole group of copper compounds except copper sulphide injured the fruit so much as to be undesirable, I will only take one single element of the notes on most of this group, namely, the russet injury on the Ben Davis fruit, assuming that the other injuries were somewhat in proportion.

Plat 3, the iron Bordeaux injured the fruit 40 per cent. It was decidedly less injurious to fruit and foliage on the Newtown and York Imperial.

Plat 4, Bordeaux and Gypsum. Fruit russeted on Ben Davis 30 per cent. It gave about a corresponding reduction of injury on Newtown and York Imperial. The reduction of injury by gypsum and iron Bordeaux would be of interest if it were not for the more successful fungicides in the test.

Plat 5, Neutral Bordeaux. Fruit of Ben Davis russeted 60 per cent. The interesting thing happened in this mixture, namely, that while it injured the Ben Davis no more, or possibly slightly less during part of the season, than standard Bordeaux, it injured York Imperials much more seriously. It therefore had no special advantage—if anything, a disadvantage, over standard Bordeaux mixture. This emphasized the fact, which had heretofore been found in spraying the peach, that a slight excess of lime was helpful. This is also further backed up by the comparatively better results obtained by Mr. Lupton in his orchard spraying with the 2-3-50 Bordeaux.

Turning now to plat 7, the copper sulphide, we have a change in the figures. The Ben Davis fruit was injured only 10 per cent., the foliage was injured only 1 per cent. Further than this, all the other marks on both the Newtown and the York were practically perfect. Here again we can say that were it not for the superior results with self-boiled lime-sulphur and iron sulphide we should certainly consider that in this new fungicide we have a splendid find. We certainly can say this, that if sulphur mixtures do not hold out, we have in the copper sulphide, made with self-boiled lime-sulphur as a basis, the least injurious form of copper. On the Newtown, and on the York Imperial, and possibly this may be true of other varieties, it is almost, if not quite, absolutely harmless. The 10 per cent. of russeting on the Ben Davis might be reduced by cutting down the amount of copper.

Turning now to plat 8, this is also a copper sulphide, but made with the commercial lime-sulphur solution instead of the self-boiled lime-sulphur. It was distinctly inferior to the other type of copper sulphide. The russeting of the Ben Davis was only slightly more serious, being 15 per cent., but the foliage injury throughout

was quite pronounced, being 10 per cent. on the Ben Davis, 40 per cent. on the Newtown and 15 per cent on the York Imperial.

Turning now to the really good things in the test we are able to abandon this record of troubles almost completely. Plot 6, the self-boiled lime-sulphur, gave almost perfect results throughout. There are absolutely no spray injury to both fruit and foliage on the three varieties tested. There was a half per cent. of russeting marked on the Ben Davis but this is wholly around the stem and was undobtedly due to the arsenic or to water alone. The percentage of fungus injury to leaves was slightly greater with this fungicide as might be expected, namely, 2 per cent. on the Ben Davis, 3 per cent. on the Newtown and 4 per cent. on the York Imperial. This was mostly cedar rust and apple leaf spot and was entirely insignificant in quantity. They are just enough perhaps to call attention to the slight doubt as to fungicidal strength which hangs over this mixture. Undoubtedly the self-boiled lime-sulphur mixture is the most harmless fungicide known. The only question being, can it be depended upon to do the work. Under the conditions obtaining at Winchester last season it stood up very well. It failed, however, on pecan scab in the South, due, probably, to very heavy rains, and as Mr. Scott has pointed out in his apple scab work, it was not quite equal to Bordeaux mixture. It also was inferior to Bordeaux mixture in my own orchard with apple leaf spot, and the fruit spot of the apple, though on the whole the results were better than with Bordeaux mixture.

Turning now to the last fungicide, namely, the iron sulphide, we have apparently the most successful mixture in the series. The fruit russet on Ben Davis was zero and so was also the leaf injury. A perfect mark was secured as to leaves and fruit of all varieties. The fungus injury on leaves of all three varieties was marked at one-half per cent. This was less than with any other fungicide on the test, including the Bordeaux mixture, although with the Bordeaux mixture there is a possibility that some of the spots marked "fungus spots" may have been copper poison spots. In this mixture (iron sulphide) we have the advantage both of high fungicidal value and an entire absence of injury effects,—apparently the best combination of quality.

It should be noted that the fruit of the Ben Davis particularly was slightly a darker green and apparently later in ripening than on most of the other plats, notably, than on the self-boiled lime-sulphur. In the case of the Pippin this made a greener appearing type of fruit. On the Ben Davis it perhaps might be regarded as slightly objectionable though probably not on the Pippin and York Imperial. The foliage also looked darker green and heavier and it was a noticeable fact that the twig growth looked more stocky and especially the fruit buds looked plumper, than with any of the other fungicides.

One point should not be overlooked, namely, that the arsenate of lead gave remarkably good results and entire freedom from russet injury. Some of the Winchester orchardists, namely Messrs. Bell, Gold and Richardson, called my attention to the apparent success of this insecticide in controlling fungi which they had observed

in the season of 1908. At the time I doubted it but the results of the arsenate plat certainly looked promising. The two pounds of arsenate of lead under the extremely favorable conditions in the Winchester district seemed not only to protect from insects but to control apple leaf spot, cedar rust, and the fruit spots.

Since this mixture was also in the self-boiled lime-sulphur and in the iron sulphide solution the question may be raised, was it not practically responsible for the beneficial effects. Self-boiled lime-sulphur, however, has a series of victories in Mr. Scott's experiments that do not rest on this single test.

Iron sulphide, made with a sulphur solution, in the experiments of Mr. Volck, at Watsonville, Calif., on apple mildew and by Mr. W. S. Ballard, my assistant in that district, have shown it to be superior to Mordeaux mixture, for that disease. Why may not this superiority extend to certain other fungi?

Conclusions.

Self-boiled lime-sulphur gave practically perfect results under the conditions obtaining at Winchester. As a spray for Ben Davis and perhaps also for Newtown and York Imperial it was a practical success. Since it has been experimented upon widely by Mr. Scott for three years, it may be regarded as a perfectly safe fungicide to use for commercial purposes as far as injury is concerned.

It is evident also from the tests that the iron sulphide, made in the new form here described, is a promising fungicide which needs testing on a commercial scale. If it maintains its apparent superiority it may have practically all the advantages of the self-boiled lime-sulphur in overcoming injurious qualities and of Bordeaux mixture as an effective fungicide. In that case it promises to be a great commercial spray. Copper sulphide is the least injurious form of copper spray and solves the russet problem as far as the Newtown and York Imperial are concerned, and gave only one-sixth of the injury on the Ben Davis produced by 3-3-50 Bordeaux. We have in these experiments the solution of the russet problem in several different ways. Further experiments on a large scale are necessary to test fully the merits of the different non-russeting sprays. The results argue strongly the necessity of abandoning Bordeaux mixture on the apple and the substitution of some form of lime-sulphur, iron sulphide or possibly, if we must use copper, the copper sulphide.

Preparations of the New Sprays.

At the conclusion of the paper, a sample jar each of the new mixtures was made up and also for comparison the standard Bordeaux mixture, self-boiled lime-sulphur, with and without the arsenate of lead. The materials being of very bright colors, varying from light blue to bright lemon yellow and from reddish brown to jet black, made a very interesting color contrast. Bordeaux mixture, made up in the ordinary way, showed the characteristic sky blue color.

A batch of self-boiled lime-sulphur was made up suitable for spraying peaches. It was diluted promptly after the lime finished slaking and was therefore of a bright lemon yellow or sulphur yellow color. Another sample was allowed to stand twenty minutes while hot to complete the boiling, and while it was rather bright yellow in color, it showed a slight brownish tint and an inch or so of clear liquid at the top of the jar was distinctly brownish. A similar sample of self-boiled lime-sulphur was treated by adding the equivalent of 2 lbs. per barrel of arsenate of lead. There was a distinct though not very pronounced dull grayish-brown color produced a few moments after the addition of the lead arsenate. To another jar of the self-boiled lime-sulphur mixture a solution of blue stone or copper sulphate was added. On shaking up this developed the distinct reddish brown color of copper sulphide more or less obscured and modified by the excess of yellow lime-sulphur mixture. To still another jar of the self-boiled lime-sulphur mixture a solution of iron sulphate or ordinary copperas was added. This at once turned the mass to an inky black color. To complete these last two mixtures lead arsenate was added to each of them but any further color change was obscured by the reddish-brown color of the copper sulphide or the black of the iron sulphide.

Formulae for the new sprays.—To prepare a barrel of either the new iron sulphide or the new copper sulphide, make first the self-boiled lime-sulphur as a basis. In experimenting we used the 10-10-50 formula but for commercial work the 8-8-50 should be used.

To make the self-boiled mixture first place 8 lbs. of good stone lime in the bottom of a barrel; pour on enough cold water (hot water if the lime is distinctly inferior) to nearly cover the lime. When the lime begins to slake vigorously add 8 lbs. of sulphur flour. This should be run through a sieve and preferably mixed with a little water in the form of a slush. Stir the sulphur into the slaking lime occasionally. Keep the barrel covered with gunny sacking, old carpets, or some suitable cover to retain the heat. Water is added occasionally to keep the mass in a slushy or creamy condition. For these mixtures on the apple cease stirring as the slaking diminishes in violence and before it has finished, and replace the cover allowing it to remain twenty minutes. At the end of this period the mass will have turned slightly brownish. Dilute, first by adding a little water, and stirring, to 50 gallons.

For making iron sulphide dilute to about 40 gallons instead of 50, then add 3 lbs. of iron sulphate (ordinary copperas) dissolved in 6 or 8 gallons of water and stir. This makes the black iron sulphide. Then add 2 lbs. of arsenate of lead stirred up as a milk into two or three gallons of water, thus completing the barrel to 50 gallons. The formula for this mixture then is:

Self-boiled lime-sulphur, 10-10-50 (or 8-8-50).
Iron sulphate, 3 lbs.
Arsenate of lead, 2 lbs.

To make the copper sulphide, proceed in the same way. After diluting the barrel of self-boiled lime-sulphur to about 40 gallons, add 2 lbs. of blue stone or copper sulphate dissolved in 6 or 8 gallons of water and stir. The mass will then turn to the bright reddish-brown color of copper sulphide. The 2 lbs. of arsenate of lead is then added, as above, to complete the mixture.

Mr. Case.—Are you going to tell us later on, the strength of the Bordeaux you used?

Prof. Waite.—Yes; but I might say right here that it is 3-3-50 in the experiment. In the orchard for general spraying we used 2-3-50, and that is better.

Mr. Case.—What kind of weather did you apply it?

Prof. Waite.—Rainy and damp. Later on it was unusually dry, which gave the spray mixture a better chance to take a good hold.

Mr. Case.—Did you have the steam guage on, so that you knew the pressure you were putting it on with?

Prof. Waite.—No; we used an ordinary hand spray; running about 60 pounds; it may have run to 80, and possibly dropped to 40. It ran somewhere between 60 and 80.

The President.—It is now twelve o'clock, so we will adjourn until 1:15, so as to give Prof. Waite at least fifteen minutes' extra time.

TUNKHANNOCK, PA., THURSDAY, JANUARY 13, 1910, 1:15 P. M.

President Hiester in the Chair.

The President.—The meeting will please come to order. Prof. Waite will now resume his talk.

Prof. Surface.—What is the formula for the copper sulphide?

Prof. Waite.—Self-boiled lime-sulphur, 10-10-50, or 8-8-50; then add to that mixture 2 pounds of copper sulphate in solution to 50 gallons. Now the iron sulphide is made the same way; make it with stock solution, use self-boiled lime-sulphur 10-10-50 to three pounds iron sulphate in solution, and then before spraying we add 2 pounds of arsenate of lead in each mixture.

Prof. Surface.—I would like to ask whether you have ever analyzed the sulphur in your concentrate?

Prof. Waite.—No, I have not, although Mr. Haywood of the Department of Chemistry, has analyzed some of these solutions.

Mr. Wertz.—Can you tell us whether this will be sent out in bulletin form in time for us to use in the Spring?

Prof. Waite.—I think so. I expect to spend the next few days in the office and get right to work on it. The full data of this work will be written up this spring and published in bulletin form.

Prof. Surface.—What have you to say regarding the concentrated lime-sulphur with the arsenate of lead in it?

Prof. Waite.—I read of that in the paper. Prof. Scott heartily approves of it. We don't know which one of these solutions is going to be the best, and perhaps a little safer than the others, but we do know that one of them will be the thing to use. It does not injure the tree and does help the foliage wonderfully.

Mr. Roberts.—Any objection to using that iron spray on potatoes?

Prof. Waite.—We have not used it, but I see no reason why it should not be used.

Mr. Wertz.—You think the self-boiled is better than the commercial?

Prof. Waite.—Yes, it is, a little.

Mr. Wertz.—But there is such a difference in the boiling: I might make it one way, and my neighbor another.

Prof. Waite.—Yes; there is as great a difference as there is in the housewife's making of bread, but you can easily test with the hydrometer how strong the concentrated mixture is.

Mr. Smythe.—How strong would you use it on peach trees?

Prof. Waite.—I have not said that I would use it on peach trees at all. We have not tried it; we have only used it on apples.

Mr. Gould.—Are these new mixtures any harder on the spray pump from corrosion than the old Bordeaux mixture?

Prof. Waite.—That is a point that I did not think about, and I am glad you mentioned it. I am sure that these two mixtures from their insolubility, will be less injurious than the other sulphur mixtures. The home-boiled lime-sulphur is probably harder on them than anything else.

Mr. Gould.—They will not be hard on brass?

Prof. Waite.—No; not so hard on copper or brass.

A Member.—Is there any preparation there to spray the black spots that appear on the Baldwin?

Prof. Waite.—There are two black spots of the Baldwin—one due to a fungus, and the other to some cause that has not yet been discovered. The one due to a fungus is preventable by spraying.

A Member.—Don't you think the soil has something to do with it?

Prof. Waite.—Yes; I think it has.

A Member.—What about the apple leaf blight?

Prof. Waite.—Oh, that is prevented by these mixtures; they will destroy it.

Prof. Stewart.—I would like to ask whether the lime-sulphur can be made up and kept on hand, or must it be made up the day it is used?

Prof. Waite.—I have only used this three times, and have always made up the lime-sulphur just before I used it.

Prof. Stewart.—Would it not be possible to make up an iron sulphide in the same way by using a concentrated sulphur solution?

Prof. Waite.—That was the former method. They would take the iron sulphide and let it decant, and repeat in three or four days. We got out of that, and made this preparation which can be gotten ready in a few hours.

Prof. Stewart.—Is there any real necessity for making it in the longer way?

Prof. Waite.—There may be new ways; we don't know how many new ways there are of making it up. This method was devised under pressure, and I would very much prefer to hold it back and test it a while longer, but its absolute harmlessness will recommend it for trial. The one danger is that it may fall down on some fungus.

Prof. Surface.—How many pounds of arsenate of lead?

Prof. Waite.—Two pounds to the barrel.

The President.—While Prof. Waite is completing his mixture, we will have the report of the Fruit Committee. Will Mr. Roberts report for the committee?

REPORT OF THE COMMITTEE ON EXHIBITS.

Mr. President: Your Committee on Nomenclature and Exhibits begs to make the following report and recommendations:

First. That this exhibit is by far the largest, most representative and complete, of any ever made at the annual meeting of this As-

sociation. For this reason, the committee, in the limited time at its disposal, were unable to give the careful attention which the exhibit merited. The report given below represents, in our judgment, the rank of exhibits when judged by the standard laid down by the American Pomological Society, which standard your committee was forced to adopt, in the absence, so far as we were able to discover, of any fixed rules governing the display.

Second, In this connection the committee suggests, and would urgently impress upon this Association, the necessity of adopting some set code of rules governing the display of fruit at all future meetings, in order that all exhibits may be judged on the same basis. Further, we would suggest that since the rules adopted by the American Pomological Society are considered as standard throughout the United States, and Canada, that these rules be adopted by this Association to govern all future exhibits, and that each County Association provide itself with a copy of these rules and acquaint its members with their provisions, or

Third, Should the Society choose to follow a more liberal policy in the matter of exhibits than that laid down by the rules named above, your committee would recommend that a special committee be appointed to draft such rules and regulations, as they see fit, governing such points as the number of apples per plate, polishing, uniformity of specimens, stems, relative importance of insect, fungous, or spray injured fruit, etc., and complete instructions to judges.

As stated above, your committee felt it necessary to adopt some standard for their guidance in this instance, and therefore followed the rules of the American Pomological Society as far as possible, with the following results:

We would recommend that the diploma for the best general or Association exhibit be awarded to the Fruit Growers' Association of Adams County, and that second place be given to the Wyoming County Exhibit. The committee would also make honorable mention of the exhibits from both Bedford and Perry Counties, which certainly reflect great credit upon these counties as great apple growing counties.

To C. J. Tyson, of Flora Dale, Pa., is awarded the Certificate of Merit, for best individual exhibit, and to R. M. Eldon, of Aspers, Pa., should be given second place. To W. J. Lewis & Bro., of Pittston, Pa., and F. H. Fassett, of Meshoppen, Pa., special mention is given for very creditable displays the former showing an exhibit of thirty varieties, as well as box-packed Baldwins, Sutton Beauty and Northern Spy.

To Gabriel Hiester, of Harrisburg, Pa., the committee would invite attention as the exhibitor of several varieties of pears.

A few plates of nuts were also shown, which reflects great credit upon Pennsylvania for her achievement in this important branch of horticulture.

On account of limited time, the committee has made no attempt to judge individual plates.

The total number of plates shown was 560, representing about 100 named varieties, and a few unnamed, some of which are said

to be seedlings but which your committee do not feel of sufficient merit to warrant their being added to the already long list of named varieties.

Signed,

E. W. Catchpole,
W. J. Wright,
Horace Roberts.

On motion, properly seconded and regularly carried, this report was accepted and the committee discharged.

The President.—I am sure the judges are entitled to the thanks of this Association. They had a pretty hard task to judge this exhibit, but I think they have done it in a very acceptable way.

We are now ready to have Prof. Watts talk to us on "Asparagus Culture."

ASPARAGUS CULTURE.

By R. L. Watts, *Professor of Horticulture at Penna. State College.*

Asparagus is generally regarded as one of the most profitable garden crops that can be grown in this State. Soil and climatic conditions in Pennsylvania are favorable and it is not a difficult crop to grow.

The most experienced growers claim that deep, rich, sandy loams are best adapted to this crop. Sandy loams are especially desirable if the purpose is to produce white grass rather than green, because sandy soil offers no obstruction to the shoots and they are always straight and can be cut without difficulty. The tendency, on the other hand, of white shoots in clay soils is to become more crooked and the crop is harvested with greater difficulty.

There is an increasing demand for green grass, although the majority of growers claim that white grass is the more profitable. There are two main reasons for this claim. First, it is held that the injury from beetles is less on the white grass because a smaller per cent. of the shoot is exposed to the attack of the beetle. Second, that the diameter of the white grass is greater than the green and that fewer stalks are required to fill the bunches. When green grass is grown the rows may be closer together, because ridging is not required. It is also true that the price for green grass is usually higher and this probably makes up for the loss in size of shoots. Nearly all Americans prefer green asparagus and its production should increase consumption.

Although the sandy types of soils are preferred, good crops may be grown upon any kind of soil which is properly handled. Heavier manuring is required on the sandy soils and these soils of course are less retentive of fertility. For growing either green or white grass, the most important factors are the supplying of water and plant food. These two factors are of vastly greater importance than the question of soil type.

Conover Colossal is one of the oldest and best known varieties in the United States. It is early and vigorous. Barr's Mammoth is

also well-known. It is said to be one of the earliest and is a large producer of good sized shoots. Argenteuil is a French variety which has attracted much attention in recent years. It was thought by many a few years ago that this variety would take the place of many of the older varieties, but I believe it is losing rather than gaining at the present time. There is some evidence that the variety does not thrive on clay soils. A variety which is attracting more notice at this time than any other, and which is planted more largely than any other is Palmetto. The shoots of this variety are large and there is a small percentage of culls. It is generally regarded as the most profitable variety in cultivation. It is conceded that the variety is less subject to rust than any other, and some claim that it is comparatively secure from attack of insects. There seems to be no good reason for planting any other variety.

Many of the most successful growers of asparagus in different parts of the country prefer growing their own plants. They prefer this because it enables them to grow plants from selected seed and then to select roots from a large number of plants, from which the best results may be expected. To start with, seed should be secured from a reputable grower whose plantation is free from rust. An excellent plan is to visit these fields in the fall of the second year when seed should be selected from plants of a few large stalks rather than many small ones. The seeds are ripe when the berries are well colored. After picking, the berries should be placed in any convenient tub, barrel or crock and allowed to soak until the pulp separates readily from the seed. This separation may be secured by washing with the hands. The seeds should be washed several times and then cured and stored.

It is considered rather unsafe to use seed more than one year old. It may be planted in the fall, although spring is preferred. The drills should be fifteen to eighteen inches apart, and covered with about one inch of soil. Some growers drill an early maturing variety of radish over the asparagus to mark the rows. The asparagus seed requires from four to six weeks to germinate, so that the radishes do not interfere in the least with the asparagus plants. The asparagus nursery should be given clean tillage during the entire summer. Some growers prefer lifting the plants in the fall, choosing only the strongest for planting in the permanent plantation. If the ground is prepared early in the spring, the plants need not be lifted until planting begins, but the safer course is to take the plants up in the fall and store them in a cool, moist cellar or pit. Experiments at the Pennsylvania State College indicate that too much care cannot be exercised in the selection and planting of asparagus roots. This is one of the main arguments for growing your own plants. If the plants are purchased at about four dollars per thousand, it is not likely that many will be discarded, while if grown at home and there is a surplus of several thousand, the grower does not hesitate to select the strongest. It is important that thinning be practiced in the nursery with a view to growing the best plans. This should be done when the plants are about two inches high and they should be thinned to an inch or two inches apart.

In speaking of seed selection it is just as important to have plants with a few eyes selected for setting in the permanent plantation. The market demands large shoots and the tendency of the plants of few eyes is to continue to produce large shoots during the life of the plantation. The importance of seed selection and plant selection cannot be overestimated.

Preparation for field planting should begin in the fall. Asparagus makes the best growth in soils abounding in vegetable matter. This means that manure should be used with the greatest freedom and if clover sods are available, they should help materially in the starting of the plantation. Land of any kind which is to be planted with this crop should be heavily manured and plowed in the fall, repeating the operation and adding more manure the following spring. The plowing should be as deep as possible, although care should be exercised to avoid turning up too much of the subsoil if of a clay composition. Disk and cutaway harrows may be used to good advantage in the preparation of the soil. Effort should be made to secure a fine bed to the full depth of the plow furrow with all vegetable matter thoroughly incorporated with the soil.

Practice varies widely with regard to planting distances. A common plan in New Jersey and in other sections where white grass is grown is to set the crowns about two feet apart in rows from five to six feet apart. This provides ample soil for blanching. If green grass is desired, the rows may be very much closer. One of the most successful growers in the state, R. H. Garrahan, Kingston, Pa., plants two by four. Occasionally a grower is found who prefers the check system. For example, Hon. Thos. W. Barlow, of Philadelphia, Pa., who has twenty-five acres, plants four by four. He claims that by this system much hand labor is avoided and that the shoots are larger. The old method was to set the roots at a great depth, often twelve to fifteen inches. Deep planting is often practiced to some extent but many growers can see no advantage in planting at extreme depths. The depth should be determined by the character of the soil. If the purpose is to grow white grass and the soil is of a sandy character, then the crowns may be planted at a greater depth and ten to twelve inches under satisfactory conditions would not be too much. If on the other hand the soil is clayey, deep planting would be a disadvantage. It is probably never desirable to set the crown in the sub-soil. This means that in most of our Pennsylvania soils the roots would seldom be more then seven or eight inches below the surface of the ground. Practically all of the soil in the furrows may be removed by means of a plow, so that little shoveling is required in preparation for planting. The roots should be kept moist and plump and not more than two inches of soil should be placed over the crown at the time of planting unless the soil is sandy or of an extremely porous character. Soil should be drawn up to the plants from time to time as the plants grow and if strong, vigorous roots are planted only a few weeks time will be required until the field is practically level. It is important to give the field clean tillage during the entire season. No weeds should be allowed to grow and soil moisture should be conserved by

stirring the soil with tools which are best adapted to the prevailing soil conditions.

In beds which are more than two years old, tillage should begin just as soon as the ground is dry enough in the spring. Soil in young plantations may be plowed while in older beds a disk or spring tooth harrow can be used to advantage even if a few plants are displaced. The destruction of a few old crowns may often be an advantage. Before plowing or harrowing, stable manure should be applied and a good grade of commercial fertilizer should be added at the rate of not less than one ton per acre. Some very successful New Jersey growers apply annually two or more tons of fertilizer per acre and it is important that the fertilizer run high in nitrogen. A fertilizer analyzing four per cent. nitrogen, eight per cent. phosphoric acid and ten per cent. potash should give good results upon most soils.

There has been much discussion as to the proper time for the application of manures and fertilizer upon asparagus fields. The probabilities are that it pays to divide the applications using part in the spring before tillage begins and part in the summer immediately after cutting. If all the manure and half of the commercial fertilizer were applied in the spring and the other half of the fertilizer used at the close of the cutting season, ideal conditions should be furnished for the growth of the plantation. The disk or spading harrow can again be used to good advantage at the close of the cutting season. Various tools as riding cultivators, narrow spring-tooth cultivators, spike-tooth harrows and Planet Junior tools are used in cultivating this crop. Cutting should begin as soon as the shoots are large enough in the spring. The diameter and length of bunches varies with different markets and the grower should aim to meet market conditions whatever they may be. In bunching, Erie County growers use rubber bands, many other growers prefer blue or red tape, while others prefer raffia and various kinds of cords. The rubber band is preferred by some because of the rapidity with which they may be placed on bunches. Colored tapes attract attention and are probably valuable on some markets in securing higher prices. There should be no cutting the first two years and the third year it is best to stop cutting several weeks sooner than usual so that the plants will not be weakened. Full cuttings may be made from the third year on, and it is important to remove everything of proper height at each cutting even if some shoots are too small to be sold. These unmarketable shoots may be left on the ground. It is seldom that asparagus is cut for market after the first of July.

The common asparagus beetle is about the only insect enemy that gives any trouble. It should be combated on young plants by arsenate of lead and on old plants after the close of the cutting season, using the same poison. When this insect appears upon the young shoots in sufficient numbers to cause injury, air slaked lime can often be used to advantage. Rust is the only asparagus disease of any importance. Although various spraying materials have been tried, they do not seem to be effective in controlling rust. Precaution should be taken to avoid rust, by selecting seed of plants from plantations which are known to be free. The tops upon all plantations should be mown and burned in the fall of the year. This work should be attended to before the leaves are dry, so they will not shake from the plants and thus spread disease germs which would cause trouble next year.

Mr. Fenstermaker.—When do you spray with the lead?

Prof. Watts.—You cannot get away from spraying to save your life, can you? Whenever the enemy appears; any time you see him, get your gun out.

A Member.—How far apart do you usually have the older beds planted?

Prof. Watts.—Rows 4 to 6 feet, and the plants set 2 feet apart in the row.

Mr. Case.—What fertilizer do you use?

Prof. Watts.—4-8-10 fertilizer. We put it on in the spring of the year; then again in the fall; I would suggest that you use no less than one ton—or even two tons; some of the best growers use $75 worth of fertilizer per acre, and get $400 to $500 worth of asparagus from it.

A Member.—Do you recommend applying manure in the fall?

Prof. Watts.—I would say half in the spring and half in the fall; I would apply it at the end of the season and then work it in.

A Member.—Will black muck soil do in place of manure?

Prof. Watts.—I don't think it would do very much good.

Mr. Walton.—How do you work the manure into the ground?

Prof. Watts.—With any implement that will get it in the ground. I prefer the disk harrow. In New Jersey I think they use the cutaway harrow; don't they, Mr. Roberts?

Mr. Roberts.—The Randall Harrow, and the Spading Harrow.

Prof. Surface.—Will seeds from rusted plants produce rust?

Prof. Watts.—I think they will, but I am not sure; how about it, Prof. Waite?

Prof. Waite.—I have never worked at it.

Prof. Watts.—How about it, Mr. Garrahan?

Mr. Garrahan.—I would not use them.

A Member.—How about planting asparagus in the apple orchard?

Prof. Watts.—I don't know; I would not do it; I don't believe it would work; do you, Mr. Hiester?

The President.—I certainly would not, because after your trees get about fourteen years old, the roots interlock, and what you gain on one you lose on the other. You want to raise two crops, but raise them one after the other, not one on top of the other.

Mr. Engle.—You cut everything, and don't leave any shoots on the ground?

Prof. Watts.—Cut everything, and don't leave anything on the ground.

I would like to have Mr. Garrahan speak to us on the subject of marketing.

Mr. Garrahan.—I don't know that I have anything to say in regard to the question of marketing. Our conditions at Wilkes-Barre are very similar to those of Prof. Watts at State College. The trade is not very critical, consequently we do not grade the asparagus, but sell it just as it comes. Our method of cutting is to use butcher knives, and keep the knife about one inch below the surface of the ground; the shoots are then carried to the end of the row in a basket, laid cross-wise, and hauled to the bunching shanty. There the asparagus is laid on the table, and put in the bunching machine. We use what is known as the Philadelphia Buncher; it is an iron machine, and makes the bunches uniform. We use little Polish girls for this work, and pay them 50 cents a day; they get quite expert at getting the ends in evenly; after being bunched they are tied; for this purpose we use a three ply Jute; it doesn't look nice, but our trade isn't critical.

Mr. Engle.—Do you ever tie with Raffia?

Mr. Garrahan.—No.

Mr. Engle.—Do you aim to have all your asparagus the same length, and what length?

Mr. Garrahan.—About 8 inches.

Mr. Engle.—Do you cut it on Sunday?

Mr. Garrahan.—No; we cut on Friday, and on Saturday; we cut very close on Saturday morning, and then sell up to six or seven o'clock on Saturday evening. Then we go over the ground with a two-horse cultivator on Saturday afternoon, and turn some dirt over the rows. This covering destroys some weeds. Then we usually go over it with a disk attachment on the next Saturday, and uncover the rows slightly, and by that method we prevent Sunday work to a great extent and keep the weeds down. When we got through with our crop this year I don't think there was a weed in the field. I have seen other fields that were simply covered with weeds.

A Member.—Do you run the disk harrow over the rows during cutting time?

Mr. Garrahan.—No; we put disks on the riding harrow and run shallow during cutting time. It is disked thoroughly in the spring.

Mr. Case.—How deep is that asparagus set?

Mr. Garrahan.—About six or seven inches.

Mr. Case.—Does not the disk strike the crowns?

Mr. Garrahan.—No, it doesn't seem to. After cutting for the season is done we are sometimes troubled with weeds a little bit, but throwing the dirt over them every week seems to smother them pretty well.

Mr. Case.—Do you ever use the asparagus chisel?

Mr. Garrahan.—No; we use a butcher knife with a rather wide blade—about an inch and a quarter wide—and a round edge.

Mr. Engle.—You speak of bunching with the Philadelphia Buncher; does that give a uniform thickness and evenness, regardless of length? I have seen them in the Philadelphia market all sorts of lengths, so there appears to be no standard.

Mr. Garrahan.—No; there is no standard length; the long bunches probably appeared at a time when it grew very rapidly. Sometimes on a Monday morning we have grass a foot long, and then we cut off the seedy tops before bunching.

Mr. Smythe.—When do you stop cutting?

Prof. Watts.—We stop cutting about the Fourth of July.

Prof. Waite.—What age are your plants; how soon do you begin to cut?

Mr. Garrahan.—About the third year.

Prof. Waite.—How much of a crop the third year?

Mr. Garrahan.—About half.

Prof. Waite.—That is, you put out the beds and tend them for two years, and then you begin to cut?

Mr. Garrahan.—Yes; in fact, we get a little the second year. It is not advisable, however.

A Member.—Do you plant one or two-year-old roots?

Mr. Garrahan.—One year old.

Mr. Walton.—Do you irrigate?

Mr. Garrahan.—No; if you could use the Skinner system that would be all right, but with our system we would fill the ground with water, and that is too much for asparagus.

Mr. Walton.—You irrigate on the surface?

Mr. Garrahan.—Yes, sir.

Mr. Walton.—We use the Skinner system; you think it all right for asparagus?

Mr. Garrahan.—I think so: Prof. Watts knows more about it than I do. You consider it all right, Professor?

Prof. Watts.—I think so.

Mr. Walton.—Asparagus needs considerable moisture, doesn't it?

Mr. Garrahan.—Yes.

A Member.—How long do the roots grow?

Mr. Garrahan.—About two feet, I think.

Prof. Watts.—We have the Hagerstown Clay Loam, and in our soil the roots go down about 10 inches. I believe that in certain kinds of soil they would have a tendency to go down quite deep. One of the Philadelphia growers, Mr. Lippencott, found them to go down very deep because his water table was down very deep.

Prof. Waite.—In the Sacramento Valley, California, they do not need to irrigate, because the water table lies so near the surface, and yet the roots go down very deep there.

Mr. Garrahan.—One more point: in washing we are careful not to get the tips wet as that would cause rot. We wash the bottom of the bunches and set it upright in the water for a few hours, and then it is packed in crates for shipment.

Prof. Waite.—You don't wash it at all for long shipment, do you?

Mr. Garrahan.—No, sir.

The President.—Mr. Garrahan has told us about the Pennsylvania local market; now I would like to have Mr. Roberts tell us something about the New Jersey markets, and the general market.

Mr. Roberts.—Mr. President, I don't want to take up too much of your time; the asparagus has always been a pet of mine. It has enabled me to plant my orchards. I prefer the Palmetto asparagus. I got my seed from Ridgeway of Mullica Hill, N. J., for $5 a pound. He also grows plants. I had an expert from Washington up with me this spring, and he told me I had planted a variety of Palmetto that was rust resistant because of the bloom on it. We plant 6 ft. apart; some of our best growers plant them farther apart than that. It is only a quesion of time when it gets too thick. We were growing other varieties when the rust attacked them, and we had great trouble in getting a rust-resisting variety, which we finally seemed to find in this strain of the Palmetto. We go to the general market in Philadelphia, and in place of the jute or raffia, we use a red ribbon to tie the bunches; it attracts attention. Little points like this attract attention, which is what is needed in our business.

A Member.—Will that ribbon run when it gets wet?

Mr. Roberts.—We had a little trouble with this at first, but this last year we succeeded in finding a ribbon that does not run. It is only cotton, but the bunches of asparagus look very pretty tied up with it.

We do not use many cover crops, but those we do use, we want to get in early. This last year we used cow peas; I am sorry that I did not use rye with them.

Mr. Smythe.—Would not barley answer better; it is very good?

Mr. Roberts.—Yes, it may be; I have never tried it. Rye is excellent, I know, and we want to work it in very early in the spring; crimson clover is also good, but we have to get our cover crops worked in very early in the spring.

The Secretary.—Do you get a good growth of cow peas?

Mr. Roberts.—Yes; with just a little rye in, they are a great success.

The President.—We will now take up the next subject on the program—an address by Prof. H. F. Tompson, of Amherst, Mass., on "Intensive Gardening Methods in Massachusetts."

INTENSIVE MARKET GARDENING IN MASSACHUSETTS.

By Prof. H. F. Tompson, *Amherst, Mass.*

Mr. President and Members of the Pennsylvania Horticultural Society: I have wondered how much there is of interest to the Pennsylvania market gardener in the consideration of methods used in Massachusetts. Your Secretary gave me my subject, so I am free to talk about any or all phases of the subject.

I had occasion last fall to look over statistics in regard to the vegetable gardening of the country. I found that more than $7,000,000 worth of vegetables were sold in New York State in 1899, according to the U. S. census taken that year. This placed New York State first on the list of vegetable producing states. New Jersey ranked second; Pennsylvania third, and Massachusetts sixth.

It is interesting to note the corelation between money value of vegetable products and the population of the states in question. New York, far in the lead in population, stood first in production of vegetable crops. Pennsylvania, standing third on the basis of population, also stood third in vegetable production with a valuation of these products of about $4,000,000, and Massachusetts ranking sixth in vegetable products, ranks sixth in population.

Queens County, N. Y., and Middlesex County, Mass., were, at the time of the census, the leading counties in vegetable production of the United States.

Figuring on the basis of acreage, Middlesex County is the most intensive vegetable producing centre of the United tates. This fact gives the Massachusetts man a chance to boast a little, if he chooses. The high rank that Middlesex County takes in intensive production is accounted for by the extent of the greenhouse industry carried on in the vicinity of Boston. The towns of Arlington and Belmont, located side by side, both near Boston, are known as "Greenhouse towns," and it is here that the growing of head lettuce under glass, is most highly developed. It is also a fact that the outdoor market gardening is very highly developed throughout the territory adjacent to Boston.

Most of the market gardens in Massachusetts are located in the eastern third of the State. I think I am correct in saying that we have more cities of 30,000 or over, in eastern Massachusetts than in any other equal area of the country, and this gives us a splendid market—one of the best in the world.

Many of the market gardeners are working the same land, which had been used for market gardening purposes by their fathers and grandfathers, and the city has grown out to them. In many instances, and within the past twenty-five years, the price of real estate has caused the sale of the market gardens for building sites; but many of the gardens are now producing vegetables on land worth from $1,000 to $5,000 per acre. This is not land on which the ordinary man can afford to raise vegetables. The average extent of a Massachusetts market garden is probably about twenty-five acres, though I have not been able to obtain authorative figures

about this. We have gardeners who are intensively working as many as 150 acres, but as a rule the men who have limited themselves to much smaller areas and worked them more intensively are those who have been extremely successful.

The market garden crops of Massachusetts are many and it is impossible to name the leading crop, unless we refer to the greenhouse industry, and that would be fairly difficult. Ten years ago there would have been no question as to the leading greenhouse crop, as lettuce production far outranked all others. To-day the amount of lettuce raised is as great, probably greater, but the southern competition has taken away much of the "fun."

Cucumbers rank close to lettuce in importance for a glass house crop. There are localities in the state which specialize to a degree. Danvers was for years noted for its onion and carrots, which fact is indicated by the standard varieties bearing the name of the town. At the present time this locality is not a large producer.

The historic town of Concord is the New England centre for asparagus, and large acreage is devoted to this crop. Here is established a co-operative Experiment Station, and the State Experiment Station, the U. S. Department of Agriculture and the growers are carrying on much useful work in improving methods of production, studying insect and disease control, fertilization, seed selection, etc. Rhubarb is also extensively grown, both in the field and inside for winter forcing.

The selling end of the business presents the same problem in Massachusetts as elsewhere. The market gardeners within a radius of twenty-five miles of Boston usually cart their produce to the Boston markets, where it is sold, either directly from the wagons or by the commission man. The first named method is the more popular. It is frequently the case that our towns receive a very inadequate supply of fresh vegetables from the local growers, and are compelled to send to Boston for their supply. In fact, if properly developed, some of these towns would afford a much better market than is secured by some of the small growers who market their crops in Boston. Town after town may be found in the western part of the State where the supply of vegetables is shipped from 30 to 100 miles by rail to supply the local demand, which could and should be supplied by the local grower.

A most important factor, or one generally so considered, is the soil in relation to the crops produced. Massachusetts soil is of glacial origin and the variety is unlimited. One can often find a range from a light sand or gravel to a heavy muck within a stone's throw. Much of our market garden land now classed as the best, is of a very light sandy character, and naturally very poor in production capacity. This is the type of soil largely found in Arlington and Belmont. A mechanical analysis of this soil shows about 75 per cent. of sand, the residue being humus, silt and clay. This Arlington and Belmont soil, naturally light in color, is now black, due to the large amount of humus supplied by stable manure, which is very freely used. The market gardeners of Massachusetts depend almost entirely upon stable manure for their supply of plant food. This is contracted for, or bought by the cord, from livery stables.

A cord of stable manure is measured as is a cord of wood, and varies in weight from 1½ to 2½ tons. Prices paid vary greatly, the price depending upon many factors. Probably $4.00 per cord is an average price for manure delivered. Few gardeners use less than ten to fifteen cords per acre, and many more use from twenty-five to forty cords per acre, for a season. The highest named amounts have proved extremely profitable where a sufficient amount of moisture is obtainable, or when the manure is well decayed before application.

The important factors in the success of Massachusetts market gardeners are: (1) high fertility, (2) thorough tillage, and (3) continuous cropping, the last of which includes both companion and successive cropping throughout the season.

The methods of handling the manure, the main source, in fact, almost the only source of fertility, are important. The large gardeners obtain most of their manure supply from city stables, and many of them keep one or two teams hauling the same nearly every day throughout the year. It is the custom to pile this and work it over frequently, to prevent "fire-fanging," and to get the manure into fine condition, with the ammonia compounds made available by decomposition. Much shrinkage takes place and more or less nitrogen is lost by this method of handling. Probably the most economical way to handle the manure is the immediate application to the land, upon hauling to the farm.

The manure is usually spread by hand. The objection to the use of a machine is that only small applications can be made at one time. Without question, the value of manure is greatly increased by the pulverization it receives when spread from a machine. A machine also insures even distribution, and as the object of the market gardener, or any tiller of the soil is to get the maximum crop of the best quality, the soil needs a uniform treatment. A manure spreader insures a uniform amount of plant food to all the crop.

A very limited use of commercial fertilizers is made by Massachusetts market gardeners. As before stated manure from livery stables forms the chief source of plant food. Where this can be bought cheaply, its use in large amounts is more profitable than any substitute. We need to recognize, though, that stable manure is not a balanced plant food, and that plants need a balanced ration, as much as live stock.

Contrary to what might be expected, the commercial fertilizer most used is nitrate of soda, a compound containing nitrogen in soluble form, the same plant food element which is most abundant in stable manure. Nitrate of soda has proven very useful when carefully used on certain crops, and commercial fertilizers will doubtless be increasingly used by market gardeners. The question of tillage needs and receives much emphasis among us.

Doubtless you have heard the story of Jethro Tull, who three centuries ago advanced the theory that plants took in through their roots, particles of soil for food. And he proved his theory by his practice of very thorough cultivation. While his neighbors' gardens did only moderately well, or were a failure, his flourished and

made its owner proud. He made it his practice to thoroughly cultivate, whereby he made his garden retain the soil moisture, made it warmer, and caused more plant food to become available. Constant and thorough cultivation is as essential as good seed.

Some of the tools made use of in Massachusetts are the double action, Acme and Meeker harrows, which make a trio of soil fillers to follow the plow that cannot be excelled. Each man must select tools adapted to his soil, but there are some tools that are standbys, and those named are such.

It is not unusual, on some Massachusetts gardens, to see, following the plow, a gang of six men, hand-raking the land, making the soil smooth and fine in beds from six to eight feet wide, with a dead furrow between. This method is used in preparing the land for early lettuce, spinach, radish, and other crops which are close planted, and particularly profitable for the early market.

The maintenance tillage problem has been carefully worked out with the following points in mind: Moisture conservation, weed destruction and soil areation. On the most successful gardens, horse and hand cultivators are kept constantly at work. The adaptation of particular tools to particular soil conditions is also studied, and one may often find tools in use which have been invented by the "boss."

Double cropping is a common practice with us. Whether this practice is desirable must depend upon the crops raised and the skill and judgment of the grower. Double cropping is usually considered under two divisions: (1) Companion cropping, and (2) Successive cropping. The latter is the more desirable practice.

The market gardener of experience does not suffer from barren land. Sometimes the question is asked: "Is there not a waste in excessive feeding?" but this chief argument against successive cropping, founded upon the theory of "food exhaustion," is not a difficult one to answer.

We have a more questionable practice to consider in Companion Cropping. Growing two crops on the same land at the same time may be made profitable but often is not. Here the skill of the grower is tested to the full. I have seen the following companion crops growing in Massachusetts: Spinach between cabbages; cauliflower and corn and lettuce grown the same way. Onions from seed, and sets between celery; tomatoes and early sweet corn; bush beans between pole beans; late cauliflower between early beans, etc. Important points to consider in planning for companion cropping are: (1) The adaptability of soil, (2) fertilization, and (3) tillage to the two crops under consideration. Other points to consider are—respective dates of harvesting, root systems, possibility of injury to one by the other from shading or disease, insect pests and their control.

For instance, while spraying the cabbage crop with arsenate of lead to kill the cabbage worm would be permissable, such a spray for lettuce, which might be grown between the cabbages, would be out of the question.

The matter cannot be settled definitely for all. There are schemes for companion cropping that are desirable and profitable, and the opposite is also true.

Another problem which interests our gardeners is the intenseness of cropping allowable—that is to say—can he afford to plant his rows of beets 10 inches apart instead of 14 inches, and have his beets 3½ inches apart in the row, instead of 4 inches. Can he afford to grow celery 4 inches apart in the row, or should he allow 6 inches? Is it more profitable to plant sweet corn 6 inches or 9 inches or 12 inches apart in a row, or in hills with three or four stalks to the hill?

Such work is being carried on in an experimental way. We know this much: The problem varies so with the management given the land and crop that we each must be our own experiment station director and carefully plan and watch. Results in the shape of a better understanding of our work, always come. Everywhere the market gardener must approach the business methods of the manufacturer to attain his greatest success. Better business methods will ensure such success as will surprise many who now say: "Impossible, impossible."

Mr. Garahan.—Would you advise companion cropping on heavy clay land?

Prof. Tompson.—Yes; I think it is better on heavy land. The sandy land would be liable to dry out.

Mr. Garrahan.—Is there any danger in walking over that heavy land, of tramping it down so hard that the second crop suffers, or can that be overcome by cultivation?

Prof. Tompson.—I am not sure, but think you could so arrange your companion crops that you would secure good results. You might use spinach and cabbage. They both do well on heavy land; they could be hand cultivated. You could grow cauliflower and cabbage, or tomatoes. There would be no more work in caring for the two crops, than for one.

Mr. Garrahan.—It is not the work, but the damage one might do in tramping down the land that I speak of.

The Secretary.—How about horse-radish and cabbage?

Prof. Tompson.—I have seen them grown together very successfully; a crop of early cabbage put in, and the roots between horse-radish demands lots of nitrogen and cabbage lots of phosphoric acid.

Mr. Garrahan.—Do the market gardeners at Boston discriminate against shaving manure?

Prof. Tompson.—Yes, they do. Some of them are using it, but most of them are not—particularly that with pine shavings.

Prof. Surface.—I would life to ask if they consider the street sweepings to be worth anything?

Prof. Tompson.—I have seen one man using it; he pays 50 cents a load.

Mr. Hull.—Is the close planting of celery a success?

Prof. Tompson.—Yes; except for the air space.

Mr. Garrahan.—Is there demand for any other early celery than the Paris Golden?

Prof. Tompson.—The Boston market likes the Paris Golden best for early. Most of the growers grow Pascal as well. Some Boston Market is also grown.

Mr. Garrahan.—Could you tell me the cost of putting away about one acre of celery?

Prof. Tompson.—I could not. The boards would cost a good deal unless you have them on hand. Each plant takes about three inches. They place the roots about three inches apart, and then throw soil over them. I don't know, but I judge it would run somewhere between $50 and $75.

A Member.—What success do you have in growing pie plant in your state in winter?

Prof. Tompson.—The forcing of rhubarb is carried on most extensively in the town of Concord, where they grow much rhubarb and asparagus. They raise their own roots and have them at least four years old. At the meeting of Market Gardeners' at Ashtabula, Ohio, one of the Ohio professors said that one year old roots were best for forcing, and he had photographs of some very fine one year old roots there.

I might say in regard to asparagus, that our growers in Concord follow the example of New Jersey growers and grade their asparagus roots. There is no regular standard, but they divide into three grades—Extras, Firsts and Seconds. For bunching, they use a round table, with a movable top, they have boys to trim it to the right lengths—about seven or eight inches long; then it is tied with raffia and packed and sold in bushel boxes. They do not use any companion crop with asparagus; they claim it needs all their time and attention, as well as all the land. The first year or two it might be companion cropped successfully.

Mr. Garrahan.—I don't use any companion crop either with asparagus. We very often follow one crop with another.

The President.—The late R. F. Schwarz, of Analomink, was one of the most systematic, as well as one of the most successful market gardeners in eastern Pennsylvania. We will now have Mr. Arny, of Philadelphia, who spent some time there, tell us something of the methods used on that farm. Mr. Arny is now a Senior at State College.

MARKET GARDENING ON THE FARM OF THE LATE R. F. SCHWARZ, ANALOMINK, PA.

By L. W. Arny.

The farm and conditions found at Analomink, were by no means ideal, as that term is now used by the market gardener, but they were so clearly an example of what the possibilities are under extreme adverse circumstances, that we can learn many lessons from them.

Before taking up the actual farm practice, of Mr. Schwarz, it is well to look into the history of his farm to note how greatly he was handicapped from the beginning, and how he overcame the most of his difficulties and turned them into successes.

Mr. Schwarz was born in Berlin, Germany, and after graduating from a local school, entered the University of Heidelberg, where he completed his education. In his early manhood he moved his residence to America, in order to escape the laws of the German army. Having no business training, Mr. Schwarz engaged in the employ of a Chicago business house in the capacity of travelling salesman, in which business he was not only successful in his work, but made many friends throughout the country. After having travelled for some few years in this business, Mr. Schwarz found his health breaking, so that he was forced to resign from his position and consult a physician. Then he learned that he suffered from tuberculosis, and that specialists gave him but a few years to live. Having heard that the region around the Water Gap and Pocono Mountains in Monroe County was particularly favorable to lung troubles, he decided to buy a home there, for reasons, as he expressed it, "To provide a home for his wife, and to find a good place to die in."

This home was the beginning of the recent "Schwarz Farm," and consisted of a small two-story house, with a small garden in the rear, probably being not over 100 feet by 50 feet. At the advice of his physicians, Mr. Schwarz spent most of his time out of doors—at first, by simply taking long walks in the surrounding country, and then, later, by becoming interested in flowers, and planting and caring for these. He knew absolutely nothing of flowers, plants of any kind, or of the natural sciences governing their growth and care, but this deficiency was slowly made complete by a great amount of reading—the reading of reliable works relating to floriculture, horticulture, and all bulletins bearing on these subjects. This new work proved so absorbing and so full of promise, that Mr. Schwarz decided to try it on his land, and if the bright prospects continued, to go into it commercially, and make it his life's work, or

to make it fill the remaining part of his life, which he then suposed to be but a short while.

The house stood some 50 feet back from Brodhead Creek, a small mountain stream winding through this part of the country, on almost level land with the main line of the D. L. & W. Railroad, running at the rear of his lot about 200 yards away. The soil, not only in the small garden, but on the surrounding land, was almost pure sand, with a great deal of loose stone, having been washed down from the mountain during the flood times of the stream.

Mr. Schwarz's first market garden efforts were with pole beans, but they did not thrive in the pure sand of his garden, and were the cause of some disappointment and discouragement. But by the time the failure came he had acquired enough agricultural knowledge to know that his land must be given body and more fertility before it could be made to give him success in market garden work. This was a phase of the work that had not occurred to him before, and the greatness of the task of building up any amount of that land, seemed such a barrier that future profits would be long coming if they came at all. But he was firmly convinced that market gardening could be made extremely lucrative if properly managed, and so set out to make his land fertile. This work was started by hauling away tons of muck from a swamp distant some two miles, and thoroughly incorporating this into the sand of the farm. This made a soil dark in color, friable, and with perfect drainage,—an almost ideal soil for market garden work. An area of about seventeen acres was treated in this manner, giving a perfectly level area of excellent soil. Then crops thrived to perfection, the only limitations being Mr. Schwarz's knowledge to perfect a suitable rotation of crops and a rational system of fertility maintenance.

Another question of equal importance, and demanding as prompt solution, was that of markets. Should the produce be sold directly at retail, or should it be handled through commission men? The latter course seemed the wiser because of its greater simplicity, but it afterwards proved discouraging. This was probably due in part to the fact that the selection of commission merchant had been unfortunate. The one chosen was unscrupulous, and returned to Mr. Schwarz an exceedingly small amount of money, on the ground that the goods had been damaged in transportation.

Having been thus discouraged with commission business, Mr. Schwarz decided to handle his produce directly to the large summer hotels of Stroudsburg and the Water Gap. This scheme not only promised greater financial returns, but also simplified the management of his place in that that particular trade did not demand the exceedingly early produce that most markets want, and hence it reduced the amount of glass on the farm to almost a minimum. Two greenhouses were constructed, each 20 ft. by 60 ft., in which were started tomato and cabbage seedlings for the early crop, together with some few flowering plants, particularly pansies, which were used as a side line.

The question of the maintenance of fertility was at first solved by using cover crops of crimson clover, and complete commercial fertilizers, but two serious objections were found to clover: first,

it did not do well on the land; and second, the crops were not off the land at the time when it should be sown. Here followed a period of experimentation with cover crops, practically every available legume being tried, alone, and in combination with other grasses, the result being that a combination was effected which had more to do than any other one thing, with the success of the farm. This was the using of rye and vetch as a cover crop and nitrogen restorer. This combination was tried at first experimentally, until it proved its value, after which Mr. Schwarz became its champion—built his own farm up on it and preached it to his friends and neighbors. The success of this rye and vetch combination was due to several things: first, rye and vetch are plants that require no particular fertility of land upon which to grow; they will thrive where crimson clover will give but a poor stand, the vetch is a member of the legume family, and its properties of nitrogen gathering are as great as that of the clovers; and, lastly, both may be sown late in the season, at a time when crimson clover would be unable to get a start. The combination was found to be better than the vetch alone, since the rye acted as a nurse crop and assured the stand. After this cover crop had proven its value, the entire area of eighteen acres was sown to it in the fall, as late as September first to the fifteenth. The stand was luxuriant, protecting the land from any erosion during the winter, and providing a large amount of green manure to be plowed under in the spring.

From this period on, very little change was made in the management of the farm. The cover crops were sown late, and plowed under in the early spring, just as soon as it was safe to operate on the land. Every third year a solution of the soil was examined for acidity, and when enough acid was present, a medium application of lime was made over all but two or three acres. If the land was violently acid, this small area was planted in early potatoes. This system of having potatoes planted in slightly acid soil proved extremely satisfactory—giving yields of 250 to 275 bushels per acre, on the average.

Every spring the farm was given an application of commercial fertilizer, varying each time in its proportions, but always being low in nitrogen—sometimes 2-8-10, and averaging from 200 to 250, and often 300 pounds per acre. The reason for this small application of nitrogen, was the fact that there already was some in the soil from the vetch, and the remainder was better applied immediately before planting in the form of $NaNO_3$, hence making the nitrogen at once available.

The cabbage, lettuce and tomato plants were started in the greenhouse in time to set out as soon as the ground was fit, when the other crops, potatoes, peas, beans, onions, carrots, beets, peppers, rutabegas, parsley, radishes, turnips, cucumbers and squash, were planted. Some varieties of these crops were unknown, but some of the most valued were: Radishes, French Breakfast and Crystal; Potatoes, Early Ohio and Carmen No. 3; Peas, Telephone; Beans, Bush-pole, Limas and Wax; Onions, White Globe and Egyptian; Carrots, Danvers; Beets, Eclipse and Egyptian; Cucumbers, White Spine; Tomatoes, an unknown variety—Earliana, Matchless, Globe;

Cabbage, Danish Ball Head; Cauliflower, Snowball; Lettuce, Boston Market. These varieties made up the main crop, but in addition there were other varieties of different crops grown, which were unknown, and at the same time valuable. The seed for these was gotten from a friend in the New England States.

The original piece of land—that small plot forming the yard of his house, was used as a seed bed for lettuce and late celery. The celery mostly grown was White Plume and Giant Pascal. This plot proved very successful for this work, in that it had been longer worked than the rest of the land; had been intelligently worked, and was in a high state of fertility. Several small plots were devoted to radishes, and this being a short crop, soon released the land, after which it was planted to spinach, although some difficulty was experienced in getting a good, uniform stand at that time in the season. Peas were planted in rows three feet apart, and trained on brush stuck into the ground. When the harvesting of the peas was no longer profitable, the brush was pulled and piled in several heaps and burned, the ashes and pea vines being then plowed under. That plot was next given an application of $NaNO_3$, about 150 pounds per acre, and winter celery then set. Where early crops could be gotten out of the way, late cabbage was set, first being encouraged by a light application of nitrate of soda, and this, in turn, was harvested, and winter celery set out. In only one case was there any intercropping practiced, and that was in a small patch of sweet corn, in which squash was planted, the policy being to keep everything separate, to crowd to the limit, and force by abundance of plant food, especially nitrogen. A cultivator was always at work, each plot being cultivated at least once a week, up to the time when the crop was large enough to be injured by the passing of the horse and machine.

Water began to be a serious problem on the farm, for, while Brodhead Creek was convenient, and a powerful windmill had been erected to pump the water, there were certain seasons in the year when the supply was limited, and it was usually at seasons when the water was needed most. This difficulty was overcome by building a dam some two miles distant in the mountains, and piping from there. From this main pipe, laterals were run into the main fields, and in dry weather, the water was allowed to run slowly all night, making for itself rude irrigation ditches, and although this method of irrigation was rough and simple, results showed it sufficient to meet the demands of the case. Never did a crop suffer from drought, for the water supply was always good, and placed so that it could be had where it was most needed.

Some trouble was experienced at first by the ravages of the asparagus beetle, but this enemy was later easily controlled by sprinkling powdered lime on the plants early in the morning, while the dew was still present. The potato beetle was controlled by applications of Paris Green and lead arsenate, made whenever the insects became numerous, so that no serious loss was experienced from these pests.

After a few years of successful trade at the Water Gap and Stroudsburg, competition came in and limited the market to such

an extent that a greater outlet for the produce had to be sought. This outlet was found, but it involved a tremendous amount of extra work and expense. This market was at the big hotels toward Pocono, and although they were larger, demanded first-class produce, and were fairly numerous, it was a long and hard trip to get to them, but, as the scheme offered the only solution to the problem, three wagons and teams were gotten, and the product hauled eighteen and twenty miles over rough mountain roads. The system worked out for these wagons was this: each driver, knowing the demand for his particular trade, would put down on a provided slip, the load he would probably need for the next day. This was done after his return in the afternoon; his wagon would then be loaded according to this slip as he had made it out, backed into a shed, and was ready for the following day's business. While this system of marketing, made possible the disposal of a large amount of produce, the expense resulting from the wear and tear on the wagons and teams from such hard use, cut the profits down much below what they would ordinarily be. This was the greatest contention of the business, and one that could not be overcome, but merely reduced to a minimum.

A few years before the close of the farm's history, some twenty-seven acres of land on the opposite side of Brodhead Creek was offered for sale. This land Mr. Schwarz purchased, and although it was poor in quality, he decided to try fruit on it. The same factor of building the soil up presented itself, as was the case with the original land, but owing to its hilly character and the great expense of hauling in muck, it was simply given the treatment of rye and vetch, together with commercial fertilizers. This new land was divided into four fields, three of which were set in apples, but the choice of varieties made was unhappy, so that they never were a commercial success. They were all early summer apples, chiefly Sweet Bough and Yellow Transparent, for which there was such a limited demand that the possible prices would not pay for the proper treatment of the orchard; hence the result was that the land was given over to sweet corn and the apples ignored, except to pick the most perfect specimens and sell them to the best advantage. For the corn, the land was treated with rye and vetch, up to a point where it was in fairly good condition, and then crimson clover was used. This crop worked just as well since late sowing was not the important factor here that it was on the old land. The fourth field of the newer land was planted in cherries, pears and raspberries, both black cap and red varieties, but the original land claimed so much attention that all of these newer fields were more or less neglected, so that the maximum returns were not gotten. Although this was probably bad management, it was due to the fact that the original land was the part of the farm that was making the money—that the new area was far inferior in fertility, that this section was nearer population, and being remote from the main part of the farm, much theft had to be contended with, and, lastly, that Mr. Schwarz felt that his remaining years were numbered, and the process of making his new land rich was too long a one for him to undertake.

There were many little points in the management of the place that were original, and, while being small in themselves, added greatly to the success of the farm. For instance, in the plowing under of any crops, such as cover crops or pea vines, instead of simply running through with a plow, as is most often done, the disc harrow was first used. This broke up the material into finer parts, making further plowing easier, and insuring a quicker decomposition of the material. This harrowing was followed by a plow, when the operation was easy, quick and more efficient. The plow was followed by the dics, after which the fertilizer application was made. Then a smoothing harrow was used, followed by a marker, after which the crop was set. A cultivator was used after that as often and as long as possible. When seedlings were set in the field, the ordinary round dibber was never allowed to be used. In its place a flat dibber or a trowel was employed. The theory of this was that the ordinary farm hand would make a far deeper hole than was necessary, and with the round dibber this would result in an open space between the roots of the plants and the bottom of the hole, and that more than ordinary care in closing was required to prevent this, while with the flat dibber, the hole would probably be just as deep, but it would be more evenly closed, and even in a case where it remained, it would be so narrow that the plant roots would have but little trouble in spanning it, and hence the supply of moisture would not be disturbed.

In the setting out of young celery plants, the tops were removed, leaving only the young central leaf. This was enough to carry on the work of the young plant and give the roots a chance to become thoroughly fixed in the soil before being called upon for active work. It often happened that soon after these celery plants were set, dry weather would set in, in which case a whel hoe was run both ways on one or both sides of the row, just as close to the plants as was possible. This gave a dust mulch, thus economizing what moisture was present and giving thorough aeration to the soil surrounding the roots. In the summer of 1909, the celery was set during a severe drought, when the soil became so dry that a total failure seemed probable. In order to save the crop, a barrel was mounted on a cart, drawn by one horse. This barrel was provided at the bottom with a twin nozzle and hose on each outlet, long enough to almost reach the ground. The barrel was filled with water at a lateral pipe line which ran into the field, and was then driven through the rows, watering two rows at a time. This procedure was somewhat slow, and required one man and two boys, but the value of the crop was at stake, and, hence, was a successful method, since it saved what would otherwise have been a severe loss.

There was one other factor which made conditions on the farm adverse, and that was the surrounding social community. That vicinity was worked by small farmers of the proverbial type, uneducated, unscientific, going by traditions, and resenting an "outsider" who came in with new and modern ideas. This state of affairs made it hard to get help of any kind and made the social life there much more unpleasant for Mr. Schwarz than it should have been.

As was stated in the beginning, this is not the history of an ideal market garden—one that should be held up as an example to beginners of what the business should be, but of one that was remarkably successful under existing conditions—one that should be pointed to as an illustration of what may result from untiring energy, firm belief and knowledge to work intelligently in spite of tremendous odds.

Notwithstanding the physicians' discouraging prediction, Mr. Schwarz lived on his farm for thirty-four years, where he finally died from heart trouble, after one of the most interesting of agricultural careers.

The President.—We are certainly indebted to our young friend for this most excellent address. He has made several things very clear to us. In the first place, when the doctor says you are going to die, don't do it, but stand on your feet as long as you can, and prove him a false prophet. Another thing, I understand Mr. Schwarz was original. No man in the horticultural business can be a copy. He must be original, and follow out his own plans. Another point is, that the market gardener and the fruit grower must be a business man. Mr. Schwarz was a business man, and applied business methods to his farm. I am sorry that we cannot devote any more time to this subject. We will now spend a little time in discussing the Lafean Apple Package and Grade Bill.

The Secretary thereupon read the following paper prepared by Mr. Edwin C. Tyson, who represented this Association at Washington, D. C., last winter, and assisted in drafting the present bill:

THE LAFEAN APPLE PACKAGE AND GRADE BILL.

EDWIN C. TYSON, *Flora Dale, Pa.*

Mr. President and Members of the State Horticultural Association: You have, I think, very properly regarded the "Lafean Apple Package and Grade Bill" as of sufficient importance to justify placing it on your program. It undoubtedly deserves the careful consideration of Pennsylvania Fruit Growers.

The "Apple Package and Grade Bill" was re-introduced in the House of Representatives on the 5th inst. by the Hon. D. F. Lafean, representing the twentieth district of Pennsylvania, and was at once referred to the Committee on Agriculture.

The reintroduction was desirable because of some changes which have been made during the past summer and to eliminate some points, whose constitutionality were in doubt. These changes and eliminations were made by Mr. Geo. P. McCabe, chief solicitor of the Department of Agriculture, at the request of the committee having the matter in charge. Mr. McCabe *also* rearranged the main features of the bill with the view of placing it in harmony with the spirit of the "Pure Food" law, under the regulations of which act it is proposed to have the provisions of the present bill administered.

After designating a "Closed Package for Apples" as one in

which the apples cannot be readily seen or inspected, the bill proceeds to specify what shall constitute a "Standard" barrel, a "Standard" box, and a "Standard" basket, for use as a "Closed Package for Apples" when entering into "Interstate and Foreign Commerce."

The "Standard" barrel is described in terms of *MINIMUM* linear dimension as follows: *length of stave,* twenty-eight and a half inches; *diameter of head,* seventeen and one-eighth inches; *distance between heads,* twenty-six inches; *external circumference at the bilge,* sixty-four inches. These dimensions are in harmony with the best practice among reputable apple growers in the United States and conform exactly with recent legislation in New York State.

The *necessity* for legislation on this point is apparent when it is stated that thousands of "Snide" barrels, if you will permit the term, have been coming to our principle markets. These barrels were made with "*short*" dimensions, *deliberately,* by the coopers to meet a demand of dishonest growers, packers, and dealers, for a cheap package. There was not necessarily any deceit on the part of the coopers, as the purchasers, for the most part, knew exactly what they were getting. They *wanted a small package* because they could save from a peck to a half bushel on every barrel, *and they got it.*

As the lowest price rules the market, and as the ordinary buyer was not able to distinguish the slight external variation in size, he naturally was willing to pay *no more* for the standard barrel than for the dishonest one, the quality of the fruit being the same.

The result was that the price which the dishonest man was *willing to take* for two and a half bushels became the price which the honest grower *had to take* for his three bushels, thus forcing the latter to practically *give away* the difference in quantity in order to sell his barrel.

This state of affairs became of such real and vital importance to the better class of New York growers that they finally passed the State law referred to above, which is working out satisfactorily. There is a suit pending in New York now, the decision of which hinges on this law, the amount involved being about twenty-five thousand dollars.

Bear in mind, however, that this New York law, does *not* prevent these "short" packages finding their way into Pennsylvania markets in competition with your fruit. Therein lies *our* interest in a National law which seeks to prevent the shipment of dishonest packages across State lines.

The "Standard" basket and the "Standard" box are both designated by this act in terms of capacity, namely, 2,342 cu. in. in each case, when measured level full, without distention of their parts.

The apple growers and handlers who were in attendance at the conference held in Washington last winter for the purpose of deciding upon the various provisions of this bill, desired to have the act designate and legalize a box and a basket of such capacity that three of them, when level full, would hold exactly enough apples to fill a barrel sufficiently to make a good tight pack when the head was forced into place, and inversely, that a barrel of apples should pack three boxes or three baskets.

It was shown by actual physical demonstration, during the conference, that three Oregon boxes of apples purchased in the open market and packed into a New York apple barrel of standard dimensions, lacked at least a half bushel of being full enough to close properly.

The *Eastern* growers in attendance affirmed that the standard N. Y. apple barrel holds three bushels, when the measure is heaped in accordance with what is the usual custom in all parts of the United States where apples and other coarse produce is sold by measure; also, that considerable inquiry over an extended territory east of the Mississippi developed the fact that a four-inch cone represents the usual amount of heaping on a Winchester bushel as practiced by the best growers and handlers; also, that by a simple calculation, this four-inch cone is shown to increase the volume of the Winchester bushel to 2,550 cu. in., which the eastern people held to be the proper capacity for a "standard" box and a "standard" basket designed to hold a bushel of apples when level full.

The western growers contended at that conference, and still insist, that the only "legal" bushel in the U. S. is the Winchester bushel of 2150.42 cu. in., and that if it is desired to legalize a "standard" bushel for apples, the proper procedure would be, to *extend the scope of the Winchester bushel* to cover that and other coarse produce. In other words that the eastern grower should overturn the practice of centuries, and compel his customers to accept a level measure of apples, stricken as is done with wheat and other small grains, instead of following the time honored custom of giving the measure a generous heaping. This, the East very properly declined to consider.

It soon became apparent, as the discussion progressed, that neither section would yield to the other and that a compromise was the only solution. It was finally proposed that inasmuch as the handlers demanded that three boxes should equal a barrel, the cubical contents of a barrel be divided by three and the quotent be regarded as the proper capacity of the box and the basket. It was objected that this was a theoretical rather than a practical solution and that because of the fact that there are more air spaces and therefore more lost room in three small rectangular packages than in one large cylindrical receptacle they could not be expected to hold an equal amount of fruit. However as this seemed to be the only possible manner of getting together a majority agreed to adopt that plan and the quotient referred to, found to be 2342 cu. in., was adopted as the standard capacity of a box and a basket.

There is no question as to the advantage of discarding the many varied sized baskets, which pretend to be alike, and adopting one of uniform capacity so that all may know exactly what is meant by a "standard" basket of apples. Understand, this bill refers to a *covered shipping basket* intended to hold a bushel when *level full* and not to the ordinary bushel basket which will continue to be heaped as usual. The same arguments we have used in favor of an honest barrel apply to the basket with equal force.

In the case of the box the matter becomes more involved. There are even greater variations in dimension than in the case of

either the basket or the barrel. We believe, however, that this variation is a matter of opinion as to what is best rather than a desire to skimp the size of the package.

Oregon and California each have two boxes and Washington and Colorado one apiece, no two of the above being alike. When we come farther east there is no telling how many variations exist. Certain it is, however, that the purchaser of a box of apples is liable to receive any where from 2150.42 to 2550 cu. in. of fruit and the man who furnishes the latter, *which is an honest bushel,* is "throwing in" 400 cu. inches of apples or almost 20 per cent. as compared with the man who uses the smaller size box.

Western growers say that they cannot pack their apples in a different sized package, as they will not fit. When we consider the wide variation between the sizes of the many varieties they grow, much of the force of this argument is lost. We also note that practically all recent reports from the west indicate that they are rapidly abandoning what they term a straight pack and adopting the diagonal method. This admits of much more variation in the size of the package and we believe will enable them to readily use a package of standard capacity. Even if this is not true, they can continue to use their old package if desired, by simply stamping its actual cubical capacity on the outside so that the purchaser be advised as to just what he is receiving.

Do not confuse cubical contents with linear dimension. The bill *does not,* specify *how long, how wide,* nor *how high* the box shall be, *that* point is left *entirely* to the judgment and pleasure of the packer. It *does require* that the box and the basket *shall* contain *either* not less than the number of cubic inches specified or have their actual capacity stamped on the outside.

The permission to use a smaller package than specified, is also granted to the barrel user, provided he stamp the barrel "Short."

The number of cubic inches required for a "standard" box (2342), would heap a Winchester bushel about two inches at the highest point of the cone. Personally I should like to see this requirement raised to at least 2500 cu. in., which would increase the cone to about four inches. The consumer would then receive practically the same amount of fruit whether he bought a closed box or a closed basket, or whether the fruit was measured out to him by heaping the Winchester bushel. And the seller who ships to the market would be on the same footing as the one who hauls his fruit there and measures it out. *A FAIR, SQUARE DEAL ALL AROUND.*

I fear this is only a dream unless the *East* gets very busy. Our advice from the West is that all the Western Associations are preparing to send delegations to fight this bill headed by Mr. Dumas, who fought persistently in favor of the level Winchester bushel at the Washington conference last winter. *What are you going to do about it?* Will you write to your Congressman at once and ask his active support? We need this bill and we will have to work to get it.

In addition to establishing standards for closed packages this bill also seeks to improve the quality of the fruit to be shipped in them.

It does not come out flat-footed and *demand* that fruit be *either packed honestly or kept at home.* I wish it did. Although it is hard work to legislate rogues out of existence.

What it does do is to define a standard of grading to be known as "U. S. Standard" (this will be itemized later). Next it gives every fruit grower in the United States permission to place the mark "U. S. Standard Grade" on the outside of all his barrels, boxes and baskets of apples to be accompanied by the name of the variety contained in the package and his own name and address. It is supposed that this "U. S. Standard Grade" mark will, because of the implied guarantee of the government, cause the particular package bearing it, to be more highly regarded both in domestic and foreign markets and that it will, for that reason, command a higher price. It is also believed that this higher price will promptly stimulate growers to adopt the mark largely, as fruit not so marked will suffer in comparison.

But,—you may say,—how will that help the quality of the fruit in this closed package which cannot be easily inspected. Of course there is no one within these walls who would think of asking his government to guarantee a package into which he had deliberately or carelessly placed the kind of fruit which our friend Collingwood illustrated some time since as having been found in the middle of a barrel of "Fancy Baldwins" but you doubtless know of *neighbors at home* who might do such a trick and you may be sure that this bill has that man in mind when it "solemnly and sincerely declares and affirms" that if one of the "Pure Food" inspectors discovers a package which is not packed "*Straight*" in accordance with specifications, said inspector will see that the rascal is *fined generously* and *continuously* as an example to the rest of us. I am thinking, however, that it will be well for most of us to keep that word "*FINE*" posted in *big black letters* close to the packing table, lest we forget that *our* name and address must *accompany* the government guarantee, and allow that apple which is slightly under size or the one with a scarcely noticeable coddling moth indication of what is inside, to slip in "*unawares.*"

The itemized quality specifications of this "U. S. Standard Grade" are as follows—please note it carefully:

1st. *Apples of one variety, which are well grown specimens.*

2d. *Hand Picked.*

3d. *Of good color for the variety.*

4th. *Of normal shape.*

5th. *Practically free from insect or fungous injury, bruises and other defects, except such as are necessarily caused in the operation of packing.*

6th. *A ten per cent. allowance for error in grading.*

There is a great deal of criticism in the west on account of the 10 per cent. allowance for imperfect fruit. They term it a "Bum" pack, a "Shovel" pack and other endearing titles. I am sorry myself that it is necessary to qualify the other requirements and particularly to the extent of 10 per cent. It seems to me that 5 per cent. should be ample. And yet, when we consider that much of the fruit in this country must be packed by hired help who are too often not

interested in anything but their wages, it is an open question whether, in view of that "*fine*" 10 per cent. is too much. Some writers have considered that it would be used as an excuse to deliberately place in the package ten faulty apples for every 90 good ones. I think this would be very rare and would soon correct itself, for it must be remembered, that *the growers name and address must be marked on the package* and the man who deliberately or even carelessly permitted ten per cent. of faulty fruit to reach the package would soon have a black eye with the trade and no amount of government guarantee would reinstate him. And on the other hand the shipping of a perfect pack would soon bring its own reward in increased inquiry for that man's apples at good prices.

The western growers claim to be packing a 100 per cent. *perfect*, grade of fruit, and demand that this bill should make no allowance whatever in the "U. S. Standard Grade." That is one of the things they will fight for. There is undoubtedly some difference between the box pack and the barrel pack. In a general way they cater to a different class of trade. The increased amount of labor necessary to produce and pack a box of *perfect* fruit makes it imperative that it be sold for a high price, particularly when it must in addition bear the expense of transportation across the continent. A limited class, comparatively speaking, are willing to pay this price if guaranteed perfect fruit. In the case of the barrel, if it is relieved of the extra labor charge which would be necessary in order to *insure absolutely perfect fruit* it can be sold to the large middle and lower class at a reasonable price and at the same time be practically sound under this "U. S. Standard Grade," even the occasionally imperfect specimen being in most cases suitable for some use in the domestic economy. With that view it is possible that two grades should be provided. One called "U. S. Standard Box Grade" and the other "U. S. Standard Barrel Grade," the box grade to have no allowance for imperfections.

This act also specifies three sizes of the Standard Grade fruit to be known as "Size A," "Size B," and "Size C." All fruit of the standard grade 2½ inches in diameter and over, to be known as "Size A." If the minimum size is 2¼ inches "Size B," and as "Size C," for a minimum of 2 inches. These sizes to be marked on the package and become part of the brand with which the contents of the package must correspond.

I am sorry to see three sizes specified. Two are certainly sufficient and none should be as low as 2 inches. The third size was included at the request of the gentleman from western New York, who said that many growers there have old Baldwin orchards standing in sod. He stated that these old orchards bore heavy crops of small fruit, running as low as two inches, which the owners wished to market. I think the point is not well taken. A two-inch Baldwin certainly can not be considered a well-grown specimen. I am of the opinion that it would be a kindness to those growers to exclude their small fruit from the "U. S. Standard Grade," and encourage them to prune, fertilize, cultivate and spray so as to produce fruit of a better size, better color and certainly therefore of better flavor.

I am in favor of abolishing the "Size C," thus making 2¼ inches the smallest size allowable. If there are a few small growing sorts which good orcharding will not produce over two inches, and which otherwise deserve a place under the "U. S. Standard Grade" then it would be better to specify that those varieties only should be admitted under the "Size C," rather than open the door for the admission of runty specimens of large growing sorts.

We have now considered the packages and the grades as included in this bill. The package regulations affect every one who ships apples across state lines, which is right. The grading rules affect *only those who elect to make use of them* which is all right *as far as it goes.* But how about the vast number of growers and packers who do not elect to make use of the grade mark? This class will include most of the rascals. What is to hinder their continuing as in the past to pack fruit dishonestly. It will be sold low to poor people and to those in moderate circumstances; some of it will find its way through attractive facing, into better class of homes but will prove a disappointment and loss wherever it goes. *What recourse has the consumer?* What is the remedy? *Is there anything we can do* as a society to improve these conditions for the consuming public and incidentally improve the reputation of our business, which in the end can only mean better markets, better demand and better prices. I think so, at least we can try. I believe the remedy is right in this Lafean Bill. I have always contended that the bill should go a step farther and take cognizance *not only of the fruit,* which a few growers, comparatively speaking, *elect* to pack under the standard grade provided by this act, but *of all fruit shipped across state lines* or into foreign countries. There need be no complicated specifications. A section added to the bill as follows would cover everything:

"*All closed packages of apples* entering into interstate or foreign commerce *must bear the name and address* of the packer or the party in whose interest the packing is done. If the packer attaches any statement, design or device intended to indicate the character or quality of the contents such statement, design or device shall be regarded as a brand with which the contents must correspond in accordance with the "Pure Food Law." In case of no external qualifying statement the "face" of the package shall be regarded as the packers statement of the character of the entire lot, and therefore a brand to which the balance of the contents must conform."

I believe very few indictments would be found necessary. The *necessity of placing his name and address on the package* would cause almost any man to hesitate and do a lot of thinking before placing fruit inside which would render him liable to prosecution. It is true, as stated before, that you cannot legislate honesty into a man, but as most dishonest men are moral cowards I am sure a regulation of this kind in the hands of the pure food people would have a very beneficial effect. I sincerely hope that it can be brought about. To repeat, WHAT ARE WE AS A SOCIETY GOING TO DO ABOUT IT?

The President.—We shall be glad to have Mr. Case tell us what the New York growers think about this bill.

Mr. Case.—All I can say is, that we had this matter up at the annual meeting of the New York Fruit Growers' Association, and after considerable discussion, they passed a unanimous resolution endorsing the bill. There were very few people opposed to it. Mr. Schaffer, representing the Apple Shippers' Association; Mr. Hayes, representing the Fruit Growers, and Mr. Mann, representing the Western New York Horticultural Association, were all very much interested.

I will have to leave now to take the train. I thank you very much for inviting me down here, and feel that I have been very well received. I have learned a lot of things, and they are all of value.

We are going to have the eastern meeting of the Fruit Growers at Poughkeepsie in February, and if any of you can see your way clear to attend that meeting, I think I can safely promise you a really good time. I thank you.

Mr. Eldon.—I think this is a matter that is of very much concern to us. It was my pleasure to attend a meeting of the growers, shippers and handlers at Washington, and I heard there much that is brought out in the paper of Mr. Tyson. Mr. Edwin C. Tyson knew more about it than the rest of us, and I am sure he advanced a very able argument for the passage of the bill. It is a fact that the apples grown in this country, with the exception of the apples grown in the west, are very much under standard in foreign markets, and very much under standard in our own markets. Our barrels offered to Europe are often turned down. As an example of what our home market gets, one of our members placed a package here, taken from what is said to be first class packing, and it is the same thing that other consumers face when they buy a barrel of apples without being able to see their purchases. I am going to open this package. It was taken from a barrel of good apples, bought by a gentleman whose word has always been known to be good. Mr. Fenstermaker is the man who gave this package to me, and these apples were bought in barrels, a car load of them, from Wayne County, where they were grown. (Empties on the table a lot of miserable small and defective apples.)

Now, Mr. President, I do not come from that particular county; I come from Adams County, and I know there are just such cases in Adams County. The man who bought the principal crops in Adams County, found when the fruit got to New York, that in one case the middle of the barrel contained just such fruit as this, and when it was investigated, it was found that they came from a man who had one of the most profitable orchards in Adams County. Now, that is no better than stealing. Now, Mr. President, there are some growers in Adams County that are determined to reach this offense by law, and I therefore move that we endorse this bill.

The President.—I have always thought that if the man's name was on the package, it would do away with these things, but in this

case it does not. I had a friend from Ohio in my orchard this fall, and I asked him whether they had any Pennsylvania apples in their markets; he said that they had formerly had, but they found that while the top of the barrels was all right, the bottom was so mean, that they fought shy of Pennsylvania apples this year. I asked him from whom he bought these apples and he mentioned the name of a man who is a member of our Society. This simply emphasizes the fact that we must do something.

Mr. Eldon.—I offer this motion: That the Pennsylvania Horticultural Society endorse the Lafean bill in all its parts, and also the additional suggestions of Mr. Tyson, in the most emphatic manner.

A Member.—I have not heard the reading of the entire bill, but I should like to know whether it covers the re-packing of the fruit by the commission merchant?

The President.—The last person who packs that box is compelled to put his name on it.

The Secretary.—Further than that, Mr. President, the same rule that applies to food stuffs, applies in this case also.

Mr. Lewis.—I was not in the room when the bill was read, but may I ask, does it prevent the repacking of a package, and fixing it up? I believe there are authentic cases where it has been done.

The President.—I believe, in such cases, the packer must present proof through his own packing house, that this was tampered with. How could they have gotten in by re-packing if they were not in, in the first place?

The Secretary.—I heard Mr. Fentermaker say that these apples were shipped in a barrel from the man who grew them to the man who bought them.

A Member.—I am from Wayne County, and I might say that the man whose name appears on the package is not a grower, but a buyer.

The Secretary.—These are the people that are making us the most trouble—men without principle and with no good reputation to lose.

Having been properly moved and regularly seconded, the motion was unanimously carried, and the bill is endorsed in all its parts.

The President.—The Constitution says that the Executive Committee shall decide on the place of meeting, but we want to know, in the first place, whether we want to hold a summer meeting. I would like to put the question. Our last summer's meeting

was an excellent one for those of us who were there. Shall we hold another next summer?

Mr. Eldon.—Our Secretary gave us a report of the summer meeting. I was not there because I could not get away from my work at that time, but that has nothing to do with other people's enjoying themselves. I think he also reported it a financial success, because there was some money left over. I therefore move that we hold a summer meeting, provided the Executive Committee can work out the details of it.

The President.—We have one invitation, but not the same offer to pay part of the expenses of going out there. I think the meeting last summer did a great deal of good. Erie County has been apart from the State for many years. They are pretty close to New York, and they grew to feel that the work being done in agriculture and horticulture and by the Experiment Station was not for them—that we had no interest in them. Our meeting up there last summer went very far towards changing that feeling. They seem now to feel that they are a part of Pennsylvania, and that we care something for them, and it seems to me that if we go where we are not known, we can gradually get the whole State to join our Association, and that is what we want. I think that the motion giving the Executive Committee authority to arrange the whole matter, is an excellent one. What shall be done with it?

This motion was properly seconded and carried.

The President.—Now, is there any one that wants to give us an invitation? We have one from Mr. Wertz, of Waynesboro. He says we can very easily hold our sessions in Waynesboro, where there are good hotels, and which is within easy reach of some six or eight large orchards. The time would be about the first week in August. I don't know whether the committee will decide that it is possible to go there. Now have we any other invitations? If not, the matter will rest there. The matter of fixing the place for the annual meeting will also be left to the Executive Committee, and the Society notified.

We will now stand adjourned until 7.30 this evening.

THURSDAY, JANUARY 13, 1910, 7.30 P. M.

President Hiester in the Chair.

The President.—The first number on the program this evening will be a talk on "Celery Culture," by D. W. Hull, of Waymart, Wayne County.

CELERY CULTURE.

By D. W. Hull, *Waymart, Pa.*

Mr. President, Fellow-Members of the State Horticultural Association, Ladies and Gentlemen: To say that I feel it a great honor to be asked to talk to you is stating it very mildly. I have never talked to an audience of farmers, except to a few neighbors, when we meet as neighbors will. So I would like, to-night, to use the broader definition of "neighbor" that Christ gives, and that will include us all.

Perhaps I should say that I am not a market gardener in the sense that our President used the word, although probably we started in on that line. At this time we are celery specialists. I might say that the reason we are able to make a profit out of celery is because it receives our main time and attention; it is first with us. Now, we have about three acres each year of this, which brings us in quite a good deal more than our other 190 acres, and this is pretty good land too, as our meadows yielded over three tons hay to the acre this last season. But the celery has not only been the main support of Hull Brothers, but is enabling us to set the rest of the farm to apples and peaches. This three-acre plot is a renovated swamp, drained about right for celery muck, but not quite enough for other crops.

The Secretary.—Did you tile it?

Mr. Hull.—No; we don't use tile drains. The muck ground is so nearly level that we are afraid they would fill with the soft soil, or our horses might get them out of line, if they should sink in over the drain. In wet times we have to use mud-shoes on team, and to be sure of good drainage, we use open ditches; cleaning them out anew each spring.

We began celery growing by renting four acres of partly developed muck ground, but it was eighteen miles from market, and seven from nearest station, while we were very inexperienced; so we about bankrupted the first two years. But the next two we gained a little, so were able to bring to Waymart a team of mules and some over $200.00.

I think it was the last year on this rented plot that we raised a small patch of celery which gave us an idea of its possibilities. It was where a small celery shed had been the fall before, and the roots, refuse, etc., from the celery cut there, and had been spread over this, making the yield seem wonderful to us. Amounting to the rate of nearly $2,000.00 per acre on a small spot. This proved its possibilities, if we could only supply fertilizer in a wholesale way that would grow the celery as the celery-refuse did.

But at Waymart we gave notes for over $9,000.00, while we were only worth about $500.00, so we felt too poor to buy fertilizer for a few years. About this time my brother was very sick with smallpox, which cost us so heavily that we felt we needed to make strenuous efforts, so we fertilized celery and early cabbage

much more than ever before, and in the fall we were better off than we had been any season yet, for all of our heavy expenses. So since then we have kept increasing fertilizer on celery.

Our main crop is Golden Self Blanching, which we start in a couple of small green-houses, built quite cheaply and heated by stoves. The seed is bought fresh each year from Henderson, because we think the new seed produces the most vigorous plants. This is sown in rows three inches apart with a "Eureka" drill, which is about right for greenhouse work, but the plow and coverer are taken off, so we can just barely cover the seed by sifting fine soil very lightly over the benches. We commence sowing about March 1st, finishing about March 20th. Our greenhouse soil is made up of loam, muck, sand, fine siftings from coal ashes, and manure. We do not sterilize it, because we believe the sun does during the summer, when it gets so dry and hot, so we just add humus in the shape of muck and manure, and use year after year. We fertilize with about 600 lbs. of Bone Meal, and nearly as much wood ashes, on nearly 2,000 sq. ft. of glass.

We try to get the soil in the benches just as level as possible, because if any higher spots are left, the water will run off of them, leaving bald spots, because celery seed must have plenty of moistrue or it won't germinate. After leveling and packing, the soil is saturated with all the water it will hold, seed sown, covered, then calico curtains are stretched on wires about six inches over the beds. Calico proves better than anything lighter or heavier; and if it should be of a blue shade, we dye it red, because red will let the chemical rays of the sun through, while blue will not.

We do not let these beds get at all dry, yet because of the curtains, we only have to water a little before they are up, which is two or three weeks. The curtains are removed as soon as plants are up, and as soon as they are large enough to grasp, we commence thinning to about one-half inch in the row, aiming to have 100 plants per sq. ft.

Broadcast sowing is just as good, only but few men can thin as fast that way. The ground is kept stirred around them, and if the plants are too yellow, we water less, or if too dark green, it shows that they need more water. If not growing fast enough, we water with nitrate water, but we dilute this quite a good deal.

When plants are four inches high we clip them so they will make a stockier growth, and also a better root system. Clipping two or three times. About two months from time seed is sown, we try to set in the field, but we have to be careful and not set too early, because if they freeze much before the roots are established, it will kill them.

We plow this muck in the fall, if possible, and then in the spring cutaway it well, making it just as fine as possible. Fourteen per cent. dissolved rock is then spread on with shovels from a stone-boat, using eight tons on the three acres. This is acmed in well, then a little over half a ton of muriate of potash per acre is sown on by hand.

The Secretary.—Do I understand you to say that you use half a ton of potash per acre in addition to nearly three tons of phosphoric acid?

Mr. Hull.—Yes, more than half a ton; about two tons on the three acres. Our experience has been that the more fertilizer we put on, the better our celery will be. We have not reached the limit yet, and the celery is worth ever so much more per acre than the fertilizer is. Celery is nearly all water, anyhow, and we leave the roots in the ground, which contain most of the fertility in the plant. We neglected to have enough potash put on in 1908, and that year we lost $800.00 or $900.00 from heart-rot, but keeping too closely shut up in our newly built celery-house also favored the rot considerably. We find that when we use plenty of potash, our plants, of any crop, will be so much healthier. I believe it is because potash has such a large part in enabling the plant to get carbon from the air, and this carbon should be half of the solids, but if potash is lacking, so a normal amount of carbon can not be used, why the plant will use nitrogen to take the place of some of the carbon.

Now we know how carbon resists decay, because the lower ends of fence posts are often charred to make them keep better, and we know that in any process of decay, the nitrogen is by far the most active.

After the muriate is sown, the soil is planked, weighting the planker enough to give the right firmness for setting, as we want the plants well pressed in the soil, without pushing them down so the heart will be at all covered.

Our rows are laid out three feet apart, with lines, generally running a light wheel-marker beside the line, so it can be taken out of way. If soil is not moist enough, we run a stream of water along the mark, putting the water in a straight line, as the setter follows the water-line. The water is close by in the ditches. The plants are clipped just before setting, so as to have less top to evaporate moisture while the roots are getting established.

The Secretary.—Cut them pretty close?

Mr. Hull.—About one half, and then we take them up with all the soil clinging to the roots that will, but we do not puddle. Perhaps we ought to, but we keep the roots wet. These plants are set about five inches apart, but we find that set at four they seem to grow as large as farther apart. We use two fingers of one hand as dibber, while other hand places plant, both hands packing it. If ground is in nice moist condition, we can set quite fast. Sometimes set in the rain with oil suits on. My brother is the fastest setter I know of, and in good setting, can set one thousand plants an hour.

Mr. Garrahan.—What time do you plant these plants in the field; in April?

Mr. Hull.—No; not as early as that; we generally commence the first week in May. You see we have to guard against the frost.

Mr. Garrahan.—Do you ever have any trouble with their growing to seed?

Mr. Hull.—Yes; in 1907 I think we lost nearly a thousand dollars worth. But we raised $3,000.00 worth that year for all of this set back, and to make a good profit with a loss from some source makes us feel safer than to make the same profit, but with no bad luck.

As soon as the plants are set, about thirteen hundred pounds of dried blood to the acre is strewn along very close to the plants, so the roots can reach it. And as soon as the roots start a little, we commence putting on nitrate of soda, but at first, very carefully, having it pulverized well, and putting only a very little along within reach of the roots, but trying not to get it on the plants, as it will burn. We have found that small plants can only stand a little of this without a setback. We repeat the nitrating every ten days, increasing the amount as the plants get larger.

Mr. Engle.—Do you apply it by hand?

Mr. Hull.—Yes; I don't know of a machine that will do it thoroughly enough, and we want to know that it is on all right, so as to give all of the plants the very best start.

The President.—How much nitrate do you use in a season to an acre?

Mr. Hull.—About the same amount as we do of muriate, or about two tons on the three acres. This is all the fertilizer we use, excepting that every two or three years we lime it, putting on about a ton per acre. We think that using so much acid phosphate is apt to sour the soil.

Of course we try to keep the soil loose around the plants all the time, keeping the weeds down, and holding the moisture in the soil by an earth mulch. If not too wet, we cultivate with a horse, some, and we use wheel-hoes quite a good deal. We hand hoe with small, well sharpened hoes, always keeping the soil as nearly level as possible. Sometimes, if it should be wet, and impossible to kill weeds on this rich, moist soil, before they would ripen their seeds, why we carry them off; sometimes taking off a hundred bushels or more, and putting a good deal of it around our mulched apple trees next to celery plot.

As soon as the earliest is fifteen inches high, we put boards on it, using hemlock about a foot wide. We fasten them up with hooks made of No. 9 unannealed wire, with ends cut off sharp, and long enough so the boards can have about five inches between them. Hooks are put on diagonally to bring boards closer together if celery is lighter, as at first blanching. We use one hook for each pair of boards, putting it on about three feet from end of boards, and then

the next set are pushed one inch or so inside of those just hooked. By lapping thus, instead of butting, the boards are held up firmer, and light cannot enter at the ends. A little soil is then hoed up along the lower edge of boards to keep the light from getting under. Boards are kept on from nine to twenty days, according to weather, etc., and cut with pruning knives; trimming root all off, with square cut on the end. In warm weather this is washed in cold well water, so as to cool it well, and in warm water in freezing weather, so the celery will stand longer without cooling.

We tie in round bunches, originally with three plants in a bunch, but lately our celery has been so large that we tie very many with only two, and perhaps two hundred plants this year each went as a bunch, by just tying a string around the top. Of course we try to put uniform weight in each bunch. We tie with jute twine, but have thought of using tying ribbon, with our name printed on it. We plan to do this, because some have tried to trim and tie as we do. Most of this is sold from the wagon in Carbondale and Honesdale, right to grocers and retailers of green stuff. Yet, quite a lot is shipped to near by towns, mostly f. o. b. Waymart.

In trimming we are quite careful to take all of the green stalks off, because it pays better to keep it home.

A Member.—Have you any way to utilize the waste celery?

Mr. Hull.—Only as fertilizer; last year, 1908, quite a lot of celery rotted in the storehouse, and we were a little afraid to put it back on the celery ground, so put it around our apple trees near by, and they appreciated it very much. Yet where we put a little of the heart-rot refuse on the celery plot, for a test, we had no rot this last season.

Our main variety is Golden Self Blanching, but we did not think it was quite what we wanted for storing, so we tried about seven different sorts and strains last season, and got badly fooled on one of them. This sort was claimed to be better for early too, so we sowed nearly an ounce in the greenhouse, but it amounted to about nothing.

A Member.—What variety?

Mr. Hull.—Silver Self Blanching from Henderson. We also tried it in the later sowing outside, but the plants amounted to nothing from there either, although with the very same care as the others had. Am quite sure we tried this variety when it first came out, and thought it about like White Plume?

The Secretary.—Could you not conclude that it perhaps does not like muck land?

Mr. Hull.—Possibly, yes.

Mr. Garrahan.—It is not a very good variety, anyhow.

Mr. Hull.—No, I don't think so, but it sort of puzzles us why it would be sold, or if the seed last year was all a failure? We wrote the seedsmen about it, so as to get light on it, but they have not answered our last letter. Perhaps we will have to change our method of using new seed, and always testing it a year ahead, so as to be sure it is all right. A writer in Marker Growers' Journal criticized Prof. Watts a little for reporting our way of sowing new seed this way, saying that it was an unsafe practice, but we felt that if we got the best French grown seed, we were safe, but of course this was of the Golden Self Blanching. Will go very carefully on new varieties hereafter, but all of the other sorts did as they should this season.

The celery that we blanch in storage is cut loose with a spade, outside stalks trimmed off a little, with some soil left on the roots, taken to celery-house, set on the rather moist dirt floor there, trying to have it stand as upright as possible, placing the plants close together, but trying to not pack the tops too much. We want air to circulate among the leaves as much as possible, so as to take up all the moisture from them that can be. This house is 50 by 150 feet, with double concrete walls, about five to six feet high. Rafters are eight inches wide, and flooring is nailed on under side; this space is packed with straw or hay, with iron roof over it. The gables are double too, and north one is packed. A ventilator all along the peak a foot wide, has double doors; the large ventilators at the ends are double too, and so are the windows. But the doors are single, yet with air-space. Ought to put in double doors too, and will, we think.

This house will hold from $1,500.00 to $2,000.00 worth, and is very satisfactory. Cost nearly $3,000.00. Is so much better than temporary shed made of blanching boards; then we need the boards yet for outside blanching when they are needed for the shed. And then the damage to the boards is quite an item, when tearing down, and the time building and taking down each year cost quite a good deal too; so we are well pleased with our house, and with a fire keep it from freezing when below zero.

As to results: In 1907 we sold a little over $3,000.00 from this three acre plot; in 1908, between $3,400.00 and $3,500.00, and last season will be as much as 1908. And none of these years was a full crop, as first so many grew to seed, then the heart-rot, and lastly the Silver Self Blanching that would not grow, the loss each year amounting to from $800.00 to $1,00.00.

The Secretary.—Do I understand that these are the net figures?

Mr. Hull.—The gross receipts, out of which the labor and fertilizer must be taken. If any expressage has been paid, it has been deducted. We will try to grow $5,000.00 worth from this field.

Mr. Garrahan.—How many years do you think you can grow celery on this same land?

Mr. Hull.—It seems to grow better each year; we do not have any disease this year; possibly a tenth of one per cent. rust, and the same amount of blight.

The Secretary.—What do you know about the expense?

Mr. Hull.—It is about half, I guess. We are thinking of keeping an account of labor, so that we will know exactly.

Mr. Garrahan.—What other variety do you like after the Golden Self Blanching?

Mr. Hull.—Columbia is about the best. We have Golden Heart and Golden Dwarf following this, but it is too late for us. We have tried White Plume in place of Golden Self Blanching, but our customers like the latter better, and so do we.

Am quite sure we had plots of Golden Self Blanching last season that yielded $1,000.00 to the half acre, because our two acres of this, yes, less than two acres, yielded over $3,000.00, and we had an ounce of this seed from Burpee that was extra fine. Oh, there is a wonderful possibility in seeds! And celery seed increases a thousand fold, financially, so *good* seed could easily be worth $100.00 a pound more than a poor strain of seed.

Now the main value of these very large plants, ones that we get 10 cents for wholesale, is the possibilities they teach. It simply proves they can be grown, and that if we get the conditions on a whole field as the conditions are for those individuals, why the whole field will be as large. This would yield at the rate of $4,000.00 per acre.

But my brother and I both honestly think that celery does not pay any better than any other crop under like conditions,—that is, favorable soil, market, etc., and that we don't know as we would care to go through the experience we have in growing celery, knowing it as we do now. We might have taken up fruit growing, because naturally, I think, we like that better. Perhaps I should turn this around and say that we think any other crop will pay as well as celery, if the same care and also favorable conditions are furnished it.

Would advise any new beginner to go slowly, carefully and thoroughly with celery, because it won't stand carelessness; but if it is quite well understood, it does not seem to be a fickle grower. I should say that we put rows two and a half feet apart where we expect to store it, because it seems to grow as well. But this distance is rather close when we come to hoe the dirt up to the bottom of the boards in blanching. And we like to put lime on in the fall, because it is better not to have it come too much in contact with the acid phosphate, as the lime tends to make the phosphoric acid insoluble.

The President.—We will now take up the next number on the program—an illustrated lecture on "Experiments with Cabbage and Tomatoes," by Prof. C. E. Myers of State College:

EXPERIMENTS WITH CABBAGE AND TOMATOES.

Prof. C. E. Myers, *State College, Pa.*

The Department of Horticulture of the Pennsylvania State College and Experiment Station is making an exhaustive study of the three leading truck crops, viz.: cabbage, tomatoes and asparagus. The work includes seed selection, methods of culture, fertilization, variety and strain tests. Of these the strain tests are considered the most important.

In order that I may give a somewhat definite idea of the work I shall discuss each of the crops in order.

Cabbage.

It is generally conceded that cabbage is the leading as well as one of the most profitable of the truck crops. It can be grown with comparative ease, and on a wide range of soils. To secure best results, however, the soil should be well drained, yet of large water holding capacity, and possess an abundance of readily available plant food.

In discussing the culture of cabbage it is well to take note of the general character of the plant. We note that the leaves are the essential part of the plant from the market standpoint. We also know that nitrogen is the element of plant food so essential in the development of that part of the plant, hence the need of an abundance of this element in the soil. Director Patterson of the Maryland Experiment Station has shown that ninety-eight and one-half per cent. of the cabbage head is water. Thus for every ton of cabbage sold we actually sell nineteen hundred and seventy pounds of water.

In order to secure and maintain a soil in a condition best adapted to the successful development of the cabbage plant the method of soil management previous to the planting of the crop as well as after it is planted is an important consideration.

We have already seen the importance of water to the cabbage crop. Experiments have proved that most of the water utilized by the growing plant is not that which falls during the growing season, but is the water that has been collected during the preceding months and held in the subsoil until the plant is ready to utilize it. We have also learned that the best way to collect and hold this water is by having the soil rich in humus, by plowing as early in the spring as possible, and by maintaining a surface mulch on the soil to prevent loss by evaporation. Experiments conducted at the Wisconsin Experiment Station have shown that in the spring when the soil is wet, when its texture is close from the packing which has resulted from the winter snows and early spring rains, the loss of water is very rapid and may exceed twenty tons per acre daily, and this loss may extend to depths of more than four feet. Another experiment showed that when a piece of corn ground was plowed on April 28 and sowed to oats but little water was lost during the week which followed, while an adjoining unplowed strip only ten feet

the next set are pushed one inch or so inside of those just hooked. By lapping thus, instead of butting, the boards are held up firmer, and light cannot enter at the ends. A little soil is then hoed up along the lower edge of boards to keep the light from getting under. Boards are kept on from nine to twenty days, according to weather, etc., and cut with pruning knives; trimming root all off, with square cut on the end. In warm weather this is washed in cold well water, so as to cool it well, and in warm water in freezing weather, so the celery will stand longer without cooling.

We tie in round bunches, originally with three plants in a bunch, but lately our celery has been so large that we tie very many with only two, and perhaps two hundred plants this year each went as a bunch, by just tying a string around the top. Of course we try to put uniform weight in each bunch. We tie with jute twine, but have thought of using tying ribbon, with our name printed on it. We plan to do this, because some have tried to trim and tie as we do. Most of this is sold from the wagon in Carbondale and Honesdale, right to grocers and retailers of green stuff. Yet, quite a lot is shipped to near by towns, mostly f. o. b. Waymart.

In trimming we are quite careful to take all of the green stalks off, because it pays better to keep it home.

A Member.—Have you any way to utilize the waste celery?

Mr. Hull.—Only as fertilizer; last year, 1908, quite a lot of celery rotted in the storehouse, and we were a little afraid to put it back on the celery ground, so put it around our apple trees near by, and they appreciated it very much. Yet where we put a little of the heart-rot refuse on the celery plot, for a test, we had no rot this last season.

Our main variety is Golden Self Blanching, but we did not think it was quite what we wanted for storing, so we tried about seven different sorts and strains last season, and got badly fooled on one of them. This sort was claimed to be better for early too, so we sowed nearly an ounce in the greenhouse, but it amounted to about nothing.

A Member.—What variety?

Mr. Hull.—Silver Self Blanching from Henderson. We also tried it in the later sowing outside, but the plants amounted to nothing from there either, although with the very same care as the others had. Am quite sure we tried this variety when it first came out, and thought it about like White Plume?

The Secretary.—Could you not conclude that it perhaps does not like muck land?

Mr. Hull.—Possibly, yes.

Mr. Garrahan.—It is not a very good variety, anyhow.

Mr. Hull.—No, I don't think so, but it sort of puzzles us why it would be sold, or if the seed last year was all a failure? We wrote the seedsmen about it, so as to get light on it, but they have not answered our last letter. Perhaps we will have to change our method of using new seed, and always testing it a year ahead, so as to be sure it is all right. A writer in Marker Growers' Journal criticized Prof. Watts a little for reporting our way of sowing new seed this way, saying that it was an unsafe practice, but we felt that if we got the best French grown seed, we were safe, but of course this was of the Golden Self Blanching. Will go very carefully on new varieties hereafter, but all of the other sorts did as they should this season.

The celery that we blanch in storage is cut loose with a spade, outside stalks trimmed off a little, with some soil left on the roots, taken to celery-house, set on the rather moist dirt floor there, trying to have it stand as upright as possible, placing the plants close together, but trying to not pack the tops too much. We want air to circulate among the leaves as much as possible, so as to take up all the moisture from them that can be. This house is 50 by 150 feet, with double concrete walls, about five to six feet high. Rafters are eight inches wide, and flooring is nailed on under side; this space is packed with straw or hay, with iron roof over it. The gables are double too, and north one is packed. A ventilator all along the peak a foot wide, has double doors; the large ventilators at the ends are double too, and so are the windows. But the doors are single, yet with air-space. Ought to put in double doors too, and will, we think.

This house will hold from $1,500.00 to $2,000.00 worth, and is very satisfactory. Cost nearly $3,000.00. Is so much better than temporary shed made of blanching boards; then we need the boards yet for outside blanching when they are needed for the shed. And then the damage to the boards is quite an item, when tearing down, and the time building and taking down each year cost quite a good deal too; so we are well pleased with our house, and with a fire keep it from freezing when below zero.

As to results: In 1907 we sold a little over $3,000.00 from this three acre plot; in 1908, between $3,400.00 and $3,500.00, and last season will be as much as 1908. And none of these years was a full crop, as first so many grew to seed, then the heart-rot, and lastly the Silver Self Blanching that would not grow, the loss each year amounting to from $800.00 to $1,00.00.

The Secretary.—Do I understand that these are the net figures?

Mr. Hull.—The gross receipts, out of which the labor and fertilizer must be taken. If any expressage has been paid, it has been deducted. We will try to grow $5,000.00 worth from this field.

Mr. Garrahan.—How many years do you think you can grow celery on this same land?

Mr. Hull.—It seems to grow better each year; we do not have any disease this year; possibly a tenth of one per cent. rust, and the same amount of blight.

The Secretary.—What do you know about the expense?

Mr. Hull.—It is about half, I guess. We are thinking of keeping an account of labor, so that we will know exactly.

Mr. Garrahan.—What other variety do you like after the Golden Self Blanching?

Mr. Hull.—Columbia is about the best. We have Golden Heart and Golden Dwarf following this, but it is too late for us. We have tried White Plume in place of Golden Self Blanching, but our customers like the latter better, and so do we.

Am quite sure we had plots of Golden Self Blanching last season that yielded $1,000.00 to the half acre, because our two acres of this, yes, less than two acres, yielded over $3,000.00, and we had an ounce of this seed from Burpee that was extra fine. Oh, there is a wonderful possibility in seeds! And celery seed increases a thousand fold, financially, so *good* seed could easily be worth $100.00 a pound more than a poor strain of seed.

Now the main value of these very large plants, ones that we get 10 cents for wholesale, is the possibilities they teach. It simply proves they can be grown, and that if we get the conditions on a whole field as the conditions are for those individuals, why the whole field will be as large. This would yield at the rate of $4,000.00 per acre.

But my brother and I both honestly think that celery does not pay any better than any other crop under like conditions,—that is, favorable soil, market, etc., and that we don't know as we would care to go through the experience we have in growing celery, knowing it as we do now. We might have taken up fruit growing, because naturally, I think, we like that better. Perhaps I should turn this around and say that we think any other crop will pay as well as celery, if the same care and also favorable conditions are furnished it.

Would advise any new beginner to go slowly, carefully and thoroughly with celery, because it won't stand carelessness; but if it is quite well understood, it does not seem to be a fickle grower. I should say that we put rows two and a half feet apart where we expect to store it, because it seems to grow as well. But this distance is rather close when we come to hoe the dirt up to the bottom of the boards in blanching. And we like to put lime on in the fall, because it is better not to have it come too much in contact with the acid phosphate, as the lime tends to make the phosphoric acid insoluble.

The President.—We will now take up the next number on the program—an illustrated lecture on "Experiments with Cabbage and Tomatoes," by Prof. C. E. Myers of State College:

EXPERIMENTS WITH CABBAGE AND TOMATOES.

Prof. C. E. Myers, *State College, Pa.*

The Department of Horticulture of the Pennsylvania State College and Experiment Station is making an exhaustive study of the three leading truck crops, viz.: cabbage, tomatoes and asparagus. The work includes seed selection, methods of culture, fertilization, variety and strain tests. Of these the strain tests are considered the most important.

In order that I may give a somewhat definite idea of the work I shall discuss each of the crops in order.

Cabbage.

It is generally conceded that cabbage is the leading as well as one of the most profitable of the truck crops. It can be grown with comparative ease, and on a wide range of soils. To secure best results, however, the soil should be well drained, yet of large water holding capacity, and possess an abundance of readily available plant food.

In discussing the culture of cabbage it is well to take note of the general character of the plant. We note that the leaves are the essential part of the plant from the market standpoint. We also know that nitrogen is the element of plant food so essential in the development of that part of the plant, hence the need of an abundance of this element in the soil. Director Patterson of the Maryland Experiment Station has shown that ninety-eight and one-half per cent. of the cabbage head is water. Thus for every ton of cabbage sold we actually sell nineteen hundred and seventy pounds of water.

In order to secure and maintain a soil in a condition best adapted to the successful development of the cabbage plant the method of soil management previous to the planting of the crop as well as after it is planted is an important consideration.

We have already seen the importance of water to the cabbage crop. Experiments have proved that most of the water utilized by the growing plant is not that which falls during the growing season, but is the water that has been collected during the preceding months and held in the subsoil until the plant is ready to utilize it. We have also learned that the best way to collect and hold this water is by having the soil rich in humus, by plowing as early in the spring as possible, and by maintaining a surface mulch on the soil to prevent loss by evaporation. Experiments conducted at the Wisconsin Experiment Station have shown that in the spring when the soil is wet, when its texture is close from the packing which has resulted from the winter snows and early spring rains, the loss of water is very rapid and may exceed twenty tons per acre daily, and this loss may extend to depths of more than four feet. Another experiment showed that when a piece of corn ground was plowed on April 28 and sowed to oats but little water was lost during the week which followed, while an adjoining unplowed strip only ten feet

away lost during the same time one hundred and ninety-eight tons per acre. Furthermore, the land plowed at the later date was in a poor physical condition, and was with considerable difficulty placed in a suitable condition for plant growth.

The humus content of the soil may be increased by either of two methods; first, by the use of stable manure, and second, by the plowing under of green and cover crops. When it is possible to procure stable manure at a reasonable price it is probably the cheapest and most satisfactory way of maintaining the humus content as well as the fertility of the soil. In some sections of the country cover crops as crimson clover, cow peas, vetch and rye are used with excellent results in maintaining the humus content of the soil. They not only keep the land covered during a large part of the year, but they utilize available plant food which otherwise would escape and put it in a condition which may readily be utilized by the crops that follow. At the time of final preparation of the soil, care should be taken to thoroughly incorporate the vegetable matter with the soil. It is important that this be done or the capilary rise of water from the subsoil may be cut off and thus the end prevented we seek to obtain. It is well also to emphasize the importance of having the soil thoroughly prepared to a good depth just previous to the time of field planting.

Seed.

There is probably no more important question confronting the farmer to-day than that of good seed, and certainly none to which he should give greater attention. At the outset permit me to say that as a whole I consider the seedsmen to be a reputable class of business men, but there seems to be enough of the undesirable element present to make the position of the farmer an unenviable one, and one which frequently results in material financial loss.

The first point the farmer should consider when purchasing seed is the germinative ability of those seeds. Unless a reasonable percentage of the seeds germinate an unsatisfactory stand is liable to result. In a series of tests of thirty-five strains of Danish Ballhead cabbage seed made by us during the past season the germination varied from one to ninety-eight per cent., and in the first instance the seed was purchased in January, 1909.

In our work at the college the seed for the early crop is sown in flats in the greenhouse about the first of February, and transplanted about one month later and placed in the cold frames. The field planting is made soon after the middle of April. Experiments have shown that it is important to maintain an even and continuous growth from the time the seeds germinate until the crop matures. In a test made during the past season of fall grown plants wintered in the open ground at White Marsh, Maryland, vs. spring grown plants secured from the same place, it was found that the spring grown plants were decidedly superior to the fall grown plants. A large percentage of the fall grown plants went to seed and quite a number of them failed to make any material growth, while the heads of those that matured were scarcely more than half as large as the

heads from the spring grown plants. There was no material difference in earliness.

Experiments seem to indicate that the size of the plant at the time of field planting is not of much importance, so long as the very large and the very small plants are discarded.

Varieties.

A great deal might be said about varieties of cabbage. It is probable that there are several hundred so-called varieties listed by the various seedsmen, and each year the number is being increased. In some instances new varieties of merit are thus placed in the hands of the farmer, yet there seems to be a decided tendency to put out old varieties under a new name. It is interesting to note to what an extent this is done as any person may prove for himself by planting side by side the seed of a number of so-called varieties of the same general type. Frequently too large claims are made by the seedsman concerning a particular variety, and in some instances these extravagant claims are accompanied by pictures to further impress on the reader the great value of the variety which in reality does not exist. In the testing of new and untried varieties my advice is go slow, and when making a test do it under the same conditions afforded the regular crop, and if possible in close proximity to it so that a careful comparison can be made.

During the past season we made a test of thirty-two early and thirty-three late varieties. In some instances the tests were highly satisfactory, and upheld the claims made by the seedsman from whom the seed was purchased, while in other instances there was no perceptible difference between several so-called varieties except possibly the extra price charged for the seed. In other instances they were old varieties under a new name.

It is probable that the one phase of the experimental work which most interests the person engaged in truck farming is the strain tests. In this work we have aimed to show the relative value of seed of the same variety from different sources. The work was begun two years ago with Jersey Wakefield and during the time that has intervened some interesting results have been secured. In some instances certain strains produced scarcely anything worthy of being called a head, and did not mature until very late in the season. In fact the per cent. of the crop marketable three months from the date of field planting varied from nothing to ninety-eight per cent. in the test of twenty-five strains, while there was also a material difference in the size of the head as well as the per centage of plants which matured marketable heads.

This work was last year increased to include the varieties Charleston Wakefield, Early Spring and Early Summer. In these varieties the differences were not so noticeable, although were of decided importance. In some instances substitution of varieties were noticeable, and where this is knowingly done by the seedsman without the knowledge and consent of the purchaser that seedsman merits all the adverse criticism he may receive. An interesting feature revealed by the tests is that in many instances the plants

which appeared the most promising during the first part of the season later became the least valuable. The results of these tests are published and can be had by applying to the Experiment Station, State College, Pa.

The insect injury to cabbage is worthy of note. Two classes of insects attack the plant and either may cause considerable trouble. The cabbage aphis or "louse" may appear any time and if not combatted may frequently cause serious damage. It may, however, be readily held in check by spraying with a ten per cent. solution of kerosene emulsion or with some good soap solution. The application should be thorough and particular care should be used to destroy the insects clustered about the growing center of the plant, for unless this is done the plant will not develop. The "cabbage worm" usually appears about the time the crop begins to head, and destroys the plant by eating holes through the leaves and head. It may be successfully combatted by a spray composed of one pound of arsenate of lead dissolved in one hundred and fifty gallons of water.

There are also several cabbage diseases which sometimes cause serious trouble, of which the black rot is the most important. It may be recognized by the discolored blotches along the margin of the leaf and by the black spots in the cross-section of the midrib. It is a bacterial disease and there is no known remedy for it. It may be held in check by destroying by burning the infected plants, and cabbage or allied crops should not be planted on infected soil for a period of several years. The heavy application of lime to the soil is said to be a benefit in preventing the disease.

Tomatoes.

What has been said concerning the soil conditions for cabbage is largely true for tomatoes, except that less nitrogen is needed. Here we are dealing with a crop in which the fruit is the essential part, and an excess of nitrogen tends to produce a large growth of vine and soft, watery fruit. This being the case we need a fertilizer containing less nitrogen but more phosphoric acid and potash, and particularly the latter. It is impossible to prescribe a fertilizer which will apply to all soils, but in general we may say that an application of eight to ten tons of stable manure to the soil the preceding fall, well worked in, and this supplemented by about five hundred pounds of a 4-8-10 fertilizer in the spring at the time of planting should give good results on a wide range of soils.

The handling of the plants previous to the field planting is an important consideration. A number of experiments have been performed by the various Experiment Stations, and it seems that two transplantings previous to the field planting give better results than more or less than this number. In our work at the college we have used paper pots with excellent satisfaction at the time of the last transplanting. We use a manila paper of medium weight and make the pots one and three-fourths by two and one-half inches in size. This gives the plant sufficient space in which to grow from the time it is transplanted until placed in the field, and is an important factor in securing early fruit as well as an even stand of plants, since by

this method the plant sustains no shock in being transplanted. This point is especially noticeable in case the ground be a little dry at the time the field planting is made.

Varieties.

What has been said about varieties of cabbage is generally true about tomatoes. Last year we made a test of fifty-nine so-called varieties. In some instances the varieties were new and distinct and worthy of a careful trial by all engaged in the culture of this vegetable, while in other instances it was impossible to distinguish the so-called new varieties from well-known old varieties.

The strain tests were conducted on the same plan as with the cabbage and included the varieties Earliana, Chalks Jewel, Matchless, Beauty, Globe and Stone. The first three named varieties have been tested for two years, and some interesting results have been secured. For these tests ten plants of each of twelve strains were compared. The results for two years show that the yield of Earliana has varied from eight to eleven and nine-tenths pounds per plant. This would mean that should we set the plants three by four feet apart in the field there would be a difference in yield of the two strains of seven tons per acre. A similar test with the variety Matchless has shown a variation in yield of from eleven and one-tenth to fifteen and three-tenths pounds per plant, which would result in a difference in yield of five and seven-tenths tons per acre were the plants set four by four feet apart in the field.

Little can be said as to the best way of securing the high yielding strains. We must, in a large measure, depend on the integrity of the seedsman from whom we secure the seed, and it is well to purchase from several. In general, it may be said that it is well to secure a variety from that seedsman who introduced it and who considers it as one of his specialties, since in that way we are more likely to get seed of known value than when it is purchased from a dealer who has no especial interest in the variety.

Marketing.

An essential point in profitable tomato growing is the marketing. When the crop is grown for the cannery this point concerns us but little, but where the plant is to supply a basket trade the question is decidedly different. To handle the crop in the most profitable manner requires a careful study of the market, and it is probable that specific directions cannot be given which will apply to all places and conditions. There are, however, a few points which are general in their application.

In the first place the crop should be graded and put up in an attractive manner. The fallacy of putting "new wine in old bottles" applies equally well to tomatoes as to wine. Unless the package presents an attractive appearance, even though the goods be of a high grade, it will not bring the best price. A second consideration in marketing the tomato crop is uniformity. Where a high price is expected the need of having the fruit run uniform in size and color

is an important one. Where care is taken to produce early fruit of good quality, and put it up in an attractive package the tomato crop may be made to yield handsome returns.

Mr. Engle.—What early, and what late varieties of cabbage did you try?

Prof. Myers.—Early Jersey Wakefield, Early Racehorse, Express; you can depend on Jersey Wakefield, followed by Charleston Wakefield, and then by Succession. For late crops you can plant the Succession and the Premium Flat Dutch.

Mr. Garrahan.—How do they compare?

Prof. Myers.—The Early Racehorse is considerably earlier than the Early Jersey Wakefield.

Mr. Engle.—I was told by an experienced grower that he could cover the season with Jersey Wakefield and Premium Flat Dutch.

Prof. Myers.—Both are good, but I think the Surehead is the better.

Mr. Engle.—Do you think it is best to grow your seed, or is seed obtained from a grower in the neighborhood better than the seed obtained from a seedsman?

Prof. Myers.—I cannot answer that question; it just emphasizes the importance of knowing what you are getting. I know a man who went to a seedsman for Jersey Wakefield seed; they told him they had two kinds, the one for $2.00 and the other for $7.50 per pound. He decided to take the high-priced seed, and it cleared him $85 per acre over the cheaper seed.

A Member.—Where can the best Charleston Wakefield seed be obtained?

Prof. Myers.—That is a question that I cannot answer off hand; Webber & Don seeds do very well on it.

Prof. Surface.—Did you get an early seed from Henderson?

Prof. Myers.—No.

Prof. Tompson.—Has any work been done towards separating seed according to size and weight?

Prof. Myers.—Yes; but the results of two years' experiments with large and small seeds show that there is not very much in that.

Prof. Surface.—This topic has brought out a subject which should receive our close attention. It is one upon which I have

been working on myself. It has been recognized fully by the farmers of Pennsylvania, and throughout the country that in stock breeding it is important to select the best animals for that purpose, and it is time that we recognize that the same biological principle prevails in plants. Directly bearing upon this is the government distribution of seeds. I believe that the greatest injury that can be done to the farmer is to send out these low grade seeds that are bought for so many cents, instead of so many dollars, per pound; they are worse than worthless. Prof. Myers has shown us how one grower by paying $7.50, instead of $2.00 per pound for his seed, made a gain of $85 per acre. What does it profit to buy seeds at from twelve to fifteen cents a pound, that have no quality, and send them out so that the Congressman may get the vote of his constituents? I think it is an injury to the American citizen to tolerate such a thing, and I believe this is one of the most important subjects that has been brought to our attention.

Mr. Hull.—I would like to say just a word on this seed business. In our tests last year, we tried some Golden Self Blanching that came, as it had been claimed, from the originator, and when it came up my brother asked me several times "what makes this so different?" It looked waxier, and came out better, and looked better in every way. I didn't say anything then, because I was not so sure about it, but since then I have looked into it and I am convinced that it was on account of the seed. There is no other reason, and it seems to me that the seed of the originator is one of the best claims there is to the quality of it.

Prof. Tompson.—There is one field of work that has been carried on in our college for sometime, that would seem to indicate some progress in the matter of seeds. In the Pathological Department the experiment was made, under Doctor Stone, of blowing the tobacco seed, to separate the lighter from the heavier. The results have been such that they have begun to experiment on onion, and other vegetable seeds. The aim of our greenhouses is to have the seeds uniform, and they find the sifting of these seeds seems to be a very great help.

Prof. Myers.—We did not grade our cabbage seed according to weight, but according to size, and there was no material difference in regard to the crop. Possibly in regard to the light and heavy seeds there might be some difference.

Prof. Surface.—It may be of interest to know that our Lancaster County farmers are blowing their tobacco seeds, with excellent results, by means of a glass tube, blowing away the light seeds, and using the heavy seeds.

If any man thinks the farmer does not have to know a little bit of everything, just let him try farming. There is no man who really does learn as much as the farmer. Just come here and look at the speakers at this meeting, and see the improvement over last year. The farmer, to keep abreast of the times has to be "going some."

Our Lancaster County men may be proverbial for their slowness, but they always "get there."

Mr. Garrahan.—I cannot see the necessity of cussing out the seedsmen on this question of tomato seeds. It is simply a matter of going through a man's tomato field, selecting the best specimens for seed, putting them into a barrel for a few days until they begin to ferment and then taking the seed out and drying it. It is only a little work. The same thing holds good in cabbage seed. It is easy enough to raise your own seed.

The President.—You have all heard the Houser Cabbage referred to? Mr. Houser has a farm near mine. He started out as a farm hand. After he came of age and wanted to get married, he started out for himself. He had no agricultural or horticultural education, but after he had been farming for a few years, he saw the necessity of paying particular attention to his seeds. Cabbage and tomatoes have been his two main crops for twenty years, and he has been selecting his very best heads and saving the seed from them for planting. Holmes came up there one day and saw a four-acre patch of cabbage; it was the most uniform patch he ever saw. Houser is said to raise four thousand heads to the acre. Holmes got Houser to raise some seed for him, and instead of giving it its proper name, he put his own name to it. It is the same way with pure seed. If the farmer won't buy from the seedsman who gives poor seed, the seedsmen will have to go out of business.

Prof. Myers.—I want to agree with the President in regard to the selection of seed. Of course, there are some farmers who raise their seed, but with most of them, they do not take the time, or it is too much trouble, or not worth while to do it. But it is worth while to take care of your good seed; it is so much better than the seed you buy. On the whole, I think the seedsmen are as good a lot of men as any other, but the sooner the farmer insists upon getting a good quality of seeds, the better it will be for the seedsman and for the farmer. The matter of selling a few pounds of seed is a small thing to the seedsman, but to the farmer it means a great deal. Any seedsman worthy of the name will, of course, try to have the best seed he can get, but the sooner the farmer insists on only the best quality, the better it will be for both.

Then another word as to variety: Don't try to get too many varieties; they never do so well. Take one or two varieties, and keep them pure.

Prof. Tompson.—We are doing some more experiment work at the Station on Peas. It was done at first from a purely scientific standpoint, but the results were such that it was determined to continue them from a practical standpoint. The pea vines are counted, with the number of pods, and also the number of peas. On some vines you will find two pods, and on others ten or twelve, and where there are more pods to the vine, there are more peas to the pod.

If this thing can be carried out it will be of great importance; it will develop a great field of work along this line.

The President.—Can you increase the number of pods by selection?

Prof. Tompson.—No; we have not been working along that line. It is a point that has come out subsequently to the general work. The general work has been to determine the matter of heredity in the pea. The results as figured out seem to indicate that there is great opportunity along this line.

Prof. Myers.—In selecting seed, tomato for instance, we should take into consideration the character of the plant as a whole, rather than the individual fruit. If you take the individual fruit you are likely to be disappointed. We must take into consideration the vitality of the plant as a whole, rather than take the individual from a vine that bears only one or two tomatoes.

Mr. Garrahan.—I would like to ask the professor if he knows any seedsmen selecting seed along that line?

Prof. Myers.—I don't know just along that line, but one firm —Landreth's,—are trying to select seed, and claim to be getting better results from it.

Mr. Garrahan.—Now, is it not a fact that most of the tomato seed is gotten by taking the entire crop, running it through a separator at the cannery, and then selling the seed?

Prof. Myers.—I agree with that; I simply made a few remarks to show the farmer that it is in the selection of seed that results lie. It is much easier to take time to select from the hill, than to select from the fruit after it is picked.

The imporance of selecting seed in the hills has been demonstrated in Wisconsin in the matter of the selection of potatoes for seed. The selection of potatoes from hills has been followed on the principle of the strain of prolific yields of certain potatoes, the same as that strains run in human families. Select your seeds from the prolific plants. I would not select tomato seeds from the basket of tomatoes; get them from the hills, where you can study the plant. I want blood and parentage in the plant as well as in the animal.

The President.—It is getting late, and if there are no further remarks, the Secretary has a matter he would like to bring before the meeting.

The Secretary.—The matter I wish to bring before the meeting is in reference to the bill regulating the insecticides on the market. There was no action on it during the meeting of the last Legislature, but it is likely that the matter will come up again in the Legislature

this year. I move, therefore, that we endorse the bill as it was presented to the last Legislature.

Prof. Surface.—I second it.

This motion was carried in the regular way.

The President.—We were very delightfully entertained by the ladies of the local Grange on the first evening. I understand that the Master of the local Grange, Mr. Benson, is in the room, and I would like to have a word from him.

Mr. Benson.—Mr. Chairman, I thank you for the honor of giving me a word to say for the Grange. It is a matter of surprise to a Granger to be called on, on an occasion like this. A man who belonged to our Grange a year ago said the Grange was worth a great deal to him, but he was worth nothing to the Grange. Now, you people are worth a great deal to the Grange, but the Grange is worth nothing to you.

The President.—We don't agree with you.

Mr. Benson.—We feel very grateful that this meeting came to Tunkhannock, and we feel that we have all been benefitted by it. I have listened to the remarks at the meetings here and have derived a great deal of good from them. I have listened to the remarks here, and I have not heard but one mistake made, and I don't believe the President is responsible for that. There is a gentleman here, who should have been called on in my place. I have not been master of the Grange very long, but this gentleman has been master of the Grange for some time, and stands very high in every other respect. I refer to the Hon. Stanley Brunges. If you had been introduced to him you would not have called on me. I have only been master of the Grange for about a week. I thank you for bringing this meeting up to little Wyoming County, and also thank you for the honor and generosity that has been shown the Tunkhannock Grange through me.

The President.—I don't admit that the President has made a mistake in calling on the master of the Grange. We have already been introduced to Mr. Brunges, and have had the pleasure of listening to an address from him. We shall, however, be pleased to hear from him again.

Mr. Brunges.—Mr. President, I think you have heard all you want of me, but I want to say that the master of the Grange is not as innocent as he appears. He has been master of the Grange before this year, and also of the Pomona Grange of the County.

The President.—I understand now why he was so anxious for some one else to speak.

Is the Committee on Resolutions ready to report?

The Committee on Resolutions, through Mr. R. J. Walton, presented the following report:

REPORT OF THE COMMITTEE ON RESOLUTIONS.

Your Committee on Resolutions beg to report as follows:

WHEREAS, We the members of the State Horticultural Association assembled, believing that this has been one of the best meetings in the history of the organization, desire to express our appreciation to all who have in any way contributed to its success. Therefore be it

Resolved, That we do hereby tender special thanks to the ladies of the Tunkhannock Grange for their efficient services in connection with the banquet; to the commissioners of Wyoming County for the use of the Court House, to the local committee of arrangements for their untiring efforts, to the representatives of the press, who have reported our proceedings, and especially to the Philadelphia North American, who have sent their Pennsylvania State editor to our meeting, assuring a full and correct report of our proceedings; to visiting speakers from a distance, who have rendered so much valuable service, in the line of instruction, and to the burgess and citizens of Tunkhannock for the many courtesies extended.

WHEREAS, The value and success of our annual meetings depend largely upon the character of the display of fruits and other horticultural products, be it

Resolved, That this Association endeavor to offer such premiums at the next annual meeting as may seem proper to the executive committee.

WHEREAS, The orchard experiments as conducted by Prof. J. P. Stewart, of the Pennsylvania State College, promise results of very great value to the fruit growers of this State, be it

Resolved, That this Association express its appreciation of these investigations and urge their continuance as long as may be necessary to arrive at definite and positive conclusions.

WHEREAS, There are many unsolved problems connected with the culture of peaches, pears, plums and cherries, be it

Resolved, That this association request the State Experiment Station to institute experiments with such of those fruits as seem to promise results of greatest value to the fruit growers of Pennsylvania.

Believing that a parcels post would serve a large public interest through the development of its possibilities along the line of bringing the producer and consumer into closer relations this Association declares itself as favoring the speedy enactment of such a law and as both political parties have declared in favor of the parcels post;

Resolved, That the Association urges its members to use every effort possible to secure the speedy redemption of the promises made.

In view of the growing interest in horticultural matters upon the part of this State your committee recommends the appointment of a committee to consider possible lines of publicity of a sort beneficial to the Association as a body and the members as individuals.

WHEREAS, This Association has profited greatly by the special appropriation of $1,000 for two years secured from the State through the efforts of our worthy Secretary of Agriculture, Hon. N. B. Critchfield, be it

Resolved, That we express our appreciation of this financial support and request that a similar or larger sum be appropriated to the association for its work in the future.

WHEREAS, Providence in His Almighty wisdom, has removed from our rank, one of our honored ex-presidents, Mr. Calvin Cooper, of Bird-in-Hand, Lancaster County; also one of our active members and successful fruit grower, W. H. Swartwood, be it

Resolved, That this Association express its deep sense of loss and extend to the bereaved families its sympathy.

Signed,

R. L. WATTS.
T. C. FOSTER.
R. J. WALTON.

Mr. Fox.—I move the adoption of these resolutions.

This motion having been properly seconded, was regularly carried in the usual way.

The President.—Any further business?

Mr. Fox.—What is to become of the fruit that has been on exhibition?

The President.—A portion of that fruit is going to be placed in storage and then exhibited at Philadelphia at the meeting of the Stock Breeders' Association, and the Dairy Union there in February. Mr. Tyson is going to take charge of it. The exhibit of the Adams County Society and that of Perry and Bedford Counties have been offered for this purpose, and if there is any fruit from Cambria County in proper condition, it is also to be used.

The President.—Is there any further business?

Mr. Fox.—I move we adjourn.

Mr. Engle.—I second the motion.

This motion was regularly carried, and the Fifty-first Annual Meeting adjourned.

INDEX.

END OF YEAR