Transactions

OF THE

FLORIDA STATE

Horticultural Society

FOR

1908

Officers

PROF. P. H. ROLFS, Pres.
GAINESVILLE, FLORIDA
E. O. PAINTER, Sec'y
JACKSONVILLE, FLORIDA
W. S. HART, Treas.
HAWKS PARK, FLORIDA

ANNUAL MEMBERSHIP $1.00
LIFE MEMBERSHIP $10.00

The Florida State Horticultural Society

Office of the Secretary

Executive Committee

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FEDERAL POINT, FLORIDA
GEORGE L. TABER,
GLEN ST. MARY, FLORIDA
H. B. STEVENS,
DE LAND, FLORIDA

Jacksonville, Florida, September 15, 1908

To the Members of The Florida Horticultural Society:

I desire to call your attention to the discussion commencing on page 108 and the resolution on page 110. If you were at the meeting I do not need to urge you to take up the matter with your Congressmen and Senators. If you were not in attendance, please read carefully. I hope you will take up the matter at once and lend your influence towards getting the necessary help. You may have no blight in your grove now, but it may appear. It is better to help keep blight and other diseases out of your grove than to have to fight it after it has appeared.

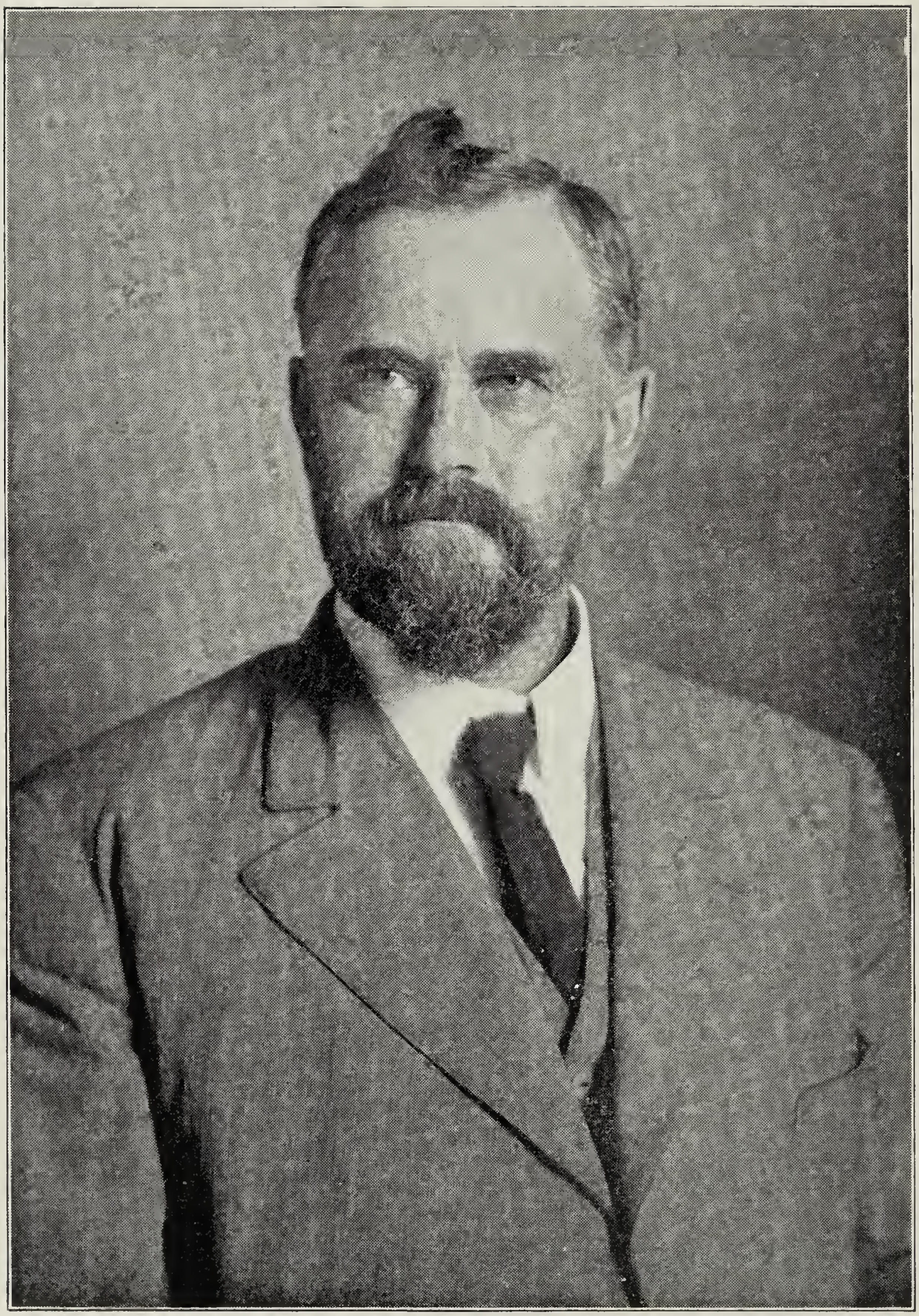
Also do not forget that at the next meeting of the Legislature the Society expects to ask for aid to print our minutes. You can help very much by a word to your representative if you meet him, or a letter if you do not know him personally. If either of the above fail, it will be because you waited for someone else to act instead of yourself.

Hoping you will not drop the matter from your mind with the reading, but be up and doing, I am

Yours respectfully,

E. O. PAINTER,

Secretary Florida State Horticultural Society.



PROF. P. H. ROLFS.

PROCEEDINGS

OF THE

Twenty-first Annual Meeting

OF THE

Florida State Horticultural Society

HELD AT

Gainesville, May 12, 13, 14 and 15, 1908

COMPILED BY THE SECRETARY

Published by the Society

DeLand, Fla.
E. O. PAINTER PRINTING COMPANY.
1908.

CONSTITUTION.

Article 1. This organization shall be known as The Florida State Horticultural Society, and its object shall be the advancement of horticulture.

Article 2. Any person may become a member of the Society by subscribing to the Constitution and paying one dollar. Any person may become a Life Member of the Society by subscribing to the Constitution and paying ten dollars.

Article 3. Its Officers shall consist of a President, three Vice-Presidents, Secretary, Treasurer, and Executive Committee of three, who shall be elected by ballot at each annual meeting. After the first election, their term of office shall begin on the first day of January following their election.

Article 4. The regular annual meeting of this Society shall be held on the second Tuesday in April, except when otherwise ordered by the Executive Committee.

Article 5. The duties of the President, Vice-Presidents, Secretary and Treasurer shall be such as usually devolve on those officers. The President, Secretary and Treasurer shall be, ex-officio, advisory members of the Executive Committee.

Article 6. The Executive Committee shall have authority to act for the Society between annual meetings.

Article 7. The Constitution may be amended by a vote of two-thirds of the members present.

BY-LAWS.

1. The Society year shall be co-extensive with the calendar year, and the annual dues of Members shall be one dollar.

2. All bills authorized by the Society or its Executive Committee, for its legitimate expenses, shall be paid by the Secretary's draft on the Treasurer, O. K.'d by the President.

3. The meetings of the Society shall be devoted only to Horticultural topics from scientific and practical standpoints, and the Presiding Officer shall rule out of order all motions, resolutions and discussions tending to commit the Society to partisan politics or mercantile ventures.

Florida State Horticultural Society.

OFFICERS ELECT FOR 1909:

PRESIDENT:

DR. WM. C. RICHARDSON, Tampa.

VICE-PRESIDENTS:

H. HAROLD HUME, Glen St. Mary; L. B. SKINNER, Dunedin; AUBREY FRINK, Macclenny.

SECRETARY:

E. O. PAINTER, Jacksonville.

TREASURER:

W. S. HART, Hawks Park.

EXECUTIVE COMMITTEE:

E. S. HUBBARD, Federal Point; G. L. TABER, Glen St. Mary; H. B. STEVENS, DeLand.

President, Secretary and Treasurer, ex-officio.

Standing Committees.

Efforts to Secure Better Shipping Facilities and Rates.—J. C. Chase, Jacksonville; L. B. Skinner, Dunedin; F. D. Warner, Gainesville.

Methods of Packnig and Shipping Citrus Fruits.—E. P. Porcher, Cocoa; Dr. F. W. Inman, Winter Haven; E. H. Mote, Ocala; J. D. Bell, St. Petersburg; S. C. Warner, Palatka.

Methods of Handling Citrus Groves.—B. F. Chilton, New Smyrna; Dr. J. F. Corrigan, St. Leo; J. E. Kilgore, Largo; Hermann Lubrecht, Island Grove.

Ornamentals.—B. H. Alden, DeLand; H. Nehrling, Gotha (Palms in Florida); H. S. Pennock, Neptune; Miss T. H. Hart, Federal Point.

Irrigation.—A. H. Bourley, Leesburg; W. F. Holmes, Daytona; H. B. Stevens, DeLand.

Vegetables.—A. A. Finnie, Coleman; J. Brown, Hypoluxo; W. C. Bentley, Winter Haven; Wm. Gist, McIntosh.

Peaches and Deciduous Fruits.—Prof. J. Y. McKinney, Candler; A. C. Haynes, DeLand; W. E. Pabor, Jacksonville; Major W. L. Floyd, Gainesville.

Pineapples.—W. R. Hardee, Jensen; B. F. Weeks, Punta Gorda; C. S. VanHouten, Orlando; Mrs. L. M. Abdill, Eldred; D. T. McCartney, Fort Pierce.

Fertilizers.—A. H. Gaitskill, McIntosh; B. H. Bridges, Tallahassee; Mrs. F. C. Prange, Vero, Fla.

Tropical Fruits.—E. N. Reasoner, Oneco; R. D. Hoyt, Seven Oaks; E. V. Blackman, Miami.

Insects and Diseases.—E. S. Hubbard, Federal Point; E. S. Williams, Fort Pierce; G. M. Wakelin, Tavares; Dr. Ernst Bessey, Miami; Prof. H. S. Fawcett, Gainesville.

Nuts.—W. D. Griffing, Jacksonville; Prof. H. E. VanDeman, Washington, D. C.

Special Address.—Prof. Lloyd Tenney, Bureau of Plant Industry, Washington, D. C.

List of Members.

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Lucius, J. W., Leesburg, Fla.
Luttichau, H. von, Earlton, Fla.
Lyman, A. E., Melbourne, Fla.
Lyman, Dr., Melbourne, Fla.

McBride, A. D., DeLand, Fla.
McComb, Jr., James, Pompano, Fla.
McClelland, W. S., Eustis, Fla.
McClendon, J. F., Leesburg, Fla.
McCoy, Abe, Fruitland Park, Fla.
McCreary, H. H., Gainesville, Fla.
McClung, J. N., Clearwater, Fla.
McClung, J. M., Dunedin, Fla.
McDaniel, H., Orlando, Fla.
McDonald, R. D., DeLand, Fla.
McDougal, S. G., Long Grove, Fla.
McIntyre, Jas., Miami, Fla.
McKinney, J. Y., Candler, Fla.
McLaughlin, C. O., Leesburg, Fla.
McLeod, E. D., DeLand, Fla.
McMullen, F. G., Eden, Fla.
McMullen, Mrs. F. G., Eden, Fla.
McNamara, J. J., Jacksonville, Fla.
McQuarrie, C. K., DeFuniak Springs, Fla.

Mace, J. P., Lake Helen, Fla.
Mace, Mrs. J. P., Lake Helen, Fla.
Mace, L. P., Lake Helen, Fla.
Mallary, E. Y., Macon, Ga.
Mantz, R., Eustis, Fla.
Marsh, A. L., DeLand, Fla.
Martin, R. D., DeLand, Fla.
Martin, B. H., Gotha, Fla.
Mason, F. C., Santa Fe, Isle of Pines, W. I.
Matheny, C. Woodburn, Sarasota, Fla.
Mathews, W. R., Leesburg, Fla.
Mathews, R., Leesburg, Fla.
Mead, Theodore L., Oviedo, Fla.
Meadows, S. D., Tampa, Fla., R. F. D.
Meislahn, H., Clarcoona, Fla.
Merrell, Herman, St. Petersburg, Fla.
Merrell, Mrs. Herman, St. Petersburg, Fla.
Miller, A. L., Leesburg, Fla.
Miller, C. A., DeLand, Fla.
Miller, J. W., Leesburg, Fla.
Miller, M. E., Leesburg, Fla.
Mobley, Peter, Leesburg, Fla.
Montgomery, Chas., Buena Vista, Fla.
Moore, C. E., Kissimmee, Fla.
Moore, J. Q., Belleair, Fla.
Moore, L. C., Roseland, Fla.
Moore, Capt. R., Geneva, Fla.
Morrill, A. W., Orlando, Fla.
Moseley, W. P., Gainesville, Fla.
Moses, Mrs. C. H., West Palm Beach, Fla.
Moses, W. R., West Palm Beach, Fla.
Mote, Mrs. E. H., Leesburg, Fla.
Mote, F. B., Newark, Del.
Murphy, T. W., Largo, Fla.
Murrell, J. A., McIntosh, Fla.

Nesbitt, W. J., Ft. Pierce, Fla.
Nevins, Thos. F., Brooklyn, N. Y., 350 Clinton St.
Newbold, John J., Miami, Fla.
Neylands, J. J., Thonotosassa, Fla.
Nickerson, H. Guy, Florence Villa, Fla.
Nordman, Fred, New Smyrna, Fla.
Norsworthy, W. G., McIntosh, Fla.
Northrup, J. W., Leesburg, Fla.
Norton, Miss Nora, Gainesville, Fla.

O'Brien, W. S., Thonotosassa, Fla.
O'Brien, Mrs. J., Leesburg, Fla.
O'Neil, Con, DeLand, Fla.
Olssen, Hans, Stuart, Fla.

Pabor, Chas. W., Avon Park, Fla.
Pabor, W. E., Jacksonville, Fla.
Painter, Miss Okle, Jacksonville, Fla.
Palen, Peter, Haines City, Fla.
Palmer, R. A., Bradentown, Fla.
Peck, P. E., Jacksonville, Fla.
Pennock, Mrs. H. S., Neptune, Fla.
Pennock, H. S., Neptune, Fla.
Penny, N. O., Vero, Fla.
Penny, Mrs. N. O., Vero, Fla.
Perry, H. A., Pomona, Fla.
Peters, G. T., Geneva, Fla.
Pfyffer, John, Pulaski, Ind.
Phillips, S. K., Melteawan, N. Y.
Phillips, Dr. P., Orlando, Fla.
Phinney, J. P., South Boston, Mass.
Pierson, N. L., Pierson, Fla.

Pickering, W. R., Leesburg, Fla.
Player, H., Tampa, Fla., care of U. S. Engineer's office.
Popple, W. S., Estero, Fla.
Porcher, E. P., Jacksonville, Fla.
Porcher, Mrs. E. P., Jacksonville, Fla.
Porter, Mrs. M. L., Emeralda, Fla.
Powell, E. P., Sorrento, Fla.
Prall, C. H., Leesburg, Fla.
Pugsley, Chas., Winter Haven, Fla.
Ploegert, Herman, R. F. D. No. 2, Sanford, Fla.
Prang, Mrs. N. M. E., Vero, Fla.
Pratt, E. E., Limona, Fla.
Prather, G. C., St. Petersburg, Fla.
Prevatt, A. B., Seville, Fla.
Prevatt, Mrs. A. B., Seville, Fla.
Prevatt, B. E., DeLand, Fla.

Ramsdell, Joseph, Miami, Fla.
Ramstead, S. G., Vinton, Iowa, Box 129.
Randolph, J. H., Leesburg, Fla.
Rankin, W. H., Punta Gorda, Fla.
Reasoner, E. N., Oneco, Fla.
Reaves, C. L., Fruitville, Fla.
Reed, C. A., Washington, D. C., Department of Agriculture.
Reed, F. A., Eustis, Fla.
Rice, M. A., Citra, Fla.
Richardson, C. O., Miami, Fla.
Richardson, E. L., Avon Park, Fla.
Richardson, Peter, Leesburg, Fla.
Richardson, W. C., Tampa, Fla.
Richtman, W. O., Satsuma Heights, Fla.
Ricker, Mrs. B. B., Lake Weir, Fla.
Ridley, W., Leesburg, Fla.
Robb, Mrs. Dr., Gainesville, Fla.
Robinson, C. A., Eden, Fla.
Robinson, Mrs. C. A., Eden, Fla.
Robinson, J. E., Gotha, Fla.
Robinson, W. E., Palmetto, Fla.
Rollins, C. A., Thonotosassa, Fla.
Rose, Mrs. R. E., Tallahassee, Fla.
Rose, R. E., Tallahassee, Fla.
Ross, J. H., Winter Haven, Fla.
Rou, S. F., Lowell, Fla.
Rumble, Alfred, New York, N. Y., 22nd St. Nicholas Place.
Runge, S., Sanford, Fla.

Sadler, O. W., Johnston, Pa.
Sample, J. W., Bartow, Fla.
Sampson, F. G., Boardman, Fla.
Sampson, Mrs. F. G., Boardman, Fla.
Sartorius, L. G., Clearwater, Fla.
Schabinger, J. J., Delray, Fla.
Schnarr, J., Orlando, Fla.
Schneider, C. F., Ocala, Fla.
Schrader, Gua., Melteawan, N. Y.
Schultz, Henry F., Ancon, Canal Zone.
Scott, David, Arcadia, Fla.
Scott, J. M., Gainesville, Fla.
Scroble, L. S., Leesburg, Fla.
Sellmer, Chas., Zellwood, Fla.
Seylor, Dan, Leesburg, Fla.
Shaeffer, H. L., Leesburg, Fla.
Shannon, Geo., Waterloo, Iowa.
Shelton, Dr. W. T., Marlton, Fla.
Shepherd, S. P., Winter Park, Fla.
Shooter, C. C., Earlton, Fla.
Shryock, W. P., New Smyrna, Fla.
Sill, A. C., St. Petersburg, Fla.
Simmonds, Edward, Subtropical Laboratory, Miami, Fla.
Simmons, W. P., Jacksonville, Fla.
Simpson, J., Mt. Dora, Fla.
Simpson, Charles T., Little River, Fla.
Singletary, Mrs. Lola M., Bradentown, Fla.
Skinner, L. B., Dunedin, Fla.
Slade, C. C., Eustis, Fla.
Sleed, Andrew, Gainesville, Fla.
Sly, E. R., Bayshore, Mich.
Smith, G. R., Fruitland Park, Fla.
Smith, J. Archie, DeLand, Fla.
Smith, J. A., Winter Haven, Fla.
Smith, R. L., Aripeka, Fla.
Smith, S. F., Leesburg, Fla.
Smith, V. C., Leesburg, Fla.
Smock, J. W., DeLand, Fla.
Snow, G. E., East Lake, Fla.
Snyder, A. S., St. Petersburg, Fla.
Soar, J. J., Little River, Fla.
Spencer, H. E., New York, N. Y., 35 Nassau Street.
Spinks, Z., Whitney, Fla.
Spivey, G. B., Leesburg, Fla.
Spooner, Dr. H. G., Eastlake, Fla.
Stallings, J. L., Leesburg, Fla.
Stanton, W. E., Miami, Fla.
Stevens, Bros., Baltimore, Md.
Stevens, H. B., DeLand, Fla.
Stevens, Mrs. H. B., DeLand, Fla.
Steele, W. C., Switzerland, Fla.
Stewart, I. A., DeLand, Fla.
Stillman, Howard, Y., Daytona, Fla.
Stoddard, F. L., Interlachen, Fla.
Stockbridge, H. E., Atlanta, Ga.
Stouder, H. G., Eldred, Fla.
Storer, F. A., DeLand, Fla.
Strawson, Harry, Lotus, Fla.
Street, A. W., Ormond, Fla.
Strodham, Mrs. G. W., St. Louis, Mo., 4407 N. 21st St.
Strout, H. T., Fruitland Park, Fla.
Strowger, Mrs. S. A., St. Petersburg, Fla.
Stunkel, J. F., Lake Mary, Fla.
Sundell, J. F., Lake Mary Fla.
Switzer, W. A., Pt. Tampa City, Fla.

Taber, Mrs. G. L., Glen St. Mary, Fla.

Talton, E. H., DeLand, Fla.
Tatem & Co., C. P., Baltimore, Md.
Taylor, T. G., Hastings, Fla.
Taylor, Dr. W. S., DeLand, Fla.
Tenny, F. F., Federal Point, Fla.
Tenny, Mrs. F. F., Federal Point, Fla.
Tenny, L. S., Washington, D. C., Department of Agriculture.
Terwilleger, G. E., Seabreeze, Fla.
Thomas, Miss C. C., Tangerine, Fla.
Thompson, Mrs. L. M. D., Lake City, Fla.
Thompson, Lewis, Leesburg, Fla.
Thornton, C. B., Orlando, Fla.
Trefry, Thos. C., Milford, Conn.
Troxler, T. W., Ocala, Fla.
Tiddell, W. G., Dalton, Ga.
Tillinghast, B. F., Davenport, Iowa.
Tischler, P., Jacksonville, Fla.
Tostenson, Miss T. Helen, Legrand, Iowa.
Townsend, C. W., Pittsburg, Pa., 28 Penn Ave.
Townsend, C. Morot, Philadelphia, Pa., 600 N. Broad St.
Tracy, George B., Nueva Gerona, Isle of Pines, W. I.
Trammell, Worth M., Tallahassee, Fla.
Trunnell, W. M., Leesburg, Fla.
Tucker, R. M., Orange City, Fla.
Tussey, H. H., Wayne, Pa.

Underwood, Dr. R. R., Pierson, Fla.
Upham, E. S., South Lake Weir, Fla.
Upham, Mrs. E. S., South Lake Weir, Fla.

Van Wormer, E. L., Eustis, Fla.
Varner, Darling, Crescent City, Fla.
Van Wyck, Miss Mary, Federal Point, Fla.

Wakelin, Amos B., Philadelphia, Pa.
Wakelin, Mrs. G. M., Lane Park, Fla.
Wakelin, G. M., Lane Park, Fla.
Walker, Capt. E. B., Leesburg, Fla.
Walker, Ike, Orange Bend, Fla.
Walters, R. P., DeLand, Fla.
Warner, F. D., Gainesville, Fla.
Warner, S. C., Palatka, Fla.
Watson, Miss Mabel, Okahumpka, Fla.
Watts, B. F., Leesburg, Fla.
Watts, W. C., DeLand, Fla.
Ward, Lee, Miami, Fla.
Wear, Dr. R. A., Ozona, Fla.
Webb, F. F., Winter Haven, Fla.
Webeking, A., Gotha, Fla.
Webster, F. P., Leesburg, Fla.
Webster, I. E., Gainesville, Fla.
Weed, Rt. Rev. Edwin G., Jacksonville, Fla.
Welch, G. W., Gainesville, Fla.
Westcott, Chas. G., Leesburg, Fla.
Westphal, G., Island Grove, Fla.
Wheeler, W. W., Winter Haven, Fla.
White, Arthur, Gotha, Fla.
White, J. W., Jacksonville, Fla.
White, Miss L. M., Dupont, Fla.
White, W. S., Rockland, Me.
Wightman, L., Tampa, Fla., P. O. Box 576.
Wilkins, W. C., Leesburg, Fla.
Wills, F. L., Sutherland, Fla.
Wilmshurst, H. J., DeLand, Fla.
Wilson, C. H., Clermont, Fla.
Wilson, J. K., Clearwater, Fla.
Wilson, S. B., DeLand, Fla.
Wilson, W. M., Gainesville, Fla.
Wimpiger, J. W., Seffner, Fla.
Winslow, J. M., Okahumpka, Fla.
Winters, R. Y., Gainesville, Fla.
Withers, I. N., Lady Lake, Fla.
Wolfe, J. B., Houston, Texas. 2812 Caroline St.
Woodall, A. H., DeLand, Fla.
Woolwine, E. M., Seville, Fla.
Wyckoff, J. S., Citra, Fla.
Wylie, J. H., Interlachen, Fla.

Yocum, W. T., Gainesville, Fla.
Young, R. H., Haines City, Fla.

PROCEEDINGS

OF THE

Twenty-First Annual Meeting

OF THE

Florida State Horticultural Society

The Florida State Horticultural Society celebrated its twenty-first annual meeting in the beautiful and historic city of Gainesville. It can be said of this meeting that it opened with the largest attendance of any meeting in the history of the Society. There have been other meetings when the total number in attendance was larger, but at no time was the hall so filled with horticulturists from all over the state, and with townspeople, as greeted the fall of the President's gavel at the opening session of this meeting. The attendance through the entire session was large and the whole time allotted for the program was taken up. None of the sessions were cut out or curtailed, but the full time put in.

The members enjoyed the afternoon session at the State University and Experimental Grounds. They spent the time very profitably in going over the field and seeing what was being done and at the same time seeing what was needed to carry on the State work. Many a member went home determined to appeal to his member of the Legislature to give the Experiment Station more consideration and a larger appropriation for its work, at the next meeting of the Legislature.

One address we are not able to give in our report was the lecture by Prof. H. Harold Hume on "Adorning the Home Place," which was given complimentary to the people of Gainesville. This was a stereopticon lecture illustrating the good and bad effects of different planting of shrubs and trees. The printing of the address without the illustrations would take away half of its value. As we are unable to print these this year, the members who did not attend will have to lose the pleasure and profit of Prof. Hume's lecture.

When the time for the next place of meeting was brought up, Daytona, DeLand, Orlando and Jacksonville were in the race. On the first ballot it was left to DeLand and Daytona, and the latter won out by a few votes, consequently the next annual meeting will be held at one of the prettiest towns in the State of Florida. The members who attend will be able to see, not only a beautiful and well laid-out town, but enjoy the privilege of surf-bathing and the other pleasures that are invariably to be found in towns that are laid on a river or a sea.

Minutes.

FIRST DAY.

Evening Session.

1. Called to order by the President, Prof. P. H. Rolfs.
2. Opening prayer by Rev. H. H. Hay.
3. Address of Welcome, on Behalf of the City, by the Mayor of Gainesville, Col. Horatio Davis.
4. Address, "The Relation of the State University to the Horticultural Society"—Dr. Andrew Sledd.
5. Response—Dr. W. C. Richardson.
6. Annual Address of the President.
7. Introduction of Question Box.
8. Social Hour.

SECOND DAY.

Morning Session.

1. Appointment of Committee on Necrology: Messrs. Hart, Hubbard and Painter.
2. Appointment of Committee on Final Resolutions: Messrs. Skinner, Brown and E. S. Williams.
3. Climatology of Citrus—Dr. W. C. Richardson.
4. Discussion.
5. Methods of Packing and Shipping—W. S. Hart, Hawks Park; O. W. Sadler, Johnstown, Pa.; W. E. Bryan, Belleair; F. H. Sampson, Boardman.
6. Discussion.
7. Citrus Census Taking—Dr. P. P. Phillips, Orlando.
8. The Planting of Fruit Trees—Aubrey Frink, Macclenny.
9. Discussion.
10. Tropical Fruits—Jno. B. Beach, West Palm Beach; B. K. McCarty, Eldred.
11. Discussion.
12. Appointment of committee to send a telegram to Wm. A. Glasgow and formulate a resolution showing co-operation with Fruit and Vegetable Growers' Association: Messrs. Skinner and Hume.

Afternoon Session.

1. Reading of telegram to Wm. A. Glasgow, Jr., Washington, D. C.
2. Address, "Shall Rudimentary Agriculture and Kindred Sciences be Taught in the Common Schools?"—Capt. R. E. Rose, Tallahassee.
3. Efforts to Secure Better Shipping Facilities and Rates—F. D. Warner, Gainesville.
4. Discussion. Adoption of Resolution approving of action taken by Fruit and Vegetable Growers' Association.

5. Cultivation and Fertilization of Citrus—Mrs. Nettie M. G. Prange, Vera.
6. Discussion.
7. Question Box.

Evening Session.

1. Address, "Adorning the Home Place"—H. Harold Hume, Glen St. Mary.
2. Address, "Is Decay of Oranges in Transit Necessary?"— Lloyd S. Tenney, Washington, D. C.
3. Discussion.
4. Eulogy, "Rev. Lyman Phelps, Horticulturist"—E. S. Hubbard, Federal Point.

THIRD DAY.

Morning Session.

1. Vegetables—W. E. Robinson, Palmetto; N. O. Penny, Vero; C. L. Reaves, Sarasota.
2. Roselle—P. J. Wester, Miami.
3. Discussion.
4. Irrigation—Francis L. Wills, Sutherland; J. W. Hoard, Gotha; L. B. Skinner, Dunedin; R. Y. Winters, Gainesville.
5. Discussion.
6. Organization of Local Societies —L. C. Moore, Roseland; H. B. Stevens, DeLand; C. K. McQuarrie.

Afternoon Session.

1. Reading of telegram from Wm. A. Glasgow, Jr.
2. Election of Officers.

President—Dr. W. C. Richardson.

First Vice-President—H. Harold Hume.

Second Vice-President—L. B. Skinner.

Third Vice-President—Aubrey Frink.

Secretary—E. O. Painter.

Treasurer—W. S. Hart.

Executive Committee—E. S. Hubbard, G. L. Taber, H. H. Stevens.

3. Selection of place of meeting in 1909—Daytona.
4. Report of Executive Committee.
5. Secretary's Report.
6. Treasurer's Report.
7. Visit to the State University.

Evening Session.

1. Controlling the White Fly by its Natural Enemies—E. W. Berger—Gainesville.
2. Discussion.
3. White Fly Investigation of the United States Department of Agriculture—A. W. Morrell, Orlando.
4. Discussion.

FOURTH DAY.

1. Diseases and Insects—Ernst A. Bessey, Miami; Cyrus W. Butler, St. Petersburg; F. P. Henderson, Gainesville; H. S. Fawcett, Gainesville.
2. Discussion.
3. Fertilizers—E. O. Painter, Jacksonville; E. S. Hubbard, Federal Point; B. M. Hampton, Lakemont.
4. Discussion.
5. Soil Studies; Report of Progress —A. W. Blair, Gainesville.
6. Appointment of Legislative Committee—Messrs. R. E. Rose, H. H. McCreary, F. W. Inman, W. S. Hart and S. H. Gaitskill.
7. Report of Committee on Final Resolutions.
8. Adjournment.

Address of Welcome.

By Col. Horatio Davis.

Mr. President, Ladies and Gentlemen:

As mayor of this city, it gives me great pleasure to welcome you to Gainesville, and in the words of Shakespeare's character, "I say to thee and to thy company, I bid a hearty welcome." Horticulture, as the dictionaries say, is that department of agriculture which relates to the cultivation of flowers, fruits and vegetables, and where can such cultivation be more important than in a state with twelve hundred miles of sea coast, over seven hundred miles long, and every acre of land within that state tempered by sea breezes?

The Bible tells us that one of the first commands given by God after He had created the earth, was for it to bring forth fruit, every tree after its own kind. As soon as He had created man, He said to him, "I give you the fruit from these trees for your food." It is to be supposed that when the trees came forth from the hand of God, it and its fruit were perfect, but as time passed, neglect worked its inevitable result, and the tree with its fruit deteriorated. As I understand it, one of the endeavors of this society is to learn how to bring back to that tree and its fruit, its pristine perfection.

It has been said that Florida has eight months summer and four months warm weather. We who live in Florida know that this is not so. We know that we have four months summer and eight months pleasant weather, and there are but few days in which the horticulturist or agriculturist cannot work. Where else in the world have you such a field for your labor? Where else are such flowers, fruits and vegetables awaiting scientific research facing him as in Florida? It is a public benefactor who causes two blades of grass to grow where one grew before. Is he not a public benefactor who tells us how to make our fruit and vegetables perfect, and how to adorn our homes with beautiful flowers, and that, I understand, is one of the objects of your association, and here, during this meeting, we will be told by a number of gentlemen how that object is to be accomplished.

With such objects in view by your society, is it surprising that there is no city that is not proud to entertain you and feel honored by your presence?

It is customary on occasions of this kind for the speaker to present to the guests, the key of the city, but as Gainesville is hospitable, she keeps no keys. Our doors are wide open, and I say to you as mayor of the city, "Walk in and take possession."

THE RELATION OF THE UNIVERSITY TO THE HORTICULTURAL SOCIETY.

Dr. Andrew Sledd.

Mr. President, Ladies and Gentlemen:

I wish respectfully to endorse and second the words of welcome which the Mayor has extended to your body, in behalf of your State University. We are very glad indeed to have you in our city, and esteem it a privilege and honor, and trust you will feel that whatever we have out there; whatever of buildings, or faculty, or service, is entirely at your disposal. We hope to have the privilege of having you out an afternoon and evening. On that occasion we wish you to take possession of the buildings and grounds, and we would like for you to go to and fro and see what is there so that you may know what we are trying to do in the cause of education.

I shall probably not be able to enjoy the Association on that occasion, by reason of the fact that I have had an engagement out of the city for some months, but Prof. Rolfs will show you every courtesy and more than take my place, I am sure.

Now, like the Irishman who wanted to make a few remarks before he said anything, I address myself directly to the matter of The Relation of the University to the Horticultural Society. I will not presume in the presence of these experts who are versed in technical knowledge, to enter into any arguments or discussions of a technical nature. I know very little about technical horticulture; but I address myself to you as citizens of the State, feeling that you are citizens before you are horticulturists. I feel that you are horticulturists as an incident, but that your citizenship is your chief work and one of the highest interests in your life. Therefore, I think I can speak to you as citizens first and then horticulturists.

Agricultural interests, including in them horticultural interests, are the greatest single interests in the nation. Recently I have been looking over some of our agricultural statistics, and find that the amount of money that we get out of the ground through crops and fruits will amount to the amazing sum of over $6,500,000,000.00; that our corn crop for one year would more than pay the national debt, and would sustain the national government for two years or more, paying all of its expenses. The vast majority of our people are directly or indirectly dependent upon agricultural interests. Not counting the non-productive elements of the population, such as children under ten years of age and matrons in the home, there are 30,000,000 of people in the United States engaged in gainful occupations. Of that number, nearly forty per cent. are engaged in horticultural and agricultural pursuits. This does not include their dependents. In our own state, forty-four per cent. of our working population is engaged in agricultural pursuits; by far the largest proportion engaged in any one line or calling in the state.

Gigantic as are the interests involved,

enormous as are the numbers engaged in those interests, but little attention has been paid to reducing these interests to a scientific basis, or equipping those engaged in this occupation for perfection in their work.

You will find that the first agricultural society was started in Philadelphia in 1785, and had the names of George Washington, Benjamin Franklin and others as prominent on its lists. The first professorship of agriculture was established at Columbia University at about the same time, in 1795. George Washington, Benjamin Franklin and the others of whom I might speak took an active interest in scientific learning in this line. The present interest, however, can be dated from about the time of the Civil War. The passage of the Land Grant Act in '62, may be said to institute the first concrete movement which still bears fruit for those people engaged in this tremendous and important work. It seems surprising that school men should have so long neglected the practical application of the principles of education in this field and that this mass of our population should not have had the benefit of scientific study and research. The schools did, however, under the attractions of the Rennaissance, devote the main part of their time to the study of the classics, especially Latin, and to the development of a type of education which is known even today as "cultural"—a part of which is a certain disregard, amounting almost to contempt, for the practical. For a long time there has been, and is today in many communities a feeling that it is unworthy to spend one's time in the study of practical things, and a corresponding respect for the man who is educated and trained along the lines of so-called "culture, don't you know." This movement has not yet expended itself, and there are more pupils in the schools of the United States today studying Latin than any other one subject, with the possible exception of algebra. Fifty per cent. of the pupils of the United States still study Latin, and Latin is required in nearly all college entrance examinations and in most curricula of the colleges throughout the Union. I cannot quite appreciate the necessity for a superficial knowledge of Latin, when a man's life work is to be the growing of tobacco or corn or cotton; and it seems to me it would be far more beneficial to the individual and to society at large if such a student would spend the time which he devotes to "culture" in the scientific study of the growing and curing of tobacco, or corn, or cotton; the prevention of diseases and the cure for same, and the wonders of germination and growth and maturity.

My education has been a classical one, if you will pardon a personal allusion, so that it represents a mighty revolution for me to say that in my judgment our educational ideas are fundamentally wrong, and whereas the majority devote themselves to the study of the classics and the small minority to the agricultural studies, the majority should devote themselves to a practical education, leaving to the minority the dilettante pursuits of the so-called "culture."

Since 1862, there has grown up a number of institutions based upon that act of Mr. Morrill whose duty it is to instruct the mass of people in the practical affairs of life. These institutions now number 50, one of which is your own State University. There are fifty institutions acting under the Morrill Act, the Land Grant Act, and other Acts supplementary thereto. Of the students attending these colleges, a large per cent. is women, and there are altogether 44,000 men, a little over 10,000 being engaged in non-technical, non-agricultural work. There is a very large proportion, about 25 per cent. who are not engaged in the strict lines of work for which these institutions were established. 5,500 are engaged in some other course, now and then taking a course in animal husbandry or some such branch. 6,000 are in the preparatory department, 21,000 only are engaged in the practical agricultural and mechanical pursuits for which the institutions are intended. Now, let us go a little further into the matter and take this 21,000 engaged in the practical agricultural and mechanical pursuits. Out of this number we find less than 3,000 engaged in the special work of agriculture and horticulture at this time, after forty years of effort in that direction. I mention this to show the persistent tenacity of the old academic ideas, the persistence of the notion that the only education worth having involved the study of literature, especially the study of the classics. It is a very hard matter to convince the school men in the first place and the population at large, after the school men have been convinced, of the advisability of a change in any educational system.

Now, as I said, the bulk of the population is engaged in agricultural and horticultural pursuits. It seems to me that the educational system should be laid out upon those lines in which the bulk of the population is interested. Less than four per cent. are engaged in professional pursuits, and yet our school system in the State of Florida, with the exception of the State University, is designed with reference to the four per cent., with almost total disregard of the remaining population. In other words, in none of the schools of the State, except the State University, will you find any instruction in horticultural and agricultural pursuits.

I wish to bring it to your attention that it is high time some action is taken with reference to changing this situation. The State University, *your* University, is the only institution offering instruction along these lines, but there should be many others. The main part of our current expenses is provided by the Federal Government, and provided with reference to the practical instruction of the young men of the State, the vast forty-four per cent. of the young men of the State, who will be interested in agricultural pursuits.

Our ideal out here is to serve the people according to the people's needs; and these needs are not, as we understand it, to be found mainly in the realm of culture, but *the people's needs begin with the need to eat.* We begin with this fundamental need, and go up, *up* with the needs of the people, up and up to the needs of the intellect and into the needs of the spirit manifested in right living. But first and foremost is the all-dominant need, the need to eat. I hold that it is a proper function of the schools to raise the standard of living; and to do this, it is necessary to improve the workman. Your institution is organized on that basis. The farmer must be equipped with knowledge of the whys and wherefores, he must know the principles of causes and effects and have a certain amount of scientific knowledge with which to combat the evils which are the enemies to successful agriculture or horticulture. Of the 15 of this faculty, 11 are engaged under this general head; to equip the worker with the proper knowledge. I include the Professor of Physics, the Professor of Botany, and except only the Professors of Modern Languages, History, Philosophy, and Ancient Languages. We offer four year courses in Horticulture, Agriculture, Mechanical, Civil and Electrical Engineering in addition to four year courses in General Science and four year course in Literature, Philosophy, and Pedagogy, which do not belong under this head. We also offer a two year course in Agriculture, and a two year course in the Mechanical Arts.

Under the Buckman Bill we are required to maintain certain entrance requirements which may be modified by the Board of Control. They have been so modified, and we now admit students who have completed the eleventh grade of the public schools. We accept actual farmer boys in the department of Agriculture without their coming up to those requirements. The young farmer boys throughout the State who really want to learn the scientific elements of agriculture and horticulture and the elements of mechanical arts have an open door and a hearty welcome into the institution.

We hold, with the possible exception of a few of our men who are still joined to their idols of "culture," that our first duty is to the largest body of our citizens, and the last duty to the smallest body, and we have done all that we can to accomplish that result.

Now I want to tell you some of the results. I said it was a hard matter to convince the people after you convince school men. *We* are convinced that the methods of education which we represent are the proper methods; we are howling dervishes in our conviction. You can hear us howl. If you listen you can hear Prof. Rolfs and myself howl clear down on the Gulf Coast and on the East Coast and down in the Everglades. *We* are convinced. The next proposition is to convince the people that this proposition is true and that we are prepared to serve them. Let me give you a few facts and figures. Before I give you these, let me illustrate from the situation in the State of Missouri. There are 555 high schools in that State which are required to give instruction in agriculture. In these schools, how many do you think were taking Latin and how many do you think were taking the course in agriculture? Out of the students in 555 high schools which were required by the law to have a course in agriculture, 28,000 students, who had the opportunity brought to them in the schools to take agriculture and at the same time the opportunity to take Latin, 14,000 *were taking Latin and* 1,180 *taking agriculture!* Now, in our own State Institution, we have an enrollment under the Agricultural and Mechanical College Acts, of college students amounting to fifty-two. That does not count two or three graduate students or some 25 or 26 students who are taking the literary course. The total enrollment for the year just closed has been 103—very small, but still the largest *college* enrollment in the State. We include in this 31 preparatory and some graduate students, but of those taking the regular Agricultural and Mechanical College courses, there were 52.

Now, gentlemen, the doors are open for a scientific education along the lines in which you are most interested. Prof. Rolfs and myself are going up and down the State trying to convince the people that what they want and need is education along the practical lines of agriculture and horticulture. There is no tuition fee, no laboratory fee; board, fuel and lights at $15.00 per month; and yet we have under the agriculture college professors, 52 students in agriculture and the kindred subjects. This state of affairs ought not to be.

It seems to me there are three reasons for this condition. In the first place, the farmers of the State do not realize the necessity for a technical education. They do not realizé that agriculture is a science and that horticulture is a science. They think if their grandfather plowed with a rope line over a lop-eared mule they should not show disrespect to his memory by endeavoring to improve on his methods. His antiquated methods were agriculture, and agriculture is just simply agriculture. Another difficulty is that the rural population does not realize the possibility of technical education in those lines. It is a new idea. Agriculture used to be regarded as a business which did not need much, if any, apprenticeship. It was simply a matter of "being brung up to it." The average farmer or fruit-grower thought the "book-farmer" a fool, —and perhaps they were sometimes right. There is a general prejudice against the "book treatment" of the subject. You have undoubtedly observed this in your own community. The average farmer will say, "Oh, he is just a book farmer and can't teach me nothing." Of course, "the book farmer" in the early stages of his career made mistakes, and is still making them, perhaps; but, as a whole, the fair-minded man is willing to concede that he has more than made good. The third difficulty that is observed is that there is no movement in the State except this one struggling enterprise looking to this end. There is no high school in the State representing this idea. There is no school in the State teaching these things. As a consequence, there is no stimulus towards the University, and it is really remarkable that we get more than five or six to come up here to study.

This Society, in my judgment, might be extremely effective in facilitating a general movement in the State for carrying horticultural and agricultural education down into the graded schools. I do not know anything more pitiful than to see a little country boy going up to read "Gallia est divisa in partes tres," or something like that, and learning nothing and caring nothing about the wonderful branch of industry which he is to make the work of his future life, knowing nothing and caring nothing about the planting and germinating and growth of a grain of corn or wheat,—devoting a quarter of his precious time to a study which will not do him the remotest good which had far better be spent in studying the science of plant and vegetable life. Now, he could at least learn that *it is a science* and that it is to his interest and is his business to study that science; and if he begins the study he will follow it up through the University.

Now, as I have before said, the running expenses of the University are met mainly through the Federal Government. In nearly sixty per cent. of the states in the Union, the State is appropriating more for its agricultural and mechanical colleges than the Federal Government. In some states they have practically assumed the entire support of these institutions. In our own State, the State gives about one-third of the current income. The institution could not be run three months on the State appropriation for current expenses. We are anxious to serve the farmer boy. We are convinced, and we want to convince the people and we trust that this meeting of the Horticultural Society may contribute to that end. We believe that sooner or later we will succeed; we know we *must* succeed, because practical training is the only training for a practical man living a practical life in a practical age. I do not mean to depreciate true culture, but what we need first in this and every other State, is an education which gets right down to the practical phases of everyday life; and the gentlemen of this distinguished Society can be of the utmost service in carrying forward that idea. We need more practical education introduced into our common schools, into our high schools; and this University, *your* University, gentlemen, needs and should receive the co-operation and liberal support of the State, in its campaign for the practical education of the masses of the people, and in its earnest efforts to serve all the people of our common State according to their needs.

RESPONSE.

Dr. W. C. Richardson, Tampa.

Mr. President, Ladies and Gentlemen:

I certainly esteem it a privilege and an honor to address an audience in this great educational centre of the state. I am afraid, however, that what may be a source of pride to me may be an infliction to you before we get through with it. If it is in the nature of an infliction, no one will be to blame but your President. When I got his notification that I was expected to respond to these addresses, I was on the eve of going to my groves. I returned home last Friday morning, but with my usual habit of procrastination, had put off writing my address. When I got home Friday morning, the good Lord had seen fit to send a little grandchild to my daughter's home and that upset me, naturally. So, in the whirl of events, I did not have any time to prepare my address. Then I thought the best thing to do was to look over the records of the proceedings of the last few years and see what had been said and patch up something extemporaneous from that. Well, when I tell you what I found, you will know what I was up against there. We had, at the last meeting, an address from our respected friend, Dr. Kerr. The meeting before that we had an address from our beloved friend, Mr. Taber, and the meeting before that we had an address from our revered and lamented Mr. McCarty. No one can compete in eloquence, style, fluency and interest with the addresses of these men.

But I am here; it is up to me, and I am somewhat in the position of the hero in one of Bret Hart's little poems. He was a preacher and a miner, and the burden of the refrain was "He always did his level best," and that is what I am here to do.

I want to say that I am particularly proud to come here to that which is essentially ours; to *our* University and *our* faculty. I am particularly delighted to have heard the head of that University speak as he has done. I have thought for years, in my conceit, that I was one of a few men who thought and talked that the only kind of an education that was worth having, is an education along practical lines, but to hear it from the President of a University is a surprise and a pleasure.

I realize, as he realizes, that a technical education along technical lines is far better, far more useful and far more beneficial in every way than a so-called classical education. I think it was Oliver Wendell Holmes who wrote:

> "There is many a one, though highly skilled
> in hic, hac, hoc,
> In arts and knowledge still a block."

When my children had grown up and were in school, they laughed at this quotation, saying that my Latin pronunciation was old style and wrong and that it should be heek, hyke, hoke. I said, "Let it go at that even, and it will still be applicable as

> 'There is many a one though highly skilled in
> heek, hyke, hoke,
> In arts and knowledge still a BLOKE!' "

I am delighted to know that we have this kind of an institution. I am delighted to know that we have this kind of men at its head. As has been said, "It is ours," and I am glad that we have come to our own at last.

Now, Mr. Mayor, I want to thank you for your courteous invitation to your hospitalities, for your courteous welcome to what you have here, and they are no small things. We appreciate this city with its paved streets, with its great University, with its great men, and we esteem it a privilege to be here. We are glad, and we realize that you understand that Horticulture is more and higher than a human institution. We may come up here with hard hands and hard heads, perhaps, as sons of toil, but nevertheless we are horticulturists, and horticulturists are men who have something to be proud of. The calling of horticulture is, as you have intimated, of Divine origin. The first horticulturist was the Creator Himself. He prepared the garden, put fruits and flowers into it, and finally put man into it. Man, in his usual manner, distinguished himself by getting into trouble the first thing, and then blamed it onto the woman. Unfortunately for us, the Creator did the same thing that we are doing. He put a tree of evil in there, and that caused the trouble.

There was another reference made by your Honor, about anyone being a benefactor who caused two blades of grass to grow where one grew before. I want to say that we are, on that proposition, multiple benefactors. There isn't one of us who has not beat that all to pieces. If you don't believe it, try to dig up a blade of Bermuda grass and see what follows.

These gentlemen who have preceded me have not taken up all the time allotted to them, and unlike the omnipresent politician, I have been "elected," for the evening at least, consequently I don't have to quit.

Isn't it a wonderful thing that the Bible speaks so often of fruits and flowers? It refers to the rose, the lily, the pomegranate, the olive and the fig, but never a word about the grosser productions such as potatoes, carrots, cabbage, etc. The most wonderful thing that has ever happened, the greatest event that was ever enacted in the world's history, took place in an olive grove; I mean that wonderful scene that was enacted in the garden of Gethsamene. I was in that garden about two years ago, therefore it may not be amiss for me to say a word in regard to it. I can understand why the people of Palestine take to horticulture instead of agriculture. They would not enjoy plowing with a lop-eared mule.

or plowing at all for that matter. And, by the way, they have no lop-eared mules in Palestine, and no plows, but you see them scratching along with a forked stick drawn by a cow, or occasionally an undersized donkey; that is the nearest approach to a lop-eared mule in Palestine.

It is the finest country for good oranges in the world. The Jaffa orange is the best orange I have ever seen. It has been my privilege to eat those oranges right from the trees, but delicious as they are, give me Florida every time. I would not give a quarter section of Florida sand for a township in Palestine. When I stood in the hill country of Judea looking out over the valley of the Jordan and saw the mountains of Moab and Nebo's lonely peak in all its glory, the idea occurred to me that the Lord was certainly good to Moses to let him die before he got into the land of Palestine. Perhaps it is not today what it was in the day of Moses. Today, it is a land of dirt, filth, ignorance and Turkish misrule, and nothing to commend it. Give me Florida every time.

There is one other thing I want to bring before you. I think we too frequently neglect to live up to our opportunities and to make the most of our immediate surroundings. We come up here to these meetings, resolving to do and be done. We come together, hoping to do ourselves and our occupation good, and we talk beautifully and make plans, and resolute—and then we go home and in a few weeks fall back into our lethargic, indifferent, indolent methods, and our good resolutions are all forgotten. Now, if we could carry some of our enthusiasm home with us, if we would carry some of our resolutions home and act upon them, it would be better for us, it would be better for the business in which we are engaged, it would be better for the institution of which you, Mr. President, have spoken. Let us try to do it; let us realize that here in Florida we have opportunities such as are found in few countries of the world, certainly in very few states of the Union. Let us work with the determination to make the most of our opportunities. Let us do the best we can to further the interests of our Society and our great educational institution.

I remember reading some time ago of a ship in the days of sailing vessels. The ship had met with contrary weather, and had been partly dismantled, driven from its course, and finally the water had given out. At last, when the crew was about to perish from thirst, a vessel was seen approaching. The captain of the damaged ship called through the trumpet, "Give us water," and the answer came back, "Drop your buckets where you are!" They thought it a strange answer and repeated again, "Water! We perish! Give us water." Again the answer came back, "Drop your buckets where you are!" The third time they begged for water, and the third time the answer came back, "Drop your buckets where you are!" They finally thought there must be some reason for such an answer and dropped their buckets which came up filled and brimming with fresh, sweet water. They had been driven into the hundred-mile-wide mouth of the Amazon and did not know that they were surrounded with fresh water.

Now, when we are perishing with a

diversity of trials, when we are dismantled by freezes, droughts, white flies, political campaigns, etc., we should drop our buckets where we are, and bring them up filled with the reviving water of renewed courage, prosperity and success.

In conclusion, let me say that

"This world is full of beauty like other worlds above;
And if we do but our duty, it will be full of love."

President's Annual Address.

By Prof. P. H. Rolfs.

Ladies and Gentlemen:

We are here to hold our twenty-first annual meeting. The hand of fate has guided us during these twenty years into the most distant portions of the state; from Pensacola on the west, to St. Augustine on the east and Miami on the south. It is quite probable that when Key West shall be made the most southern railway station in Florida we will stretch out a hand of welcome to our lusty young neighbor, the Cuban Horticultural Society.

During our devious wanderings and in the course of these two decades, our membership has gradually increased. Even the terrible freezes could not chill the ardor for information. The meeting of 1895, following the most disastrous catastrophe the state has known, was characterized by the most earnest attention to the program. While the attendance was smaller than at some of the previous ones, the membership was sufficient to enable us to print the annual proceedings.

Of the members who took part in the organization at Ocala, only four of the original eighteen remain to us. Our worthy and distinguished ex-president was then a lusty youngster. You would not know that he is a year older today, if it were not for a slight intimation of gray, and his dignity when in the executive chair.

CHANGES IN VARIETIES.

Twenty years ago the list of varieties of oranges was probably as long as the list of today. Many that were at that time thought to be the best have since been discarded, and six varieties not then recognized are ranked as among the best today. The list of those that have originated in Florida is increasing, and it is quite probable that in the course of time the leading varieties will be those that have originated in our state.

In our first catalog of Florida fruits only one variety of grapefruit was recognized. There are now at least a score, nine of which are catalogued by this Society. The old many-seeded, first-known grapefruit is rapidly being displaced by newer and less seedy varieties.

The progressive changes in the citrus fruits are however no greater than in the deciduous fruits.

In the case of vegetables we have a much more radical change. The old varieties have been almost entirely replaced. In fact, vegetables were grown only to a limited extent twenty years ago. Even celery was spoken of as an experiment as late as the report of our fifth meeting.

CHANGES IN RAILROADING.

At the time of the founding of this Society (1888) a large part of the state was horticulturally unknown. Such railroads as occurred in the state were poorly equipped, and many were disjointed fragments beginning in a hammock and ending somewhere in the piney woods. How horticulturists ever succeeded in making a living under those conditions of transportation is impossible for us of a later day to understand. The following incident, which occurred in the spring of 1892, illustrates the indifferent way in which business was done on some of the plug lines then in operation. Some co-operative experiments were being carried on at Grand Island, and it was desirable for me to make my way from Eustis to a point on the Sanford & St. P. R. R. By driving to Tavares one would be able to take the T. & G. then popularly known as the "Tag," which left at about sunrise. On the morning in question, the train, probably the only one on the road, was composed of a few box cars and a coach for accommodating passengers. The train started about a half hour late, but still early enough to prevent the passengers from obtaining breakfast. After running for an hour or an hour and a half the train stopped suddenly in the woods. The whole crew, from fireman to conductor, abandoned the train and started directly for a nearby watermelon field. We passengers discussed among ourselves whether to follow or to remain. To our surprise, the train men went leisurely about to find the choicest melons, carried them to a fence, sat down and ate until satisfied, and then each carried back to the train one or two melons. Well, to cut the story short, we got to Clermont just in time to see the train we wished to take pull out from the other station. One train a day. Passengers and perishable fruit left at a junction point without any reasonable cause. While we do not live under ideal conditions at present, the passenger and freight traffic is fairly good compared with a decade and a half ago.

THE PRACTICAL HORTICULTURIST AN ARTIST.

The progress made in the production of fine fruit is fully as great, or possibly greater, than that in transportation. We all recognize the fact, however, that we still have much to learn. If it were not for the strong desire to improve on our present condition we would not be assembled here.

The best horticulturists of today in Florida are artists in their special lines. It takes as much careful thought, and as much application of this thought, to produce an ideal tomato, or an ideal orange or grapefruit, as it does to produce a fine picture on canvas, or to build an engine. As there are only a few master hands that can command a talent sufficient to produce a really first-class painting, so there are only a few who produce a really superior horticultural product; and still fewer who have the commercial instinct sufficiently developed to get the highest price for their product.

The pioneer fruit and vegetable grower lives under conditions that enable him to extract a mere existence in exchange for his toil and thought. It is quite natural that he should become more or less dissatisfied with his lot in life. His surroundings cause him to lose interest in his work and home; he either sinks into a careless and indifferent existence, or drifts to a populous center where he becomes a mere atom in human existence, and tosses about from one engagement to another.

MIGRATION TO BUSINESS CENTERS.

Under our old routine rule-of-thumb method of horticulture, the farmer and his children were mere machines, which did a certain amount of work at the expense of a certain amount of energy. The thinking-mechanism was scarcely called into action. Under such conditions it is no wonder that our young men and young women sought relief by migrating to the business centers. The evidence from history is that our foremost statesmen, our foremost men and women in literary pursuits, as well as our foremost business men, were in the majority of cases raised in the country. This migration to the business centers still continues. It is not surprising to those who have studied the matter, and who perceive somewhat clearly the cause. You cannot blame a young woman for hesitating to accept the position of a wife in the country, when laborious drudgery, from early morning until late at night, is the only prospect in view. You cannot blame the young man for shrinking from a life of six days constant toil, and a Sunday of only half rest. Under such conditions we find even the fathers and mothers, who have spent possibly a half century of constant vigil on the farm, moving to the town or city to retire and spend the rest of their lives in comfort. This move to the city would never have been contemplated if they had been perfectly contented on the farm; or if the farm were the ideal place it ought to be. They move to town because their money will there buy them the comforts that were not obtainable in the country.

MIGRATION TO THE FARM AT PRESENT IMPOSSIBLE.

I have called attention to the fact of history that a larger percentage of our leading men and women were raised on farms than was due to the rural population. There must therefore be some virtue in the country as such for producing superior intellects, sturdy manhood and womanhood. Let us for a moment look at the extreme negative of this question. In the tenement district of New York City, which is the most populous center in America, there hangs a diagram showing the number of people to the acre of ground. It is calculated that at the same rate of crowding the world's population could be placed in the State of Delaware. An accompanying diagram shows that the average boy and girl in this crowded section is far below the normal size.

These facts are so well known to my hearers that it is useless for me to enlarge upon them. My speech has recalled to you the well known fact that we have a constant stream of migration from the country to the town, and no counter-current to the farm. It speaks volumes for the thrift and strength of those who remain that this condition could have gone on for decades. The stream has been all one way—toward the town. It should not be understood that I would raise an argument against migration to the city. It very often happens that a very poor farmer would have made a first-class merchant, lawyer, preacher, or doctor. No two of us are endowed with the same talents and tastes combined in the same manner. We cannot readjust the elements that make up our talents and intellects, but it is our divinely-appointed duty to seek and find the vocation for which we have been best endowed.

BACK TO THE FARM.

Thousands of people, possibly hundreds of thousands, in the United States find out when too late to change, that they have taken up the wrong vocation. The following is a composite of scores of pathetic letters that have come to my office for a reply:

Dear Sir:—I have twelve hundred dollars that I have saved in the last ten years and wish to start in farming or fruit growing, as my health has been pretty badly broken by hard office work. There are three children in our family who ought to be brought up on a farm. I want to get away from town so that I can enjoy the companionship of my family.

Where in your state can I invest and make a living from the start?

Yours truly,

Can there be anything more pathetic? After ten years of hard, unrelenting toil, with health broken, and disappointed in his highest ambition of providing for his family. Ten years of the best of his life spent in following the wrong vocation. Ready, like the drowning man, to grasp at a straw, he risks his future on the advice of a man to him unknown and in a distant state. I must confess to you, ladies and gentlemen, that when that proposition is placed before me to answer, my courage fails. It is too serious a matter.

These letters, of which the above is a composite, would not have made so deep an impression on my mind; nor would I have realized the magnitude of the unrest in the city population, but for one incident that came to my attention rather accidentally.

Mr. A. D. Shamel, a young friend of mine, was asked to award the prizes in the corn exhibit of the North-west. In an interview with a Chicago newspaper reporter he made mention of the fact that many young men wanted to go back to the farm. In less than ten hours letters began to pour in, and for two days three stenographers were unable to complete the work of replying to the inquiries. This happened just before the money panic. The burden of all these inquiries was, How to get back to the farm?

I do not contend that all of these men would make a success of farm work. It had been clearly demonstrated to them, however, that they were misfits in the city. They were eagerly seeking for an opportunity to get away from the city, but the way was securely blocked.

I have drawn out these illustrations at length to show fully the present condition. (No one can say that he is not interested, for it is our own children who are swelling and will swell the throngs in the over-crowded cities.)

Dr. Sledd, in his address tonight, has shown most clearly that our public schools teach our boys and girls away from the farm and from the grove. Nowhere in our common school system do we find anything that will make the boy more efficient on the farm or grove, or the girl more efficient in the house.

AGRICULTURE IN OUR COMMON SCHOOLS.

In discussing the matter of agricultural education in various parts of the state this year, a number of people have told me that they could teach their boy more agriculture and better agriculture on the farm than he could learn in any school. My natural retort is: "But do you do it?" The candid answer must be, No. Every mother here is able to teach her girls and boys arithmetic, spelling, and geography; but she does not do it, simply because it is much cheaper to hire it done, and at the same time the teaching will be much more efficient. Let me ask again: How many of us send our children to hear the reminiscences and war stories told from grocery boxes, and call that history? The agriculture that is taught in the field while driving a mule or "cussing" a laborer bears about the same relation to agriculture that the grocery-box reminiscences do to history. It is not because the subject is too intricate or difficult, but no parent can afford to take the time from his busy day of labor to assume the role of a teacher, and give his son a systematic and rounded course in agriculture, any more than he can afford to give his son a course in arithmetic or bookkeeping. It takes no longer to teach a dozen students in the same class than one; consequently, it is much cheaper to hire some one to teach a whole class than it is to spend all the time on one student.

Probably the most potent reason why agriculture is at present so imperfectly developed in that adequate systematic effort for its advancement has not been made. Organized and concerted efforts for its advancement have been practically unknown until very recently; and at present even higher education in agriculture cannot be said to be well organized, excepting in those states that are most advanced.

We are entering a period where organized and systematic effort will be required to accomplish anything even of moderate proportion. Agriculture, the newest of the sciences, is being rounded out and brought into tangible shape. Our sister states, Georgia and Alabama, have made provision for district high schools in which are taught agriculture and domestic science.

This is well enough so far as it goes, but it stops too high up. The very pupils who need the education most are the ones that are denied the privilege of attending the high schools. It is only a small percentage of our Florida boys and girls that receive any training above the eighth grade. These young people need to get some insight into the plants and animals they see and handle every day. Books have been, and are being, published bringing our knowledge into a concrete and teachable form. What if they don't learn quite so much about the number of planets, or recite fewer definitions from a so-called grammar!

It is not necessary to over-burden the course of study with agriculture in order that we may have pupils to study it. There are many thousands of children that do not receive any instruction at all, who would gladly avail themselves of a chance to learn something that appeals to them as being worth the while.

Finally, ladies and gentlemen, I wish to say that we have left our homes and labors at no small sacrifice. We are here not for the mere pleasure we get out of the trip—that is a mere incident to the annual pilgrims; nor are we here that we may accumulate a few more dollars by some sordid method; but we expect to go back better men and better women; better equipped mentally and morally for the unceasing struggle of life. We expect to return home with newer and better ideas of how to equip and beautify the home; and above all, we expect to be better women and men for having met our distant friends and neighbors on common ground for argument and discussion.

As your presiding officer, I hope that the arguments will be strong and forceful, and the discussions vigorous and to the point, sparing neither colleague nor adversary; for it is the heated furnace that separates the gold from the dross.

Climatology of the Citrus.

By Dr. Wm. C. Richardson.

Mr. President, Ladies and Gentlemen:

The subject of climate has in all ages and all countries furnished a vast and highly important field for the consideration of the horticulturist.

This is especially true of those engaged in citrus fruit culture, for it is a thoroughly demonstrated fact that the orange is limited in its profitable commercial production to certain well defined climatic zones.

The study of airs, waters, places and soils may fairly be said to embrace chiefly that which is included in the climatology of a locality or territory. On the northern hemisphere the isothermal line of seventy may perhaps be said to be the centre of the orange growing districts, and the isotherms of sixty and eighty practically, though not exclusively, the limits. The isotherm of seventy is not confined to latitude but extends, in belting the earth, north and south more than ten degrees and may be said to range between the twenty-fifth and thirty-fifth parallels. Within this belt are found the orange-growing districts of California, Mexico, Louisiana, Florida, Spain, Morocco, Algiers, Italy, Egypt and Asia Minor.

These are not the only countries in which the orange thrives, as there are many other places in the transitional zones, both north and south, in which it may be found doing fairly well, but they include nearly all the districts that are chief factors in the commercial production of this fruit.

The orange does not attain its greatest perfection or productiveness in tropic heat and can stand little or no freezing cold, hence any place where the temperature ranges for any length of time below twenty or above one hundred is not a suitable climate for its culture. In Southern Europe, Northern Africa, Western Asia and in California the cold is greater than in Florida, but is more evenly distributed and continuous. In Spain, Southern France and Northern Italy orange groves are often covered with snow. In these countries, and in California as well, temperatures ranging as low as seventeen or eighteen degrees Fahrenheit are not infrequent and result in no serious harm to orange trees. In Florida, owing to more warm days, such extremes would be disastrous. Continuous cold weather hardens the trees, but alternate warm and cold periods do great damage.

Under the head of water in relation to orange culture it may be said that it is a necessity in liberal quantities.

As to location, it is a fact worthy of note that the most thriving districts are clustered around large bodies of water, as the Pacific, Mexican Gulf and Mediterranean Coasts.

The most extensive orange districts of Mexico are perhaps an exception to this and are found on the table lands, at elevations of from three to five thousand feet; but even here they are rarely more than seventy-five or one hundred miles from the Gulf or Pacific Coasts.

I saw no large or thrifty looking trees in Mexico, and in fact I have never seen trees anywhere as large and vigorous looking as we have in Florida.

Oranges grown to maturity in the tropics are frequently wormy and usually sweet, almost to insipidity; hence they are generally harvested when intended for shipping before ripe. The delicious, snappy subacid flavor that makes the orange so attractive requires some cool weather.

Long, continuous heat without cold snaps which we, perhaps wrongly, dread so much, has a tendency to encourage all kinds of predatory insects, described and indescribable and some others besides.

If there is a deficiency in precipitation, mean or relative humidity, to get the best results it must be made up by irrigation. In those places, as Florida and Mexico, where there is a summer rainy season, the ripening of the fruit is somewhat accelerated and it reaches maturity shortly after the close of the wet season. On the other hand, a dry summer and rainy season in the winter, as in California, has a tendency to retard the time of ripening.

As to soil, it may be said that a littoral alluvium rich in sand is the best. The writer's observations lead him to say that he has seldom seen a profitable orange-growing district in which there was not a rich supply of sand in the soil.

There have been so many scares recently that it may be worth while to say a few words as to change of climate, about which of late years we have been talking so much, but perhaps no more than people have feared and discussed for the past five or six thousand years. There is a probability susceptible of proof that within the period of recorded history there has been absolutely no change of climate, with the exception of slight local changes due to destruction or planting of forests, cultivation of crops, irrigation, etc.

In the marvelously storied land of Egypt the same cereals, fruits and vegetables are planted and harvested at the same time of the year they were thousands of years before the time of the Pharaohs. In Palestine, if not since the antedeluvian period, certainly and positively since the time of Moses there has been no change. The seed time and the harvest time of the same staples, including seasonal festivals of the Syrians are still on the same dates. The same is true of Europe, and the brief history of America offers no other kind of evidence.

Meteorologists have from time to time advanced many plausible theories as to the causes that operate to produce sudden changes and extremes of weather. Solar heat is thought to be the main, if not the only source of warmth. Planetary influences as disturbing causes have had many advocates and a Frenchman has recently suggested that the earth revolving in its orbit has a motion like a spinning top, and from time to time wobbles nearer to or farther from the sun, without any possible regularity; hence the absence of periodicity as time in the occurrence of severe changes. All theories so far advanced, it seems, are almost purely speculative, and probably extremes of temperature are caused largely, if not solely, by local disturbances and movements of the atmosphere. It is scarcely two hundred years since accurate instruments, careful observations and detailed records have been in use, but these show no change. Speaking from a geological standpoint, the climate is indeed growing warmer. There is evidence of glacial drift with Arctic weather as far south as Ohio, and the same is true of Central Europe. These geological changes, however require thousands of years for their manifestation and we need not suffer any fear that our citrus isotherm will move far enough north to make it too tropical for any orange groves that may be planted near it within the limits of our present civilization.

DISCUSSION.

Prof. Rolfs—We have cords of statistics on records of weather and climate, but we have not a single man who can interpret them or make any use of them. We are now getting our climatological records in a little more accessible shape than they were twelve or thirteen years ago.

Methods of Shipping and Packing.

By W. S. Hart.

Mr. President, Ladies and Gentlemen:

It has been wittily said, "To train a child, commence with his grandfather." So to market fruit easily and profitably, one should commence by so cultivating, fertilizing and handling the grove as to produce good fruit, i. e., fruit of desirable sizes, good color, fine appearance, heavy weight, leathery rind and with juice qualities of the highest type; but, as all this has been and will continue to be discussed in these meetings by other committees, I will pass on to the time the fruit is taken from the tree.

By a careful study of Prof. G. Harold Powell's very valuable report, "The Decay of Oranges While in Transit From California" (Bureau of Plant Industry, Bulletin No. 123), and the report of Prof. Tenny before this society last year, all orange growers should become convinced of the important part that *careful* and *proper* handling of the fruit bears on the matter of successful marketing. With the *best product of its kind,* put on the market in the *best possible shape* there remains little in the way of "marketing problem" that need tax the ability of any able business man.

Every handler of fruit wants the output of him who furnishes *the best.* To the dealer it means high prices, the most profit, the best trade and the finest kind of advertising at no cost whatever; for every grower wants to get in where high prices are being steadily realized, no matter what the quality of his own fruit may be, and the consumer able to pay for the best goes to the high-priced merchant, feeling assured that there is where he will find it.

I propose in this paper to give special attention to that branch of the subject covering the preparation of oranges so that they may command the attention of the best trade on arrival in market, leaving the broader but not more important phases of marketing to other members of this committee, whose experiences especially fit them for the work.

Hire all help by the hour, except, possibly, the foreman and box-maker. When sending the pickers to the grove they should be well equipped with plenty of the best tools for their work that the market, or the employer, can provide.

A strong draft animal, with nose covered so that he cannot browse even a leaf from the trees, a good, three-reach platform wagon so made that the hind wheels will follow the tracks of the front ones, plenty of good field boxes made to rest one on top of the other in a way that will not allow of slipping, and with sides lower by three inches than the tops of the end heads, with openings at the sides near the bottom to allow of the free circulation of air and easy cleaning, with sides not too thick or heavy, and the box to hold no more or less than from one-half to a full packed box of oranges according to the system of handling, and provided with good hand holds at the ends. Never use bags for picking. Either baskets, tin or galvanized iron receptacles are the only ones on the market that are safe. The latest make of basket leaves little to be desired in that line.

Send a light but strongly made step-ladder for every picker and a good extension ladder to about every three men, if the trees are of good size. Most important of all, send clippers that are strong and durable so that each picker can afford to own and care for the one he uses, and so made as to render it as near to an impossibility to clipper-cut or puncture an orange as possible and yet allow of cutting the stem snug to the calyx, or even slice a part of it from the fruit.

Until within a very short time, there has been no really good orange clipper on the market. Now the need is fully met. It is best always to send an extra pair of clippers along, and also a jug of water, that time may not be wasted in trips back to the packing house in case either is needed. No man should be allowed to use a pair of clippers that is not in perfect order so as to do good work rapidly.

With the foregoing equipment and a piece of chalk for putting their number on each box they pick, the pickers should start their work at the bottom branches and work up as high as they can easily reach; then take the step ladders and, without leaning them against the tree, clean it of its fruit to fourteen or fifteen feet from the ground. Above this, long ladders will have to be used; but the utmost care should be exercised not to jam the limbs and fruit out of place more than can be avoided; as where that is done much fruit is injured by thorning, crushing, scratching, or being shaken from the tree. Do not allow pickers to pull on an orange to get it within reach of the clippers. Every orange should be so clipped that if the stem end should be firmly pressed against another orange, it could not injure it.

The picker should be trained to clip three or four oranges, where hanging handily, before putting them in the basket; which must be done carefully and without a drop of over a half-dozen inches at most. Don't leave scattering fruit, but pick clean as far as you go, unless selecting for size or ripeness. Turn the fruit into the field boxes with care, keep all dead twigs and trash out of all receptacles and keep the fruit shaded from the hot sun while waiting to be hauled. In loading, see that no box is so full as to permit of injuring the fruit by placing another on top of it, or that any may roll off.

If oranges drop so that injury is possible, lay them out as culls. There are many methods of handling fruit at the packing-house. They should be studied and the one best suited to the individual needs adopted; but there are some general directions that may apply to all cases. The packing-house should be arranged for the careful and economical handling of fruit, as little carrying from place to place as possible; as little lifting of heavy weights as need be and above and over all, plenty of light. The house, bins and runways should be kept reasonably clean and no rotting fruit be allowed to remain in them or in out-of-the-way corners to fill the air with blue mold germs. Everything that fruit comes in contact with—receptacles, runways, spouts or finger nails—should be often inspected to see that no rotten fruit, slivers, nail heads, rough trash or sharp edges can, by any possibility, come in contact with it. If oranges could squeal like a pig when hurt, there would be noisy times in some packing-houses and about some pickers.

The markets have had washed fruit and like it, if washed without injury. No washer will do good and safe work in the hands of careless workers; but there are some now on the market that, properly handled, will rather add to than injure the keeping qualities of our fruit while doing nice work. I wash all my fruit, though it is as clean and bright as that of any grove probably, and I could hardly be hired to give up the practice. After washing the fruit should be dried, being but one layer deep before being put into bins or crowded together in any way. A wet skin does not hurt sound citrus fruits if all parts are wet. Drying on one side and soaking on another is not recommended. My own packing-house is so arranged that if fruit has to be taken in wet from the outside drying rack, it will dry evenly in the trays where it is graded.

All citrus fruits should be carefully graded into at least two grades. My own practice is to make three grades: Fancy, No. 1 Bright and No. 2 Bright. I have few russets. While grading, I have the scale insects, where there are any, removed by scraping with a light spatula of hard pine. Any orange that is even doubtful as to soundness is put in the cull box.

I prefer to pack after the fruit has been off the trees at least twenty to thirty hours and has lost its rigidity.

If the system of handling is in deep masses of fruit, then the quicker they are packed and shipped the better their condition on arrival in market. If the nights are cool and the days warm, it is advisable to close the packing-house tightly before the air warms up much, as otherwise it will deposit its moisture on the cold fruit so that they become dripping wet and unfit to be handled for the time being. With this exception a good current of pure air through the packing-house is always desirable.

From the grading trays, the fruit goes to the large hopper holding many boxes, and from there to the sizer and through the spouts to the packing-bins. The slope of the hopper should be a little greater, but for drying rack and spouting, three-fourths inch to the foot is about right. There are many sizers on the market and several do good work. I should choose one that by no possibility could injure the fruit, that would size by the largest diameter, would be lasting, simple in construction and easy to run.

The bins from which the fruit is packed should be of good size; those likely to receive the greatest quantity should be the largest; those taking the largest and smallest sizes can be of less capacity. They should be so constructed as to avoid the necessity of pulling the fruit about with the hands and should have either canvas bottoms or be well cushioned where the oranges are to drop more than four inches.

Use strong but not heavy tissue paper for wraps. The so-called Japanese is good, but a little too transparent. Paper that will give a reddish tinge to the fruit is best, if not too tender. Have your private brand printed on each wrap, and not so large but that the whole of it will show plainly on a 200-size orange. Wrap with brand opposite the stem and pack as closely as possible without injury to the fruit. If the pack runs too high or too low, don't pass the box until it is made *just right* by changing some of the fruit. The sizer must be set according to the shape of the fruit and will occasionally require re-adjusting where the average shape changes, as it will do when running on different varieties or fruit from different soils.

Close packs will not stand to pack as high as the looser ones. From half to three-quarters of an inch above the heads of the box, necessitating considerable pressure in putting on the cover, is about right if packed properly in the layers. If the boxes are trimmed with lace paper, it is best to paste it at the bottom of the box and pack the first two or three layers with the brand next to it, then stencil so that in opening, that side will be the cover. If an attractive display card for the retailer to hang in his store is put in, it helps the marketing. Everything that tends to give the impression of care and neatness about a packed box and its contents adds to the price the fruit will bring and increases the demand. I have my material gotten out to orders sent in May for fall delivery. Bead the edges of every side, use a handsome strap thick enough to allow air to circulate between the boxes, and a neat and tasty stencil or printer. Don't hesitate to put time and labor into preparing your fruit for market, for there is where a good portion of the profit lies. Every large city contains one, two or three, seldom more, fruit dealers who handle only fancy stock and they have customers who care little for the price they pay but are only satisfied with the very best fruits obtainable. These are the houses that purchase from the man who puts intelligent work into his products; they are the ones that pay a dollar, two dollars or even more above the top quotations and never find more than they want of the kind that pleases them. There are only about three houses of this kind in New York, our largest city. The others pay the prices quoted, but they will pay more for the second grade or for the poorer sizes of the man who supplies the best trade than they will for the best fruit of the careless shipper.

The shipper who caters to the best trade is not apt to be the one who ships one, two or more cars a day, but he may employ as many hands as one who does and give them work four months each season, help his town as much and net as much profit as his neighbor who has several times his acreage and crop. The man who makes and markets his crop at a cost of $1.25 and gets $1.50 for it makes a clear profit of 25 cents. He who sells for $3.00 makes *five times as much net gain*, if we allow 25 cents for added commission and cost of preparation, and there will be a short time almost every season when he will gross six or seven dollars per box for his best grades and sizes. At these prices, the small grower of only a few thousand boxes, and groves not so large but that he can handle them properly and protect them in case of danger, may have quite a satisfactory income, while he escapes much of the anxiety and loss of the large grove owner who cannot give the close personal supervision necessary to the very best work. I am a believer in small groves, but there are individuals who are built for big things and can carry them on successfully, though they seldom reach the top of the market.

The matter of agencies through which to market is one that I will leave mostly to other members of this committee to present; but I wish to say this much: if you put your fruit in the hands of commission houses, look them up carefully before doing so, both as to reliability and courage in naming prices. To put hundreds, or thousands, of dollars' worth of your products into the hands of strangers at a distance, with no security or guarantee of a square deal, is one of the strangest customs of our business system. You would not loan money to them without careful consideration and ample security. Why should we throw such fearful temptation in the way of our fellow man and give him so many chances for fraudulent gain with little chance of punishment until, whether honest or not, he gets blamed when results fall short of our expectations? If we must do this, let us at least take every means possible of eliminating temptation and assure ourselves of the integrity of those who sell our products. Some salesmen have little trouble in asking 25 cents above the market for something extra nice; but for the shipper of the choicest oranges there must be salesmen who know a good thing when they see it and who can ask fifty cents, a dollar or two dollars above the market with absolute assurance that it is not an over-charge.

Much condemnation has been heaped on the heads of those who make early shipments of green fruit. It is often claimed that such shippers get meagre returns and ruin the orange market for others for the season; that it should be frowned upon by every citrus grower or handler and stopped by law, if possible. The first claim is seldom true, for the worst of these sinners. It is those who compromise with their conscience and follow the bolder ones, who take the low prices. For instance, a neighbor with groves alongside of mine shipped his tangerines in early November and got, gross, \$6.00 and \$7.00 for them. I commenced November 20th, and they sold for \$5.00 and even lower later in the season. I am no lawyer, but I don't believe that the law can touch the matter, except it be through Boards of Health at the northern end; nor would I advocate it if I could, for I believe there is and always will be legitimate demand for a small quantity of early green fruit at good prices, and just so long as this is the case, just so long as growers are hungry for money in the fall, just so long as the fear of loss through drought, cold or other disaster is upon him who has a crop for sale—just so long will there be a rush of green oranges to market early in the season, a few condemned by health authority, a few high prices realized and then a slump and disappointment for the laggards. As these things will continue, why rant over them? Let the early shippers have their experiences. They cannot all be happy ones, and the more there are the sooner will every consumer get to know the true conditions, and the lover of sweet oranges will be taught to wait for them until Nature has had time to ripen their sugars and temper their raw acids.

Though oranges grow in size throughout the shipping season and very high prices are often realized in March and early April, the danger from cold to the fruit of unprotected groves, the great dropping that commences when growth starts in the tree, the tendency to crease, to get puffy, to dry out and lose flavor late in the season, make it questionable whether it is best to hold even a part of the mid-season varieties later than the first week in March. After this, the later varieties may be shipped at good prices and fair profit from groves well south in the state or farther north if the groves are protected from injury from cold.

Load your own fruit into cars wherever possible, even though there be but a few boxes in the shipment, and see that the ventilators are all open.

As between express and freight, for sound fruit I prefer the latter, believing that the rougher handling and stealage by express more than compensate for the difference in time of delivery, to say nothing of the greater difficulty in collecting just claims.

The lesson, then, that I would teach is carefulness that should run, like the red strand in the cordage of the English navy, through all our operations and relations with our fruit. This, coupled with honesty and loyalty to ourselves and the handlers of our products, will allow of our shipping our fruit to the north in ventilated cars and there hold more than our own against the pre-cooled and iced fruit of our worthy rival, California; but the lack of it during the past season has cost us dearly in both money and the reputation of our fruit.

I also have some rules posted in my packing-house, and if you would care to hear them I will read them to you. They are for the guidance of help, and No. 18 is for casual visitors as well.

1.

Care must be taken when picking oranges not to clipper-cut, bruise or thorn them.

2.

Every picker must put his number on the boxes he picks.

3.

Do not let oranges remain in the hot sun when waiting to be hauled, or for long when on the drying rack.

4.

Every orange must be washed, and sponges used regularly when washing.

5.

Keep plenty of water in the washer to hold weight of fruit so as to wash clean.

6.

All oranges must be examined for long stems and all found must be closely clipped before the fruit goes into the washer.

7.

When curing, oranges should not be over two layers deep.

8.

Keep a constant and careful lookout for anything that will injure the fruit, such as nails, slivers, sharp edges or long finger nails. All persons handling fruit for shipment should keep their finger nails closely cut.

9.

Be careful to have cushions in place when pouring oranges into bins or hopper, and see that no injury is done to any that may be already there.

10.

Look out for blue mold about bins or boxes and for rotten oranges in the packing-house. These should be removed at once.

11.

Care in picking, washing, grading, packing and all work connected with preparing fruit for market is of greater importance than speed.

12.

Every doubtful orange is a cull.

13.

Citrus fruits should remain in *this* packing-house to cure at least thirty-six hours.

14.

Pack true to grade, size and quality, and so that when the cover is put on the fruit will be tight in the box.

15.

Each packer must put his initials or number on every box he packs; also grade and number of fruit in the box. Customers will be requested to send us the packer's mark on every box badly packed, so that the packer can be held responsible.

16.

The W. S. Hart brand *must* be known as an honest brand.

17.

No excuse is a good one for carelessness or waste of time.

18.

All persons, both casual visitors and help, must bear in mind that this is a place of business and not for loafing, long stories or gossip; nor must visitors divert the attention of the help from their work for long at any time.

No one but the undersigned has authority to change these rules.

W. S. Hart.

He who knows it all and resents instruction, is hopelessly ignorant, a disappointment to himself and vexing to others, the last to be employed when help is scarce, and the first to go when it becomes plenty.

By F. G. Sampson.

Mr. President, Ladies and Gentlemen:

When I learned of my appointment on your Citrus Packing and Shipping Committee, I wondered what I could say at all worth while, but from shape of market the past season, it does seem as if the time were right now when we should take counsel together for the bettering of conditions. We can start with the fact that if we are calculating to hold any position worth while in the markets, we shall be obliged to adopt the most improved methods all the way through from growing to marketing our fruit. The citrus plantings in California, Porto Rico, Cuba, Arizona, and Mexico are enormous and add to that the yearly planting in Florida makes an increasing supply that leaves no possible room for profit, for anything but the best work of which we are capable. The production of all other kinds of fruit is year by year being brought to greater perfection in quality and attractiveness, and any orange to get preference over other kinds of fruits must be both good to look at and to eat. Florida does produce such fruits; but those very qualities (thin skin and full to bursting with delicious juice) calls for extra care all the way through, and in that, I am afraid, most of us are not doing our best at all. The past season was opened with shipments of fruit as green as the leaves on the trees; it is no trouble at all to color an orange, but it is impossible to make an unripe fruit fit to eat, and pretty nearly so to get a buyer for second lot after sampling first. Some early oranges are ripe enough inside before the rind is fully colored and should be shipped and so prolong the season; but until you yourself enjoy eating them they should be left on the trees.

Then, unless you have been in the markets and actually seen condition on arrival of many of the shipments, you have no idea of the amount of decay. The percentage of shipments arriving in bad order is responsible for continual lowering of the markets; for you can bet your last dollar that if the buyer sees any decay at all (*and he will see it if it is there*), he will buy at a price allowing for double what he *suspects* is there.

Now, it is not enough for oranges to arrive sound; they must stay so until the retailer can sell them and the consumer eat them. Our fruit not standing up is responsible for the tremendous margin the retailer exacts.

Then, again, no orange that has been in contact with a decaying orange has the fresh, inviting flavor that we must furnish our customers in order to secure consumption at good prices for the size of crops in sight.

The wide range of prices the past season shows that the buyers are ready to pay well for what they want. For instance, auction market sales New York February 26th Florida 1.20 to 3.25, February 27th 1.25 to 5.20, and 29th Florida 1.25 to 5.65, California 1.65 to 3.10, Porto Rico 1.10 to 1.55 for oranges and grapefruit, these date from 1.12½ to 8.62½. The growers getting 3.10 to 5.65 for oranges and 8.62½ for grapefruit were getting rich; the others, *I guess not.*

Part of our marketing troubles the past season were from causes beyond our control, national financial troubles and drought causing summer-bloom fruit of different ages; but this trouble was increased by many shipping all ages together, which, with decay, soon brought our markets too low for any profit.

The Agricultural Department, in bulletin 123, clearly shows the cause and the *practical*—not theoretical, mind you, but *entirely practical* remedy for most of the decay and we had best be getting busy studying and following.

Putting me on this committee means, I suppose, that I am to give my own packing methods and so help start the discussion. We use the cloth-lined, rattan picking baskets, strap that goes over shoulder, of wide webbing, hung low enough so the elbow just clears the basket, which is then where the forearm reaches the bottom of the basket; the fruit is *placed* in basket, not dropped. We round off ends of bent-blade scissors blunt, and pick all bottom fruit before using ladders. The picking "boss" sees that a picker slips his basket off his shoulder, laying a dozen or so oranges in bottom of box and then tipping basket with one hand eases fruit into box with the other, and he puts his ticket in box as filled. Hand holes in field boxes are not cut clear through and so avoid finger-nail cuts, and boxes *set* down, not dropped at all. At the packing-house the fruit goes to grading bench, cloth-lined, and with heavy duck apron at the ends, with one side nailed down. The box is placed on a shelf four inches lower than the table, and the grading boss gathers end of apron in each hand and holds tight over box of fruit while he upsets the box and then lifts box off. As the fruit spreads out, if it shows long stems, they are cut and word is sent to the grove to straighten up that picker.

Have short side benches that hold boxes for two grades bright and one russets, and cull box under bench and try, and do not forget to use cull box. Trucks hold-twenty-eight boxes carry graded fruit to different piles to cure a couple of days. Sizer-hopper has shelf and apron. We use sizer made by Alfred Ayer, Ocala, that sizes, and is set so that in packing, each tier has to have pressure to get last row in, and so the box will stand tipping at quite an angle before the fruit would roll out.

We use Warner wrapping machines that twist paper tight and get box packed tight all the way up, and so avoid so much pressure on top as box is nailed up. As boxes are nailed up they are stood on end, two high, and have trucks with 11-inch axle and wheels inside, so the two boxes are put right in place in car without further handling.

We hire by the day, for I fully believe that piece-work is responsible for very much of the decay; at any rate it is certainly easier to get the extra care from a hand when you are paying him for the extra time that may be required; but really when once the habit is formed, it requires very little more time to handle right, but it is certainly a day's work to make our hands understand we *will* have careful handling.

My paper is too long already, but I want to say that I think our marketing methods must be improved, or our increasing crops will bring us no profit. The buyer and packer who did not lose money the past season was exceptionally fortunate, and, naturally, all will contract very carefully this fall. I believe we must have a central distributing headquarters at Jacksonville, so the crop can be handled so as not to have each packer competing for every sale in each and every market.

To handle the present crop in sight, the packers ought to get together for thoroughly systematic distribution. We ought to have very much lower freight rates to nearby states. We could then sell fruit very good to eat but not quite up to standard—cheap, and still get more than with distant freightage and so relieve the large markets of so much off-grade fruit. It is the accumulation of off-grade fruit that breaks our markets. Our Southland is prospering and will take lots of our fruit if we could deliver at reasonable freight rates. Unless our shippers organize and use quite a little judgment, we are likely to see our markets go to smash in a hurry this fall. The early markets paid so much better than the later, the past season, that the last one of us will probably think it smart to work all night and Sunday, too, to swindle someone with our unripe fruit.

I believe the situation a very serious one, needing the most intelligent handling. If we continue our present policy of "each one for himself and the Devil take the hindmost," my judgment goes on record right here, that he will get a good big bunch of us this fall.

By O. W. Sadler, Jamestown, Pa.

Mr. President, Ladies and Gentlemen:

I want to call the attention of the society to the *extreme importance* of a most thorough study and discussion of means and methods for the sale of our products of Florida. The extremely low prices obtained for everything this year, should have touched *every grower* in his tenderest point—his pocketbook—severely enough to make him *think and act.*

Since the collapse of the panic before Christmas, except a few cases of especially fancy stock, oranges have not *netted,* on the trees, over 25 to 50 cents when *consigned;* at least that has been my experience with several cars to various markets reported as the best; $1.25 to $2.00 being the average limit for good oranges. The *causes* preached to us were the "panic," and the "large crop." By investigation on my trip north, and since I have been here, has given another cause,—*green fruit* early in the season. The green-fruit proposition is brought about by two main facts or conditions. The first is, on account of the comparatively few Florida oranges since the big freeze, the *great mass* of orange eaters have not learned what a good ripe Florida orange is, and do not know a Florida from appearance, or where it comes from, so have not sufficient knowledge to judge by. When there are few, if any, other oranges, the *green* stuff is offered for sale. They make a first purchase of "fine sweet Florida oranges," and Oh! the awakening; and straightway their opinion of Florida oranges is decidedly expressed in—"Well, if that is a *sweet Florida orange*, I *never* want any more." By the time they get over that disappointment, they venture to try some other kind, and they find a *colored* green California and try it. It is not real sweet, but as a Florida *green colored* orange is always very much more sour and rank than a California of the *same stage of development,* without further trial, remembering how *awfully* sour the Florida was, he *remains* a California chooser.

This experience was told me by several people from several states and markets, and positively asserted that the sale of *green* fruit had injured Florida's reputation for good oranges to an enormous extent.

As *speculators* were the chief cause of the shipment of green fruit the past year, and as the majority got left to the tune of 50 cents to $1.00 per box, after the distribution of the first car in a community, they cannot work the "early sweet Florida" game in the same places again, at least to the *consumer,* it is to be hoped the state may redeem its name in part the next crop. Until this season I have always been able to sell my Florida oranges in competition with Californias at an average advance of 50 cts. over Californias. This year the reverse is the case, except with people who *know* the difference. Our greatly increased foreign population who have not yet had the opportunity to learn the difference, make up a *majority* who buy through ignorance and looks—*bright* Californias.

The *dealers* have proclaimed *loud* and *long* that "the poor, the laboring class eat the oranges, and they are out of work and can not buy."

Is it true they can not, and do not buy? We are *all* aware the crop *has been sold,* and *consumed—somebody* ate the oranges. *Did* the *consumer* get any advantage of the low prices paid the grower?

A few figures from my own sales on *consignment* of about 1,500 boxes, mostly car lots, will give one example of the very small returns to the grower. The *average* sales returned was $1.78. The average freight, cartage and commission, was 89 cents, leaving 89 cents f. o. b. at packing-house. Taking from this the usual picking, packing and shipping 50 cents, leaves 39 cents on the trees. This was during January, February and March. Those sold f. o. b. at home did better, bringing $1.30 to $1.40, showing considerable advantage of f. o. b. at home, over *consignment.* But this year there were very few f. o. b. buyers, and not all could be relied on to carry out their contract.

Now, let us see if these low prices were *necessary* to the retailing of the fruit with a *reasonable* profit.

I have inquired carefully as to many places, from Georgia, North, East and West, and in my own town, and find that retail sales were 15 cents to 20 cents for the smaller sizes, progressively upward to 25, 35, 40, 50 and 60 cents as to size, and one gentleman living in New York said he paid 75 cents per dozen for 150-size. Averaging all prices would give 37 cents per dozen. If oranges run all sizes in equal quantity, the average dozens in a box would be 15½, giving an average retail sales price of $5.73 per box. If we only include 250s, 216s, 175s, 150s and 126s, we get an *average* of 18½ dozens, and averaging per-dozen prices at 15 cents, 20, 30 cents, 35 cents, 40 cents and 50 cents, we get an average of 31 2-3 cents per dozen, 31 2-3x18½—$5.85 per box, *average* all sizes and prices.

If we grant a loss of 16¼ per cent. for decay, there is still left $4.90 as the retail price per box. The above average commission house return price of $1.78 leaves a *net profit* of $3.12, while the grower has received the generous sum of 39 cents, including his *investment,* and profit?--where is the profit?

Suppose we add one dollar more to the cost to the small and interior town retailers, he still has $2.12, or over *five times more* for selling than the grower for producing.

Fruit-growers of Florida, are you willing to continue this unequal division of the products of your labor and expense, without an effort to change?

Let us take another example in the vegetable line—cukes. The first week in May cukes selling in the chief markets at $1.00 to $1.25. The average express charges in less than car lots not less than 75 cents, commission 11 cents, hamper, picking and packing 30 cts.—$1.16, average *consignment* sale $1.25; loss, 3½ cts. for grower. Consequently none but those who can ship in car lots have any chance of coming out even.

Investigation as to retail prices, by personal inquiry at large and small stores and fruit stands, I am told cukes average —small, medium and large—6 dozen per basket; averaging the prices 30, 40 and 60 cents per dozen—43 1-3 cents or $2.60 per basket, or $1.38 net *profit* for selling, against nothing or a loss for growing.

What is the use discussing how best to grow our products if we can get nothing for them? The few commission men I have talked with about the matter, who *should* be the *grower's* agent to see that he got his share of what the *consumer* pays, say they do not see how they can change conditions. Although they have a society, they make no *concerted* effort to get our equal share, but, on the other hand, *compete* with each other in selling OUR products, thus favoring the retailer, practically giving us over into his power, as the foregoing figures demonstrate.

Is there no way to remedy this condition? This is the great problem for our society to solve. Can we do it? Can the growers come directly to the consumer and cut out the middlemen who now are only agents for our undoing?

The *consumer* pays enough for our products, but we get very little of it.

The result of my study of the question is, ORGANIZATION OF GROWERS SELLING DIRECT TO CONSUMER.

That there will be many difficulties in its accomplishment, goes without saying. But that there are business men in our society to devise a plan and work out the details, I am certain; and when done, *taking present conditions* as a basis, I am sure there will be much more profit in the selling than in the raising.

As I cannot be present at the meeting to discuss the matter with you, I will give you a few of my thoughts as to a plan.

Let every district or section organize and establish a common packing-house at the most convenient shipping point, so as to ship in car lots. A packing-house implies a competent picking and packing crew.

Elect a competent man as grader and inspector of the fruit, either on the trees or as delivered at the packing-house, and each grower be given a credit certificate for the number of boxes of different grades, or a more exact way, the number of pounds, and then let his fruit lose its identity as his special lot.

A manager for each packing house or board of managers representing several or all, are then ready to sell f. o. b. at packing house. *Or, having organized* and opened a sales house or houses in places capable of taking—consuming a car load a week and upward, keep these sales houses supplied through telegraphic communication with a general head as they need. The details of retail distributing houses can certainly be worked out by successful business men. Each grower, each *manager* of packing-house, and of sales store, should be a stock owner, or interested financially, and partake of the profits. The organization could by vote fix starting price for fruit on the trees, or the proportionate percentage of the net proceeds at stated times.

As it is *now*, the grower must pay the cost of shipment before they leave, and gets no money until the consignee gets ready to remit—from ten days to three months, and by drawing no money from the organization for the same average time the capital need not be large.

I have not the time nor the capacity to go into all the details, but hope I have suggested enough to introduce the subject, and certain that together, a successful way of benefiting ourselves and the consumer can be devised.

By W. E. Bryan.

Mr. President, Ladies and Gentlemen:

Starting at the beginning of the season the first problem is the packing of fruit that is not thoroughly mature; this fruit requires to be kept in the packing-house several days until the water in the rind has sweated out. If this is not done before the fruit is packed it will sweat in the box and undoubtedly cause decay, which will not develop until after it has left the packing house, and the grower will often be astounded when he gets a letter from his commission merchant informing him that his fruit, which he knows left his packing-house in good order and condition, has arrived in bad order, and has had to be sold at a sacrifice.

The grower often thinks the commission merchant is deceiving him and trying to cheat him when the true reason is found in the fact that the fruit having sweated in the box, has caused the wrapping paper to become thoroughly wet and the whole contents of the box are in a very moist state, which is a condition highly conducive to very rapid decay.

Let us beware, then, of shipping oranges with moisture in the rind.

SIZING AND GRADING ORANGES.

When packing fruit it is well to remember that most of our fruit is packed to be sold to some stranger, who in turn will probably sell to somebody else; therefore it is necessary that he should have some idea of how many oranges he is getting in each box and of what quality they are. The number and grade, then, should be put on each box plainly and the contents should be strictly according to stenciling both in number and in grade. Any irregularity in this respect will make the buyer suspicious of the fruit not being equal to the markings and in future buying he will feel unwilling to pay full market prices, and hold a general distrust of orange packers. It is necessary, if each person concerned in marketing oranges is to get their full quota of profit, that each and every one does his share of the work and that all should be in sympathy. When all can be trusted there is an economy in the marketing that should be an extra profit to all concerned. I have known of well-known brands of fruit fetching higher prices because it was known to be exactly as represented by the markings on the box. Such fruit often passes through the hands of the middlemen without the delay and cost of inspection.

Let us, then, be careful to mark and grade our fruit correctly.

PROPER PACKING.

One of the worst features of poor orange packing is the putting of too much fruit in the box; in some instances so much is put in as to cause the top and sides to bulge out. This is done to such an extent that the top of the box cannot be nailed in the middle; the fruit in such a packed box is nearly sure to be very much bruised by pressure from other packages in transit and from handling. If dealers find much damaged fruit in their purchases, they have to sell the good fruit at very advanced prices to make their purchase profitable, and thus materially restrict the consumption of oranges, which restriction results in glutted markets and poor returns to the grower, whilst the consumer is complaining of the high price of retail oranges.

These results are brought about by loss of damaged fruit caused by putting too many oranges, or too large oranges, in too small a space and then subjecting the box to outside pressure from other freight, both in the railway car and on the transfer trucks.

SIZE OF ORANGE BOX.

What size should an orange box be? The size should be regulated by economy for the grower and availability to the consumer. The packing will be most economically done by having a box large enough and not too large for one man to handle and lift without other aid than his own physical strength, and large enough to keep a man of ordinary strength in good exercise, thus handling a good many oranges at one time and at the same time keeping up a high degree of manhood amongst the orange fraternity.

The size of the box from the seller's point of view should be that which is most available to dispose of in the market. The present size of the box, viz.: 12x12x 24 inches, would seem to be large enough and not too large for one man to handle; and if the commission merchants do not complain of the size as being awkward to dispose of, I do not think we should change. We should pay no attention whatever to any size of box that some other orange section may produce, knowing fully well that the orange buyers will pay just so much, that the fruit will bring them a profit and that their price will be regulated by their ability to make their profit out of the contents of the box.

The unit of economy in the size of the box is that it should be large enough to tax the strength of an ordinary man, and not larger, and if the present size of the box fulfils this condition, any other size would make the cost of handling greater, which extra cost would have to to be paid by the grower when the fruit was in abundance and low in price, and by the consumer when the fruit is scarce and high and always means money paid to the middleman either by the producer or consumer.

Some sections may find it advisable to have a very small box, as possibly not much of their fruit is wanted; but if Florida fruit is classed as being equal to the best, let us send it out in abundance, and not try to restrict our output by contracting the size of our box.

DISCUSSION.

Mr. Hart—Now, there is a great deal of difference in white papers. Some white papers will give you the proper color. The mandarine orange is of much better quality than the tangerine, but the latter brings nearly double the price of the other. The Japanese paper does not give that pretty tint and it is so transparent that it shows up the blemishes badly, but it is tough and does not break or tear easily. I also think the print is of much importance. Your private brand should not be too large. I have seen some so large that on a 200 orange you could only see some confused printing in the middle. A good print can be made small, yet plenty large and plain enough to show the whole of it on a 200 orange.

Before the fruit goes into the washer the thumb, finger or the eye comes in contact with every calyx, and if any stem is left on them they are carefully clipped off. It would be almost impossible for a long stem to get by my men as far as the washer.

Mr. Skinner—I have heard it said that Mr. Sampson puts up the best pack in the state, not excepting any. I think it will do us a great deal of good to listen to these men and learn what they have learned by experience. The great trouble with me is labor. We have to import from 100 to 200 hands every year and we have to get green hands and when you have to deal with these fellows and get them to pare their finger nails, etc., we are up against it. I have one thing in my packing house that is of great help to me, and that is truck boards. When the boxes are nailed up they are set on this truck board and we have a special truck that is slipped under it, and the boxes are moved right into the car and are not touched at all. The truck board protects the fruit entirely.

I was struck by a little article I saw in the paper not long ago. The writer said he set his fruit over some steam pipes so that it could not get cold and attract outside moisture. He also said he washed his fruit with a little salicylic acid, and he said the wounds that it had received dried over. I have been thinking of that. I use a washer with a great deal of satisfaction except when the burlap breaks loose, then I have a good deal of trouble in getting it fixed. I think my washer is the best washer there is, but it is necessary to have good burlap.

Mr. Hart—I would like to ask Mr. Skinner what becomes of the boards he speaks of?

Mr. Skinner—The fellows that are trucking run the truck to the end of the car where the man is loading, and he lifts the boxes off and sets them in place. The truck boards are thrown to the side of the car and a man sets his truck under them when a pile accumulates and carries them back into the packing house.

Mr. Hart—I saw them in California used for plums and I thought they would be fine for oranges. The point I mean to bring out is that you would have to handle your oranges once more than you would without them.

Mr. Skinner—We use them when the fruit is brought into the packing house, in fact, we use them everywhere. You see, our station and packing house are together.

Mr. Hart—Most of the trucks that are used are so made that the arms are so high that it comes right in the middle of the section where it can do the most harm. I think them very bad, indeed, to handle fruit. I once put an iron bar across them to prevent that, but if these boards can be used, I think it wise to do so. Do you use one board to three boxes?

Mr. Skinner—Yes. You see, you have to have two cleats underneath the boards. These cleats fit right over the prongs on the truck, and you can lift them up and carry them without the least difficulty or danger.

I might speak of another thing. Perhaps you are familiar with the California load. In refrigerator cars especially it is a fine thing. You put six boxes across the car, standing them up on end, and there is a space of about four inches between each box in an ordinary car and six inches in a vent. Then two strips are nailed across, leaving a vent clear through, each box by itself. There is a straight line of boxes from one end of the car to the other. The cost of the stripping never exceeds $1.25. To show you how well it holds, I had a car handled by the Atlantic Coast Line in its usual careful way. They were going about forty miles an hour when a wreck occurred. That car turned over on its side and rolled down a hill. However, each layer of boxes settled down against the next one, and only about six boxes in the car were broken.

I think Dr. Inman might be able to tell us a good deal along this line, if he will.

Mr. Inman—Mr. President, Ladies and Gentlemen: Had I known that I would be called upon, I might have formulated some ideas which would be of interest to my fellow fruit growers. I am not a good talker, and if I had any ideas, I fear that I cannot present them in a very interesting way. But I can probably tell the story as it appears to me.

First, let us cast about and take an inventory of what we are doing in the way of growing and harvesting citrus fruits in Florida. Are we producing as much or of as good quality of fruit as we should do? And after it is grown, are our methods of harvesting in keeping with the spirit and progress of the times? I am free to say that we are growing but little over one-half of the fruit that the groves of the state are capable of producing under a more through system of care and cultivation. But, upon this subject I do not propose to dwell, as it, within itself, would require a volume. However, I will say right here that I have visited a good part of the world where citrus fruits are grown, and have come to the conclusion that, so far as I have seen or acquired knowledge of, there is no country or region which affords the advantages for the growing of oranges, tangerines and grapefruit that we possess right here in Florida; no place where fruit grows to such perfection or the groves produce so abundantly, and no place where an enterprising man can engage in the business with the same certainty of being well compensated for his labors.

Harvesting.—This is one of the all-absorbing subjects of the day, and the one demanding the most thorough investigation and thought, followed by energetic action upon the part of every one engaged in the fruit-growing industry. Our careless and rough handling is costing the state thousands, yes, hundreds of thousands, of dollars every year. I make the assertion that fully ninety per cent. of the Florida fruit which arrives in market in bad order is attributable to careless clipping and careless handling. All of us flatter ourselves that we are taking extra pains and doing better than our neighbors, and that if our fruit does not reach its destination sound, the fault lies with the transportation companies and not with us; when, if the truth were known, fully one-fourth of the oranges were either punctured by the clippers, scratched by the finger nails or bruised by dropping, jamming against the ladders, pouring into the field boxes, rought treatment by teamsters, emptying and piling up in the hoppers, or falling from the sizers into packing bins. All of these matters seem to be of small moment until they are carefully looked into. When that is done, the result is simply astounding. We must awaken to the importance of these little details, and bear in mind that fruit should be handled with the same care that we would give eggs, and will actually stand no more roughness without great damage. Stop and consider. Is there one of the abuses mentioned that we cannot correct and entirely eradicate?

I am not making these statements at random, nor without abundant evidence to substantiate every word or assertion. They have all been confirmed by actual tests, made by government experts, both in this state and California, during the past season. Remember that the slightest scratch upon the rind of the fruit is just as surely fatal as a deep puncture or severe bruise, provided the fruit is exposed to the rot spores, which are never wanting in every one of our packing houses. Every small inch of atmosphere contains thousands of them.

Marketing.—Here comes the business part of all of our undertaking, the one that must be revolutionized very soon, or the business of the growing of citrus fruits in our fair state will soon fall into a more chaotic and helpless state than it is at the present time. Who is to blame? No one but our dear selves, and no one but the growers can ever correct the existing evils. We can and must do it.

Let us take the state of Florida as a whole, and make it a business proposition, applying to each one of us singly; for what concerns any one of us, applies to every one in Florida engaged in the growing of fruit.

Let us see if we are acting as business men should—are adopting good business methods. What are we doing, and what are our methods, and what must we do? If you will bear with me, I will enumerate some of our follies. To begin with, we are supporting about one thousand solicitors and drummers, representing commission houses from almost every city in the North, South, East and West. Add to these one thousand men about five hundred livery rigs and drivers. These are all high-priced men, and expensive livers. This army of itself costs us hundreds of thousands of dollars annually. But this is but the beginning of our extravagant management, for we are supporting, in a good part, an equal number of commission houses in nearly every city in the Union. I do not wish to be understood as casting any reflection upon these men, nor upon the fruit houses; for I acknowledge that the great majority of these men, also the houses which they represent, are doing a legitimate business, and at the same time doing the very best they can for our interests. But, is our way or system of marketing correct and in keeping with good business principles? I would answer, most emphatically, No! No! You will ask, "Is there any remedy within our reach, any system of economical marketing upon which we can all unite, one which shall be just to all, one by which the widow and the small grower with a badly assorted grove, producing a little of all varieties and kinds of citrus fruits, will fare as well and receive the same price (quality the same), as the most shrewd and competent business man?" To this I answer, with the same emphasis and confidence, Yes!

You inquire by what authority and

ways I have arrived at these positive conclusions, and how I am able to talk as though these were established facts. To answer and prove that I am not dreaming or theorizing, I will tell the whole story as I know it.

I have been in Florida twenty-two years, and during all of that time have been engaged in the growing of fruit, and that, too, with very good success and results, which I do not complain of. But, for the past two or three seasons, I have been convinced that our methods were not the best, and that the orange growers of California were outdoing us, both as to harvesting and marketing of their crops.

On April fourth I decided to go to the Pacific coast and investigate, not alone for myself, but with the hope of benefiting my neighbors as well. By appointment with Prof. Tenny, a government employe, I was met at Riverside by Professor Powell, who has been engaged, through the Horticultural Department at Washington, for the past five years in making a thorough study of conditions existing there, and teaching, by a vast number of experiments, the growers how to correct the evils and errors, which he discovered existing there, which were many, yes, even more and worse than are besetting us at the present time. The growing and marketing of their oranges was affording almost no profit and, in many cases, an actual loss to the producer. Their methods of harvesting were very crude, and when it came to selling their fruit and getting it to market, the results were such that a great many of the orange groves were abandoned, or cut down and the land planted to other crops. It seemed impossible for them to get their oranges to the Eastern markets without their arriving rotten. How to remedy matters was the task undertaken by Professor Powell, and that, too, almost single-handed, for he was supported with an appropriation of only $3,500 annually, out of which he had to meet all of his personal expenses, as well as to pay his assistants (when he had any). This season the appropriation is $6,700.00 and he has seven men to aid him. It seemed a Herculean task, and one almost without hope. But, what has been the result, what has this one man achieved? How plainly has he demonstrated that men, not money, are the powers which are moving the world at the present time.

In the first place, he demonstrated that the harvesters, and not the transportation companies, were at fault for the rotting of the fruit. He showed the growers, by actual experiments, that in some cases over fifty per cent. of their fruit was hopelessly damaged before it was delivered to the railroad company. This was his first key to the solution of the problem, and, with all of his experiments before the growers, the remedies were easily found, and all enterprising growers set about jointly to correct and remedy every bad feature in the harvesting, until today oranges in California are handled with the same care as eggs. And claims upon the transportation have been reduced about seventy-five per cent.

Next, as to the methods of marketing, and the organization known as the California Fruit Exchange, which is today, I believe, the most thorough business organization in the United

States, not excepting the Standard Oil Company or the United States Steel Company; and, more, it is one without graft or fraud, and to which I can see no probability of fraud creeping in. The California Fruit Exchange has only about or less than $20,000; If I remember correctly, it is $15,000 capital, upon which it never pays a dividend. I will try to tell you something of the Fruit Exchange. This organization consists of numerous packing houses, or associations. These associations are usually made up of neighbors, for whom it is convenient to do their packing at one packing house, and of these associations there are a great many, and each one of these associations is entitled to one share of stock (no more) in the Fruit Exchange. This share of stock entitles the association to one representative to or in the Fruit Exchange. The Exchange is made up and controlled entirely by these representatives from associations (who do not draw pay). These representatives elect the board of directors; the board of directors elect the officers, and the officers elect the President and employ the executive force. The Fruit Exchange is almost a complete duplicate of our Federal Government.

All business is transacted at headquarters at Los Angeles, and it is surprising how much can be done by a few men when well systematized. For instance, and to illustrate some of their methods and their success, only five years ago the Fruit Exchange was organized, with only a few associations. It then only controlled a small percentage of the fruit. But, by thorough business methods and advantages which co-operation afforded. It has grown very rapidly, until this season The Exchange will handle fully seventy-five per cent. of all the citrus fruit grown in California, amounting to over thirty thousand (30,000) carloads. And all of the sales are managed by two head salesmen, with only six traveling salesmen to help them. How does this compare with our force employed for the selling of our small crop? It is not five per cent. of our expense. In fact, the whole expense of managing associations, Fruit Exchange, collections, buying and all, does not amount to five per cent. Losses, defalcations and non-payment of accounts, as shown by the books of the Exchange, which are open to all, amount to less than three hundred ($300) dollars, and this, too, upon sales amounting to over thirty millions of dollars ($30,000,000.00). Payments for fruit to the growers are made in cash every thirty days, *no losses, no worries.* You might inquire if there are any other benefits or advantages to be derived from such an organization as the California Fruit Exchange. Yes, very many. For instance, before this organization was effected, the growers were paying nineteen (19) cents each for orange boxes. Today they cost them 12 to 12½ cents. Paper, machinery, the price of help, and the supply are managed by the Exchange. Freight rates are all managed by the offices of the Exchange, and the rates which they pay on fruit, considering the broad distribution which they enjoy, is very much less than we pay from Florida, notwithstanding that we are two thousand miles nearer to the markets.

A very small proportion of the California fruit is re-shipped from point to point, as the Florida fruit is. The California rates are all made to Denver, Colorado, and beyond. It costs no more for them to place a car in Boston than in Denver, freight the same to all points east of that city.

Shall I tell you how the labor is done by the Californians? This might be of interest and may be a help to you in getting down to a proper way of doing the work, with the object in view of correcting the present errors and abuses.

To begin with, all labor is employed by the day, except the wrapping of the fruit. This work is nearly all done by women, and the price per box is two and one-half (2½) to three cents. In all packing houses which I visited they were paying two and one-half cents per box. The picking is done by man, *not expert pickers* such as we employ, but Mexicans, Chinese, Japs, Indians or white men, under the eyes of a Superintendent, whom they must obey to the letter and in the proper spirit. This field superintendent is supplied by the association for which the work is being done, and all gathering must be done under the supervision of their officers, and not according to the taste or ways of the growers, for here is the beginning of the careful work, and of very vital importance, for an error here is past remedying. We cannot patch up a damaged orange.

Hauling.—This is all done upon spring wagons, and the field boxes are carefully set upon the wagon and when taken off are carefully set down, not shoved or thrown. They never use a field box larger than a common orange box, and they fill these boxes about two-thirds full and carry about seventy-five to ninety boxes upon each wagon.

I am asked how it would be possible for us to form such an organization in Florida, where our matters are in such a state of confusion. You say that it would not be possible to get a sufficient number of growers to unite to control a majority of the fruit; too many firms and individuals with private interests would oppose and work against us. Yes, they would do their best; but we would not need any certain percentage of the fruit. The principal object should be to do the work in such a manner and at such a saving, and show such results, that the question would be not as to who wished to join the associations, but as to who the associations would take in; for all who become members of the Exchange have to submit to the positive rules of the same. Remember, and do not confound the terms Exchange with that of associations. The latter is made up of an association of neighbors for the better gathering and packing of their crops. The Exchange is composed of representatives, one from each Association. Every grower is in reality a member of the Exchange. How could we proceed to organize an Exchange? What steps should we take? To this I will say that nearly all present are orange growers, and among us we have a large number of enterprising, loyal men who could be appointed by this Society for the purpose of forming an organization. They would proceed as follows: Say three be chosen to go to California and fully familiarize themselves with the workings of their Exchanges and Associations. The Californians send you through me an invitation to come there, and they will warmly welcome and aid you. Get a copy of their Articles of Incorporation. The California Fruit Exchange is an open book, and they are with us and are very anxious that we organize, which would mean much to them, and do away with our glutting and ruining every market within our reach. You never hear of a glut of California oranges. They were willing to give me a copy of their Articles of Incorporation, which I have, also by-laws governing several of their associations. This Committee would return and report to their fellow members. The next step would be to secure a lecturer and organizer—a teacher; the same one who did the work (or nearly all of it) for the Californians. (I was told by their President he thought he could be had.) Set him at work and as soon as half a dozen neighborhood organizations were effected, proceed to incorporate the Florida Fruit Exchange. And, by the way, we have now in this state quite a number of these local organizations, which are ready and waiting to organize an Exchange. This work would go on very rapidly and with a positiveness of success, as we would have all of the experience of our California neighbors, the full benefits of their system, from beginning to end, which has cost them thousands of dollars and five years of hard work.

After a great deal of study, I am in favor of an organization in Florida, with the California organization as our pattern. We must do this if we wish to remain in the fruit-growing business for profit; if we wish to avoid the greater calamity which confronts us. Conditions are becoming worse every season, and the coming season will experience worse gluts and rot-outs in the markets than ever before. Not that there is too much fruit; no. We cannot grow too much fruit. That is not the trouble, and is not a fault to be remedied. The faults are these: Too great an expense is allowed to accumulate upon our fruit between the tree and the consumer. This is an old song, but we are going to remedy it. I speak again with positiveness, for where our pocketbooks are touched, the same thrust pierces our hearts also.

We are going to organize and that, too, soon. The time is at hand, and within five years seventy-five per cent. of our crop will be handled in a business way, and the same per cent. of our expenses will be cut off.

It may seem like a big undertaking to get us in line, but it would not be. But it must be done by men with an honest and pure motive, with no graft to be anticipated, for none can exist. If I were a young and strong man, I would be only too glad to do this work for the good of our state, and could do it with but very little money to start with.

Dr. Richardson—I have been very much interested in these papers and the discussions. While they have all been instructive and beneficial, it does not seem to me that any suggestion has reached the bottom of the situation. What the Harts and Sampsons and Inmans and the rest of the men can do as individuals, does not benefit the average grower. These gentlemen have found out how to raise oranges and how to contend with the natural and unnatural enemies of the industry and meet them successfully. They represent themselves and perhaps five per cent. of the orange growers outside of themselves in the state of Florida. Let me tell you how the situation is in my own neighborhood, and I think it is a typical neighborhood. Seventy-five per cent. of the fruit grown in that neighborhood is neither picked nor packed nor marketed by the grower. The buyer comes in and he hires men to pick it and pack it and ship it. The men that we have to hire to do this work for us are a set of irresponsible men, and if they got their just deserts they would all be hung. I can't stay to see my oranges packed. I have got reasonably fair prices for my oranges and the men who have bought them have suffered perhaps more than I have. Why do we sell our fruit this way, though? Why are we compelled to sell it to people who have no interest in his reputation as an honest grower, whose only idea is to sell the fruit at the best possible price? It is simply because of the lack of co-operation; simply from lack of willingness to exercise confidence in our neighbor and fellow man. When I talk to my neighbor about co-operation for our mutual good, he simply draws into his shell and says, "My business is my own, and your business is your own, and if you will leave mine alone, I won't bother yours." Now, we know what is the proper thing to do, but how are we going to get seventy-five per cent. of the growers to know what we know and what should be done for their own good? It is bound to come after a while, as Dr. Inman says. It may not come in his time or in my time, as he has so unkindly intimated that he and his contemporaries are past the first flush of youth; but it is to the gentlemen who are on the platform—Prof. Rolfs, Dr. Sledd, and the others—to whom we must look. It has to be done through education. It must be taught to the coming generation; not only horticultural and agricultural methods that will be successful, but they must be taught that intelligent co-operation is the only way to make a success of the orange or any other business. We expect you to teach the coming generation how to do this, but we know you can't do it alone. We cannot get all the orange growers to come into this association, and how can we teach them to pack and ship oranges to get the best results? Through *education*. That is the keynote, and until we educate them up to seeing their own interest and realizing the fact that "united we stand, and divided we fall," we never can expect anything in the way of results. What does the man coming here from Cleveland or Baltimore or New York care about our success or our reputation? He wants to get the most he can out of the crop. We have to pay his expenses and, in fact, everything comes back on the grower. The only way to restore Florida's reputation as the best orange-growing country in the world, is to co-operate with that end in view. Send out men to organize local organizations, and let the members of these local organizations obligate themselves to practice methods that will protect us all. Let us bind ourselves together in organizations that will hold, and then we will succeed.

Dr. Inman—I also want to tell you that under the California organization the man who produces ten boxes and the man who produces a hundred boxes stand on a parity with the largest growers in the association. This organization is not incorporated for the purpose of making money for itself. It never pays dividends. The men who operate the California Fruit Exchange are salaried men. They are employed by the association. I would not advise our people to organize an association here in Florida except on this strictly and purely democratic basis.

As Dr. Richardson has said, we are supporting too many men at too great an extravagance.

Mr. Reaves—I just wanted to ask Mr. Inman to explain a little further. We had experience down at Sarasota some years ago. We had an Orange Growers' Union in this state then and local unions were organized, one at Sarasota and one at Oneco. I was president of the one at Sarasota and felt so much interest I also attended the meetings at Oneco. The union saw the necessity of properly distributing the fruit and for that reason they had adopted the fruit exchange as a medium through which to ship. In order to get the fruit properly distributed we tried hard to get all the growers to ship through the exchange; we knew that fruit shipped to commission men was not properly distributed. One prominent shipper at Oneco said that he had a good commission man and he was going to ship to him. Another shipper by the name of Marshall hesitated, but finally joined and shipped through the exchange. When the returns came, the man who had shipped to his commission man said, "Well, Marshall, how are your returns? Ha, ha; mine are way ahead of yours." Marshall looked at them and said, "Doggone the Fruit Exchange, the Orange Growers' Union and the whole business; I am going to ship to commission men after this." Commission men are sharp enough, and if they see that things are going against them, they are willing to make a little concession. His commission man saw the point and he used his opportunity to do us up there. Of course, a lot of the men who were shipping through the Exchange could not see through the little scheme and said to themselves, "Well, if the commission men give so much better returns, we will ship to them after this and let the Exchange go." That one man broke up the whole thing; everybody went back to patronizing the commission business.

The time has been when commission men were necessary, but I believe that time is past. We have rapid communication to all points to which we ship, which makes it possible for us to sell if the commission business were out of the way, and I believe if this Horticultural Society would co-operate with the Association in California, we could get a United States law against the commission business. As it is, hundreds of growers may ship to some one point, the market may become glutted and prices correspondingly low. In many cases, we all know it would be cheaper to let the crop stay in the field to make fertilizer than to ship it.

Dr. Inman—If you people would only be in earnest about forming this organization, we would not have as much to contend with as the Californians did. Prof. Powell, in two months, would organize the state of Florida into as solid an organization as that of California, if you would only co-operate with him. There is no question about the commission men bucking hard and trying all their methods and schemes, but they will be very easily overcome if you listen to the advice of men of ability and experience like those in California. They have driven the commission men out of business out there. There would be no trouble to get these men of ability; the trouble is to determine definitely and positively what we want. I don't want you or ask you to take my investigation of the matter. Send some men out there to see for themselves and make you a report. The fruit exchange is composed of such men as Dr. Richardson, Mr. Boardman, Mr. Skinner, Mr. Hart and all you other gentlemen whose names I do not know.

Mr. Sampson—Don't you think we need it particularly this year? What price do you expect the buyers are going to offer for fruit if there is not some better methods of packing? I think one great need is to standardize the packing.

Dr. Inman—So do I. I don't think it would take very long to organize if we can strike while the iron is hot. We ought to be able to know every year that we are going to have a good fruit market and that we are going to get our money for the crop with the least possible expense.

AFTERNOON SESSION.

Professor Rolfs—We had this morning a little talk about packing and shipping oranges, and Dr. Inman and some others cited the methods that were employed in California in preparing the fruit for market and shipping the oranges. It was suggested that you, Mr. Tenny, be requested to give us a little talk about the organization out there.

Mr. Tenny—I will not talk long now, since the society asked me to give a paper this evening on a somewhat similar subject and as this will require nearly an hour I do not wish to weary you this afternoon. The Doctor has possibly given you an impression that the organization that has been known up to a couple of years ago as the So. California Fruit Growers' Exchange, now known as the California Fruit Growers' Exchange is a pretty large affair. This year they are shipping approximately sixty per cent. of all the oranges and lemons from Southern California. This great organization did not come into being at a single stroke. It has been a growth. Its beginnings were back about 1895. The organization grew out of the fact that it was realized that the citrus growers were not independent of each other, but dependent, especially as to marketing of their fruit, with regard both to a systematic distribution of the fruit over the shipping season and to the geographical distribution. The Exchange has grown steadily from 1895 when it handled about one-third of the crop until the present time when its shipments amount to something like sixty per cent. No better account of the workings of the exchange can be given than is found in Bulletin 123, recently published by the Bureau of Plant Industry, Department of Agriculture, which says, "Among the co-operative organizations, the California Fruit Growers' Exchange packs and sells through its own district agents in the markets somewhat more than fifty per cent. of the entire citrus crop. This organization is formed to regulate the distribution of citrus fruits throughout the country and to give to its members the benefits that arise from its co-operative efforts of various kinds. This Exchange represents about 4,000 growers, who are organized into more than eighty local incorporated associations, the primary function of which is to prepare the fruit for market. The associations in the different producing regions combine into one or more local incorporated district exchanges or selling agencies, which sell the fruit through the district agents or at public auction and receive the money therefor through the medium of the California Fruit Growers' Exchange. There are thirteen of these district exchanges. Each local district exchange selects a representative to act for it on the board of directors of the California Fruit Growers' Exchange, which is an incorporated body acting as an agency or clearing house for the district exchanges in the marketing of their fruit and which operates for the growers without profit to itself. It takes the fruit of the district exchanges after it is packed, and with their co-operation and advice places it in the different markets of the country, sells it, collects the proceeds, and turns them over to the district exchanges, which in turn pay the growers through the local associations. The California Fruit Growers' Exchange is the agency through which the grower is able to control the larger business problems and the general policy of the handling and marketing of the citrus-fruit crop."

This description gives you a good idea of the management of the general exchange; but you may be interested in a more detailed account of the relations of an individual grower to the Exchange and the way his fruit is handled. A group of men, possibly one hundred or it may be a much larger number, living in a certain locality form an association. They build a packing house and elect a general manager, who has the running of the house. The shipping season is divided into periods varying in length from two to six weeks, and these periods are known as pools. As the fruit of the individual grower comes into the house it is usually weighed; at the time of packing, this fruit is put into the several grades and each grade is weighed automatically. A record is kept of the individual loads, and this gives the weight of fruit of each grade. At the end of the pool the total amount of each grade of fruit shipped from the house is determined and also the selling price of this fruit. In this way, the manager is able to determine what each pound of fruit of each grade for that pool is worth. He is then able to figure the amount due to each grower contributing fruit for that pool. By this method of shipping fruit under brands selected for each grade, the individual grower loses his identity as far as the market is concerned, when the fruit is graded.

Mr.——What has been the result?

Mr. Tenny—It has been satisfactory. The fact that the Exchange has grown from handling a small portion of the crop to sixty per cent. shows that it has been successful.

Mr.——What per cent. of Californa is Southern California in the shipping of fruit?

Mr. Tenny—This year the state of California is shipping somewhere in the neighborhood of 30,000 cars of oranges and lemons. About 2,000 of these come from north of the Tehachapi Range of the Sierra Madre Mountains. The largest plantings are in Tulare County, and these plantings are sufficient so that under favorable conditions 10,000 cars may be expected. Some co-operative houses are in operation in this section.

Mr. Skinner—Is the exchange still growing?

Mr. Tenny—Yes.

Mr.——What is done with the other fruit not included in the sixty per cent?

Mr. Tenny—There are several large co-operative houses that are not connected with the California Fruit Growers' Exchange. Then there are certain individuals who ship direct to eastern markets. There is also considerable buying by eastern men who have their fruit packed in private houses.

Mr.——About how much does the cost of maintaining this organization tax the grower? How much per box?

Mr. Tenny—I can't give you that figure, but the tax per box is not large.

Dr. Inman—It is about five cents a box, if I remember correctly.

Dr. Inman—Are you able to give the figures showing how much the organization has been able to save its members by the purchase and transportation of supplies?

Mr. Tenny—No, I cannot give these figures either, but I do know that the saving has been very large. They have been able to secure a rate on box material that is very satisfactory from the growers' standpoint.

Mr. Reaves—Do you think it would be possible to have the same organization run on the same principles in Florida?

Mr. Tenny—No, I doubt if an association exactly similar to the California exchange could be worked in Florida. The scattered condition of the orange sections in Florida make it harder to co-operate. The industry in Florida appears to be more in the hands of the packer and the shipper rather than in the hands of the grower. I see no reason, however, why a co-operative body of shippers or shippers and growers could not be made successful in Florida. The essential feature would be to have people that are willing to work together. The success of such an organization depends very largely on the character of the men who are selected to be at the head. These need to be high-class business men, who, of course, will have to be secured at a good big salary.

Mr.——Does the association discourage the selling of oranges at the packing house, or do they do all the selling through agents in the east?

Mr. Tenny—No oranges except the culls are really sold at the packing house. If a person wishes to buy fruit from any individual packing house, f. o. b., he can make this purchase through the agent of the exchange. Of course, in all these matters, the managers of the individual houses are consulted and, to a very large extent, they determine where their fruit shall be sold.

Dr. Inman—When a person wants to come into the exchange, is it done for the life of a crop or for a series of years? For violating the rules it costs them a penalty of about fifty cents a box. It ceases to be boys' play. A man might become dissatisfied, but it would make no difference about the marketing of his fruit. The association of packers come in, and take his fruit just the same. That is the better way; not to be bothered at all by the individual growers.

Mr. Tenny—As I understand it, any grower may withdraw from the exchange house at the end of any fruit season. I would not be sure about this matter, however.

Mr. Griffing—Does the local association look after the picking or just the packing of the fruit?

Mr. Tenny—The usual method has been for each individual grower to do his own picking. Recently, however, we have been doing a good deal of work on the methods of picking and we find it much easier to eliminate injuries made in the picking when the association does the picking than when it is done by the individual growers. When the house picks the fruit, it is possible to obtain an efficient foreman, who properly superintends the picking.

Mr.——What is the output per day from one of these packing houses?

Mr. Tenny—From one to ten cars. The average house ships four or five cars a day.

Dr. Inman—The packing houses are run under perfect discipline. Each man has a certain work to do and pays strict attention to business. It is just like clock work. There is no racket at all.

Mr. Griffing—Do they have much trouble with labor?

Mr. Tenny—They have all sorts of labor. There are many Japanese, Chinese, Mexican Greasers and a good many hoboes. Women do a large portion of the packing. The Chinese are also used in the packing houses, but not much in the fields. The field work is done largely by the Japanese, Mexicans and whites.

Dr. Inman—The wrappers were getting 2½ cents per box. Some were paying as high as 2¾, and it was a rare instance where the limit of three cents was paid for the wrapping.

Mr. Skinner—How many boxes per day will the average packer pack?

Mr. Tenny—I have seen packers who would wrap and pack over 100 boxes. A great many wrap and pack from seventy to seventy-five.

Mr. Hart—My experience has been that the packers will only average about fifty boxes per day. I consider that good work for an average packer.

That is about the limit of my pack. It costs me about four cents a box; that is an allowance of $2.00 per day for packing. If the packing went up to the average of the California packer it would cost me about $4.00 a day for packing.

Mr. Von Engelken—Is the grower expected to clean his fruit when it is infected with scale or other diseases?

Mr. Tenny—All washing and brushing of the fruit is done in the packing house. Practically all the fruit is run over brushes which clean it of dust. In case the fruit has to be washed in the packing house, this is charged up extra against that lot of fruit.

Mr.——Did the Department have anything to do with the organization of the exchange?

Mr. Tenny—We have had nothing whatever to do with the organization of the exchange and have done no co-operation with the exchange other than what we have done with individuals. The fact that the Exchange handles its own fruit and handles such a large quantity of fruit has made it advisable for us to do a large part of our experimental work in their houses. We have shipped much fruit, however, in cars that have been packed by individual shippers, or in co-operative houses that are not connected with the Exchange.

Dr. Inman—Through what agency was the fruit exchange organized and put into operation?

Mr. Tenny—I cannot give you the details of the organization of the exchange.

Mr. Reaves—Does the Exchange use the commission men in any way?

Mr. Tenny—All sales are made through their own agents or at auction.

Mr. C. L. Reaves—I located in Manatee county in the vegetable and fruit business in the spring of 1874. I have orange trees that are nearly forty years old from which I shipped the first fruit, and have been shipping fruit from them ever since. When I settled in Manatee county near the Sarasota Bay in the spring of '74, I had only $15.00 in money and no property at all. Now, I have an orange grove, a little stock farm coming on (about eighty acres); I have a store and the postoffice and my credit is good everywhere except with my wife. I must tell you about that. At the time I was married, I married a lady down here, there was nobody in the country except cattle men, and they were having very little work done and it was hard to get money in any way. I gave $11.00 for oranges to get the seed and managed somehow to get rid of the other four dollars, so that I did not have any money. I had a little muzzle loading rifle that was almost the only property I possessed. I pawned that to get money for the preacher. My wife had forty dollars and I borrowed money enough from her to pay for the license, and she declares to this day that I have never paid it back. I don't believe now she would lend me money to buy license to marry any women.

Now, about the vegetable growing and shipping. I have had experience along this line as well as the fruit business. I don't expect to say very much about the growing of it; that would be enough to take up all the time. I would advise anybody who goes into the vegetable business to first try to learn the methods of doing it right.

Now, the shipping is the main thing. I remember yesterday one gentleman said, in telling about the rules posted in his packing house, that one of them was that his brand must be an honest brand. If you can make your brand an honest brand, you can sell your fruit and vegetables and you don't need commission men to sell it for you. Now, you know the commission men do not sell direct to the people very much. The commission houses I have seen sell only at wholesale. About the only good they do you, is to have you dump in your stuff and then they show it for you.

One day I was in Bradentown in company with some of the best fruit and vegetable growers. They were talking about the shipping of tomatoes. One fellow said, "If I ship my tomatoes, I would like to put up good stock in good shape. If I were selling here, it would not make so much difference." Another said, "Well, I don't know so much about that. I think if I were selling here I would like to put in good stock, because I would like to build up a good reputation at home." I listened to these men and was amazed. Not an honest expression. It was simply a question of doing right because it was good policy. Not a single one said he was going to do right because it was right. That is what we should do; we should make our fruit and vegetables something that can be depended upon; make it so that when anyone buys from us, they know they are going to get their money's worth and they are going to be done by as we would like to be done.

I asked several questions yesterday while we were talking about the California Fruit Exchange, with a view of finding out their methods. I learned that sometimes this Fruit Exchange sells the fruit at auction where it is an auction town, but if not, they sent a man all the way from California to sell the fruit, which is expensive. Not only that, but when they send a man they have to trust that man to some extent, just as we have to trust commission men. I noticed some time ago that there was a man in the United States Treasury Department who had grown old in the service, having been there since he was a young man, and had established a reputation for honesty. In some way, he got into a little tight place and there was a $1,000.00 bill missing out of the Treasury. One man came very near paying the amount back because the suspicion was directed to him. A lady learned the truth about it, and the guilty man finally acknowledged having taken it. What we need to do, is to arrange it some way so that we will not have to trust anybody only just as far as business methods go. It is asking too much to found an Exchange and put men in charge and find some among them who will not work to their own advantage. There is bound to be graft in any organization, and we will have to pay for it.

In Manatee county we have men who for years have been buying, packing and shipping fruit and vegetables. The rule in their packing houses is "Honesty." They have built up a reputation for honesty. They use the wires, which is less expensive than sending a man. They get a man to buy, and when the man sends an order they ship the car and send a sight draft on the man's bank, with the bill of lading attached. If the man who gave the order will honor that draft, the fruit is his, but if he won't honor the draft, he can't get the fruit. The shipper is notified by wire and he at once places the fruit with some other man. They sell it right from Manatee county, and they get their money, too.

I have had considerable experience along that line. Some years I sold everything, some years have shipped to commission men, and the years I have sold are the years I made the money. I have known some men to get rich in a year sending to commission men, but, as a rule, they have come out at the little end of the horn. In many cases, they use rented land, pay rent, pay for fertilizer and pay for labor; then after they have a crop they ship it hundreds of miles away to a man they know nothing about and say to him, "Take my stuff and do just what you please with it. Send me some money if you can."

Last fall, one of the best tomato producing men in that part of the country, who had as good land as there is, decided to raise a little crop. The weather was dry, and we didn't raise very much, fortunately. We got about 400 boxes and they were carefully put up and carefully selected, and vegetables were quoted pretty high. We shipped to several commission men and they all said, "Your fruit came in bad condition;" or this, that and the other; and after shipping about four hundred crates, we had to foot the bills, but the returns we received were just a little more than enough to pay for the crate material. It would have been better for me to to have let those tomatoes rot in the field.

The question with us is, whether the commission man is a necessity at the present time. I think the time has been when he was. One man said yesterday, "I think it is necessary to have the commission man to buy the fruit." Now, if that is the commission business, I am in favor of it; but what I understand to be the commission business is for a man to sit up and ask the people to send him goods on the consignment plan, and if you send them to him he shows them to the public, sells them if he can, takes his commission out, and sends you the rest, if there is any. If he does not sell it, he loses nothing, but you do.

I believe the commission man hinders our business. For instance, you want to buy fruit in one of the cities and you invest in a car of it. You buy from a commission house and they don't know and you don't know what is going to be dumped in within the next few hours. You pay your money and in a few hours perhaps a dozen cars of fruit come in, and what are you going to do? You have spent your money and the fruit is on your hands and perhaps no market for it. The commission man is going to put you out of business if he can.

We buy goods frequently from the manufacturer instead of the middle man, and why cannot the people buy direct from the grower instead of through a commission man, who is going to get a profit from both sides?

Down where I am, there used to be a large number of alligators. All we knew how to do with the alligator skins was to buy them and ship them to commission men. Of course, freight would be so much, commission so much, available portions of the skin so much, and we never could tell just what we were going to get for them. Now we don't have to do this. I have here a letter from a certain firm who are getting alligator skins direct from the merchants. They guarantee us a certain price for a given length of skins.

I think that nine-tenths of the fruit and vegetable growers patronize the commission business; perhaps even a larger percentage. The Bible says, "Lead us not into temptation." This commission business will lead us to do wrong, and it certainly leads the commission man into temptation. I have known many a commission man who had enough consignments in one season to set him up in business. And, as I have said all along, though the time may have been when the commission man was necessary, that time is past, and it is up to us to discover some way that we can get along without dealing with him.

One man sent well-gotten-up letters and quotations to all the growers in South Florida and offered the shipping agent at Sarasota a large percentage of his commission to solicit consignments for him. A lot of our most intelligent shippers sent oranges to him. He sent quick returns and large checks, which caused us to think that he was all right and we shipped him more oranges, but his checks proved to be of no value. Mr. Montgomery, of Palmetto, Fla., let one of his checks go to protest and employed a lawyer in the city where the commission man was located to try to collect something, but he failed. Then I reported him to the Post Office Department for using the mails for fraudulent purposes. His case was presented to the United States Court at Macon, Ga., but they neglected to subpoena the witnesses to go before the grand jury until the statute of limitation was nearly out and then they did not give us time enough. I was the only witness that got there in time and they said that one witness was not enough and that the time was too near out for them to subpoena us again on that complaint, but that he had been reported later by a man near Jacksonville, which would give us another chance. The next time, my subpoena got to my postoffice the day that I was to be in Macon. I sent them a telegram at once that I would be there and took the first train, but when I got there the grand jury had adjourned, so the whole thing was lost and nothing accomplished.

Is Decay of Oranges in Transit Necessary?

By Lloyd S. Tenny,

(Pomologist, U. S Department of Agriculture, Washington, D. C.)

Mr. President, Ladies and Gentlemen:

The ultimate end of commercial fruit growing is to make money. With a very limited supply and a large demand for any particular fruit, no difficulty is found in realizing this end. This has been true in the citrus industry. But with the growth of refrigeration and the extension of the railroads, production has increased, and the tendency is for profits to diminish. There comes a time finally when the minutest details must be looked after in order that the profits may be large enough to keep the industry alive.

In 1894 when Florida reached high water mark in citrus production, Southern California was shipping annually less than two million boxes of oranges and lemons. The Tulare district in California was then unplanted. Shipments from Cuba and Porto Rico were so few as to influence but little the market conditions. Then came the freeze and Florida was practically eliminated for the time being as a large producing state. Fourteen years have passed and once again Florida looks forward to a record-breaking crop. During these years, however, great changes have been made in the orange producing sections. Southern California is, this year, shipping nearly or quite 30 thousand cars or over 11 million boxes of oranges and lemons. Tulare county has now an annual production of about two thousand cars; new plantings have been made which, under favorable condition, may increase the production in that section to 10 thousand cars, or about four million boxes. Cuba has been pushing forward in its planting, and while no reliable information is at hand, doubtless between 8 and 10 thousand acres have been planted. Porto Rico, also, has extensive plantings that run up into the thousands of acres. I do not wish to discourage you orange growers, or to make you think there will be no market for your fruit. With the increase of production, there has come a large increase of demand. Hundreds of small towns over the country that now have oranges in their stores throughout the season scarcely saw a box of the fruit in 1894. The quantity eaten in the large cities has also been very largely increased during these years. It is safe to say that with a proper distribution of the fruit, fair profits might be made by all growers, *provided only the fruit could be placed on the market in a sound condition,* and with a feeling in the minds of the buyers that they could hold the fruit ten days or two weeks with only a reasonable amount of decay.

This leads us to ask the question, "Is it necessary to have decay of oranges in transit?" or "What is the length of time that oranges should be expected to keep after being packed?"

Two years ago the Department of Agriculture at Washington began the study of conditions in this State to see if these questions could be answered. Previous to that time considerable work had been done in California, and some very definite results obtained. These have recently been published in Bulletin 123, Bureau of Plant Industry, U. S. Department of Agriculture, entitled, *The Decay of Oranges While in Transit from California,* by G. Harold Powell and several assistants. At the last annual meeting of this society held at St. Petersburg, I had the pleasure of outlining our experiments in Florida and giving the results we had secured up to that time. The investigation has been continued during the past season and valuable additional data secured.

Briefly stated, the losses from decay of oranges while in transit from Florida amount annually to one-half or three-quarter million dollars. The principal loss is due to a decay or rot which is produced by the growth of a mold or fungus within the tissue of the orange. The most common fungus is a species of *penicillium.* This trouble cannot be called a disease for sound, healthy fruit is not attacked by the fungus and seldom rots. It seems to be necessary first to puncture the rind of the fruit, or to bruise it in some way sufficient to kill the tissue. If now the seed of the fungus are present at this injured place, the first step toward decay has been taken and if the temperature and moisture conditions during the following few days are suitable for the development of the fungus, the orange is sure to rot. On the other hand, large quantities of fruit have been held experimentally under weather conditions most favorable for the development of decay, yet when the fruit has been carefully handled and the skin of the orange has been uninjured, there has been practically no loss, even when the spores or seed of the fungus have been purposely placed over the surface of the fruit.

This belief is not a theory or a laboratory scheme. In 1905, experiment work conducted in six packing houses in California, holding the fruit for two weeks under the most trying conditions, frequently in a lemon-curing room, so that often from 50 to 100 per cent. of the injured fruit decayed, yet the average decay for all the sound uninjured lots was only 4.9 per cent. In 1906, the experiments were in 15 houses and the average decay for the carefully handled fruit was 1.5 per cent. In 1907, the number of houses where work was done was increased to 31 and the average decay for sound fruit was 2.9 per cent. In addition to these experiments, where the fruit was held in the packing houses, last season 186 cars were shipped from California in which there were placed experimental lots of oranges. Under ventilation the sound fruit shipped immediately arrived in New York City with 1.4 per cent decay; under ice with 1.1 per cent. decay.

While these figures are for California oranges, yet we are finding that the same principles hold true in Florida. An orange without a cut or scratch on the skin and which has not been bruised in picking and packing, almost invariably keeps. Last season the carefully handled fruit held packed here in the Florida houses for two weeks, contained 2.9 per cent. decay. This present season the same lots showed 2.1 per cent. waste. This has been the first season for any shipping experiments from this State and the results show the very encouraging average of only 0.4 per cent. rot on arrival at market for carefully handled sound fruit.

The work has now been carried far enough so that it seems safe to say that the Florida orange inherently is a good keeper. We can go even farther than this and say that it has been possible to pick, pack and ship the fruit in a way that has practically insured its safe arrival on the market. Judging from the past season's shipping experiments, it seems safe to say that any large percentage of decay in transit is not necessary.

The question then does not seem to be, "Is it possible for the Florida Orange to carry to market?" but rather "Is it practicable to handle the crop in such a way that the carrying quality has not been injured?" The first question seems to be well solved in our investigations and we have now turned our attention to the practicability of careful handling.

THE HANDLING IN THE ORCHARD.

Before there can be good carrying quality, there must be careful work in harvesting the fruit. Under the present conditions, a premium is placed on the amount of work done, rather than on the quality. In handling a tender perishable product, it is false economy to reduce the cost of an operation at the expense of the keeping quality. A laborer picking 75 boxes of oranges per day at five cents a box and injuring a quarter or more of it, and dropping the oranges several feet into his picking bag or box, is far more expensive than the one who picks 30 boxes for $3.00 a day, but who does his work carefully.

There are three points that need careful attention by the picker. (1) the oranges should not be cut or punctured by the clippers, (2) the stems should be cut short, (3) the fruit should be put in its place by hand and not thrown or dropped.

CLIPPER CUTTING.

The smooth round Florida orange can be cut from the tree with a short stem without injuring the fruit with the clippers more easily than can the California navel, which has a depression around the stem. Notwithstanding this, considerable damage is being done by clipper cutting. The amount of injury varies widely in different picking gangs.

CHART I.

Percentage of Clipper Cutting by Individual Pickers in One Gang.

0.0	8.0	12.8
2.6	10.0	26.0
3.4	11.0	36.7

Chart I shows the work of the individual pickers in one gang in Florida. Of the nine pickers, not more than one or two were doing satisfactory work. The average for the nine was over 12 per cent. cut fruit. Not all of these injured oranges would decay under ordinary shipping conditions. With conditions favorable for rot, however, a large percentage would go down. As a matter of fact, several boxes of the fruit picked by the two men showing the high percentages of clipper cuts, after being packed fourteen days, contained 21 per cent. waste, and the beginning of the decay could almost invariably be traced to the injury made by the clippers. Another lot of fruit selected from the more careful pickers and packed and held the same length of time and under the same conditions had 3 per cent. decay.

The clipper cutting indicated in Chart I is above the average for Florida. In one small district counts were made at one time in four different orchards, with the following percentages of clipper cuts. 1.4 per cent., 1.6 per cent., 3.8 per cent., and 10.4 per cent. It is rather suggestive that of these, the first gang was paid by the day, while the last one was on box work. In another orchard two men were working together. Two boxes of fruit from each were examined. The first picker had cut but four oranges, while his companion had literally slaughtered 65.

In another place, the average injury done on a ranch, where the owner had everything under his direct control was slightly over 6 per cent. At a nearby packing house where the owner purchased all his fruit and had his picking done under the supervision of a foreman, the total injury found at one inspection was only 1.6 per cent. The difference lay in that on the first place the pickers worked largely by themselves, without proper instruction and inspection. The second foreman had been trained by us to watch for injury and had personally instructed each picker and inspected his work, until almost uniformly good work was done.

INJURIES OTHER THAN THOSE MADE BY CLIPPERS.

It is not necessary that the injury be made with the clippers in order to cause the fruit to decay. Any other abrasion through which the seed of the fungus can enter the fruit does the same damage. Frequently there are found oranges in the box that have been thorn punctured, scratched on the branches of the tree, cut by nails or splinters in the box, or injured by the finger nails. Many of these are made through carelessness and haste on the part of the picker and therefore vary with individual pickers. The amount of thorn puncturing done while the fruit is still on the tree is surprisingly small or at least the decay which results from such puncturing is small. After a heavy wind decaying oranges may frequently be seen hanging on the trees. If the fruit is picked soon after such a storm, some punctured oranges are found. But more damage is done by "thorning" as the pickers pull the fruit from among the branches. In the gang referred to a short time ago as having a careful foreman 3 per cent. of the fruit had body bruises. In the different boxes there were all the way from 2 to 8 injured oranges. The fruit from four other pickers in another locality showed the following high percentages of body injuries. 7.6 per cent., 15 per cent., 22.4 per cent., and 23.6 per cent. Add to these injuries two or three oranges per box cut by the finger nails, and another two or three and frequently more bruised by nails or splinters in the box. A large amount of damage is possible therefore, before the fruit has left the grove on its journey to the market.

LONG STEMS.

Considerable emphasis in the past has been placed by orchard men on having the fruit cut with the stems short. It has been realized that an orange with a long sharp stem was capable of doing much damage. The long stem in itself causes no trouble; it is only when the stem has been brought into contact with another fruit and the rind punctured that damage is done. The amount of injury, therefore, depends largely on the extent and the nature of the handling of the fruit after picking. More puncturing is done if the fruit is dropped 18 inches or two feet into the picking bag and then for an equal distance into the box, than would be if it were possible to lay the oranges carefully into the bag and box. A long haul over a rough road with a considerable number of oranges with long stems in boxes will do plenty of damage. It is not necessary to have much shaking of the fruit in the box in order to do puncturing, for the field crate used almost universally in Florida is so large that the weight of the fruit in the box is sufficient to force a sharp stem through the peeling of an adjacent orange near the bottom of the crate.

The number of long stems left by different pickers varies largely. Some pickers work steadily without leaving scarcely a long stem. Others cut practically all the stems too long. The following figures show the percentages left by different individuals. 5.9 per cent., 14 per cent., 18.8 per cent., 8.7 per cent., 15 per cent., 7 per cent., 14.1 per cent., 0.7 per cent., and none. The following are averages for gangs: 2.9 per cent., 2.3 per cent., 16.1 per cent., 1 per cent., 9.7 per cent.

As in the case with the clipper cutting, when the attention of the picker is called to the number of long stems he is leaving and when he knows his fruit is being inspected the number cut incorrectly generally decreases.

CAREFUL HANDLING.

The third point in connection with good picking has to do with careful handling. There is nothing in connection with the citrus business of Florida that impresses a person accustomed to handling different fruits than the roughness with which the oranges are treated. To see the fruit dropped several feet into the picking bag or basket as the laborer holds the branches with his left hand and clips the fruit with his right, starting it toward the mouth of the basket at a lively speed with his clipper, one would think an imperishable product was being handled instead of a very delicate living fruit. When the picking basket is full, the fruit takes another severe fall into the field crate, and the usual method of locating the gang in the orchard is to listen a moment for the rattle of the oranges in the box. I need not call your attention to all the places in harvesting and packing the crop where rough handling is practiced. If anyone doubts the statement that a large percentage of the fruit falls somewhere at least 18 or 20 inches, a trip with this in mind through his own grove and packing house will probably satisfy him about the matter. At least such a trip through his neighbor's grove will convince him. On his journey let him stop for a moment at the side of the hopper, one of those real large ones, holding fifty boxes or more, and watch the results. Let him place his hand on one of the fruit, and allow the other oranges to hit against it. Just then have him forget that he is watching oranges and imagine that they are apples or perhaps Georgia peaches. I wonder how successful a shipper of such fruits would be if the handling was as rough as that to which the oranges are subjected. Yet the experiments last year indicated that with oranges dropped once 18 inches one out of every five would rot within a short time. This year the skin of the fruit seemed rather thicker and tougher and but ten per cent. rotted. But in test after test where the oranges were dropped 18 inches decay developed where it did not where the fruit was carefully handled. Charts II and III show the amount of decay in two individual experiments made this past season, where the fruit was held packed in the houses.

CHART II.

Sound, carefully handled	1.1 per cent.
Dropped 18 inches	10.2 per cent.
Commercial packed	16.5 per cent.
Through machinery	18.4 per cent.
Mechanically injured	25.3 per cent.

CHART III.

Sound, carefully handled	1.4 per cent.
Dropped 18 inches	9.2 per cent.
Commercial packed	19.8 per cent.
Through Machinery	11.9 per cent.
Mechanically injured	30.0 per cent.

The sound carefully handled lots were picked under our personal supervision and the fruit was not dropped in any way. It was drawn to the packing houses usually on spring wagons, and packed without any machine handling. The dropped fruit was handled in identically the same manner, except that just before packing each orange was dropped separately 18 inches on to the floor of the packing house or into the empty field crate. The series indicated by the words "through machinery" were handled in the grove as the carefully handled lots, but before packing the oranges were poured into the empty hoppers and were then graded and sized in the usual manner, and generally by the labor in the packing house. In all cases, the hoppers and bins were empty so the maximum amount of injury from the machinery was obtained. For this reason it was not uncommon for our experiments to show greater decay in the fruit carefully picked but run through the empty machinery than we secured in the regular commercial pack which had been picked and packed without any attention on our part. The boxes that made up the "Commercial Pack" were selected after they had been packed and were taken from the fruit coming from the same orchard in which we had obtained the other experiment boxes. The "Mechanically Injured" lots were those in which each orange showed some abrasion. Clipper cuts, box injuries, finger nail scratches and stem punctures were the most common.

Chart IV gives the summary of the decay for all of the experiments that were made this past season, with the fruit held two weeks in the packing houses.

CHART IV.

Summary—Packing House Experiments.

Sound, carefully handled	2.1 per cent.
Dropped 18 inches	10.0 per cent.
Commercial packed	18.2 per cent.
Through machinery	20.3 per cent.
Mechanically injured	35.4 per cent.

MARKET STORAGE TESTS.

Aside from the experiments, where the fruit has been held in the packing house, about fifteen shipping experiments have been made. These lots have gone by express, freight, and water and have been shipped to Washington. The average length of time in transit has been about 7 days. Upon arrival the fruit was examined and the percentage of decay noted. The fruit was then repacked and held in a common storage room and reexamined at the end of one week and again at the end of two weeks. At that time most of the lots were discarded, yet some boxes of carefully handled fruit were held for some time longer.

The results of these shipments showed that all the lots except the injured fruit arrived at market in a fair condition. Chart V gives the data in detail.

CHART V.

Summary—Market Storage Tests.

	Time of Inspection		
	On arrival.	After 1 week.	After 2 weeks.
Sound, carefully handled	0.4	1.9	4.5
Dropped 18 inches......	2.3	6.0	10.9
Through machinery.....	1.1	5.4	12.4
Commercial pack........	3.9	10.6	18.1
Mechanically injured....	20.2	38.0	52.4

The boxes from which the injured fruit has been removed, although the oranges may have been dropped just previous to packing arrived in reasonably good condition. The trip was sufficiently short so that the bruised fruit apparently did not have time to decay and it reached the destination with but a slight amount of loss in excess of the carefully handled boxes. The commercial pack having some injured oranges showed more waste, yet not arriving in a bad condition. The injured boxes averaged 20 per cent. rotten.

At the end of the first week the decay in the carefully handled lots has but slightly increased while that of the bruised fruit jumps up to over 5 or 6 per cent. The commercial pack has reached the high figure of over 10 per cent. The injured fruit shows 38 per cent loss. At the end of the second week the carefully handled series remain still practically sound. All other lots show heavy losses. The commercial pack at that time had nearly one-fifth waste while over one-half of the injured fruit has decayed.

Among the results shown by this chart there is a confirmation of the belief held by the fruit trade in general that it is not a safe thing to handle Florida oranges for even if there is but little decay on arrival, the fruit will not hold sufficiently long for the retailer to sell his stock. There is probably no other one thing that has more to do with low prices or small demand for Florida fruit at any time than this. The quality of the fruit is such, and the texture and general appearance so good, that there should be a healthy demand for your fruit throughout the season. But as long as the buyer must figure on losing perhaps one-quarter or even one-half of a box by decay, if it is necessary for him to hold it some days, he cannot afford to handle such fruit if there is on the market a brand which he is sure will hold an equally long time with but a slight amount of waste. The sound, carefully handled lots shipped this season answer all his requirements. Is it possible then, to handle your fruit in any better way than is being done at present? Chart VI gives the results of some educational work done among the pickers.

CHART VI.

Before inspection work.	Clipper cut.	Total injury and long stems.
December 4	7.4	18.0
December 6	5.6	22.0
After inspection work.		
December 17	2.3	6.0
December 27	1.0	4.0

The first half of the chart gives the percentages of clipper-cuts in one gang at four different inspections, the first two at the time our Department representative began his work. The last inspections show what successful results he obtained. Within a month the average amount of clipper cutting was reduced to 1 per cent., a very fine record. The last part of the chart gives results on the total injuries made in the picking and in addition the number of long stems left. On the fourth and sixth of December the average was 20 per cent; three weeks later the total was reduced to 4 per cent. This large reduction was made by a little quiet educational work by showing the different pickers where they were doing bad work, and by telling them of the damage this kind of work was doing. This particular lot of pickers was on day pay, so it was easier to work with them than it was with pickers paid by the box. Notwithstanding the better work done, the quantity picked remained about the same and was perfectly satisfactory to the owners. This was in a community where I had been told less than a year before that it was entirely out of the question to pay by the day. Decided improvement may be made, however, with men working by the box. One crowd under a good foreman after some help by us was averaging only about 2 per cent. injury at several inspections.

Those who think it is impossible to handle the fruit with care should visit a large peach ranch in Georgia, where under one general foreman and with colored help, ten cars and more of peaches are shipped in one day, and the fruit is so delicate that a heavy pressure by the finger in picking damages the carrying quality.

The outlook, then, is hopeful. Decay—at least damaging decay—is not necessary. Fruit, sound and carefully handled has been held in the packing houses two weeks with but slight decay. Other lots have been shipped and arrived on the market with almost no loss and have stood the market holding test remarkably well. On the other hand roughly handled and injured fruit should not be expected to keep, and it does not. The methods of harvesting and packing at present in operation are extremely rough and should be expected to produce a poor-carrying product. Experiments show that this is true. It is not impracticable on the other hand to change these methods sufficiently so that a great improvement in keeping quality may be expected.

DISCUSSION.

Mr. Skinner—I note in your paper you speak of the oranges going through machinery. To what do you refer?

Mr. Tenny—All the machinery found in the average packing house: the hopper, the elevator (if there is one), the sizer and into the bins.

Mr. McClung—How long after the fruit was picked before the dropping of it was done?

Mr. Tenny—We tried it at various times. As a usual thing, within twenty-four hours; almost certainly within thirty-six hours after picking.

Mr. McClung—And you found the same results after the fruit was wilted a little as when perfectly fresh?

Mr. Tenny—Very much the same. The majority of the dropping that causes damage in the commercial handling is done at the time of picking, hence most of our experiments were made with fruit that was dropped immediately after picking.

Mr. Warner—I think it would be a good thing for Mr. Tenny to give us a lecture next year on the methods of packing and shipping oranges from California, using the stereopticon slides so that we can see for ourselves. I make a motion to that effect; that is, that Mr. Tenny give us an illustrated lecture at our meeting next year showing just how these matters are handled by our California brethren.

Motion seconded, put and carried.

Controlling the White Fly by its Natural Enemies—Report of Progress, and Other Observations.

By E. W. Berger,

(Entomologist, Florida Agricultural Experiment Station.)

Mr. President, Ladies and Gentlemen:

The mills of the investigator grind slowly. Whoever makes a business of investigating nature (coaxing as best he can her secrets from her) is treading unknown ground, or ground in regard to which he has only suggestive evidence, or no evidence at all, as to what he may find. Then also, a great part of his work generally consists in developing new methods as he progresses, although he may be guided by certain general principles. And then, at the best, his results are generally obtained point by point, and after long waiting. Thus it is with the whitefly investigations. This matter has been investigated before. Riley and Howard write: [1] "Our first acquaintance with the species was in June, 1878, when we found it occurring in profuse abundance on the leaves of the citrus trees in the orangery of this department. Some observations were made upon its life-history during that summer, and all of its stages were observed. During the following years we observed it in Florida, and it was studied by two of our agents, Mr. H. G. Hubbard at Crescent City, and the late Jos. Voyle at Gainesville." It was first referred to by its present scientific name (*Aleyrodes citri*) by Mr. Ashmead [2] in 1885. In 1893 Prof. H. A. Morgan [3] published a brief report of his observations upon this insect in Louisiana. He states that orange growers believe that it was brought into Louisiana on plants exhibited at the New Orleans Exposition in 1885. Later on Dr. H. J. Webber studied the pest in Florida, publishing his bulletin on the *Sooty Mold of the Orange* in 1897. Next came A. L. Quaintance and H. A. Gossard. Finally Dr. A. W. Morrill and E. W. Berger are risking a lance, and woe unto the white fly when they have finished with it (we hope).

WORK DONE UPON THE WHITEFLY.

The writer's investigations upon the whitefly have been continued chiefly with experiments for introducing the fungus parasites; together with some other observations and experiments

1. Insect Life, Volume V, No. 4, U. S. Department of Agriculture, 1893.

2. Florida Dispatch, New Series, Volume XI, November, 1885.

3. Special Bulletin of the Louisiana State Experiment Station, 1893.

upon the ability of whitefly to survive on detached and partly dried leaves; the varieties or species of whitefly represented in the State which attack citrus seriously, the amount of honeydew excreted, and a few other points.

METHODS OF INTRODUCING THE FUNGUS PARASITES.

It has been repeatedly demonstrated that the red and yellow Aschersonias can be successfully introduced by spraying their spores (germs) suspended in water on to the under surface of white fly-infested leaves, or by pinning leaves having these fungi upon them to the under surface of the leaves of white fly-infested trees. Both methods are also applicable to the cinnamon and whitefringe fungi.

The spraying method is probably not generally applicable for introducing the brown fungus, and pinning fungus-bearing leaves is therefore recommended. This fungus has, however, been several times successfully started by spraying a mixture of water and fungus, obtained by agitating fungus-bearing leaves with water. A better way would be to scour the fungus from the leaves with a little sand and water. Use one to several leaves to a quart of water and strain the liquid if necessary.

EXPEIMENTS FOR INTRODUCING THE FUNGUS PARASITES OF WHITEFLY LARVAE.

Actual experiments and observations in the field have again demonstrated that the period of summer rains is a most favorable time in which to introduce the several fungus parasites of whitefly larvae. Introductions of the red and yellow fungi made during October and November were successful only to the extent of getting a small start of fungus, but were sufficient to insure a good spread of the same during the following summer. Thus, sprayings with spores of the red fungus in the R. S. Sheldon Grove at New Smyrna, on October 3, 1906, developed but a few pustules of the red by the first of December of the same year, and no more by the first week of May, 1907. The fungus spread, however, during the summer of 1907, so that by the fall of that year the trees sprayed had the foliage of many small branches literally dotted over with the red pustules, besides which the fungus had spread to perhaps all of the trees of the grove not sprayed with spores. This fungus will, no doubt, quite control the "fly" in this grove during the coming summer, and from there will spread over all the whitefly-infested citrus trees of New Smyrna. Why sprayings with spores of the red and yellow Aschersonias (fungi) made in the Ronnock groves at New Smyrna, at the same time (October 3, 1906), failed to produce a start of fungus can only be surmised; it may have been due to a more arid condition in these groves at that time, but more probably to poisoning of the spores by the use of an old spraying outfit previously used for spraying Bordeaux mixture. There being much less "fly" in these groves, of course, also lessened the chances of getting a start.

Sprayings with fungus spores made in the F. W. Edison grove at New Smyrna, on November 29, 1907, have given a promising start of red Ascheronia [trees examined April 23, 1908]; but other trees sprayed with spores at the same time in New Smyrna (some in the Ronnoc groves) show but a very poor start of either the red or yellow Aschersonia after a period of five months (November 29, 1907, to April 23, 1908). Again, spore-spraying operations in some trees of Mr. B. F. Hampton's grove near Gainesville, made on October 6 and November 16, 1907, resulted in promising starts of both the red and yellow Aschersonias.

Spores of the red and yellow Aschersonias, together with some brown fungus material, scoured from the leaves with a little sand and water, were sprayed into some citrus trees at DeLand on January 17, 1908. Examination of the trees on April 20, 1908, revealed no certain growths of fungus. Introductions of the red Aschersonia made into thirteen trees on April 21 and 22, 1908, at the same place, by the spore-spraying method have produced an excellent growth of this fungus [trees examined June 17, 1908 and paper revised to this date]. In two trees, Mr. H. B. Stevens and the writer estimated that from 30 to 40 per cent. of the white fly larvae had become infected by the fungus and were dead. In two other trees the writer estimates [estimate was based on actual counts made upon leaves] that at least 50 per cent. were dead. Fungus introduced into two other trees by the leaf-pinning method resulted in only very poor growths of fungus; the growths of fungus produced by the spore-spraying method are estimated at from several hundred to perhaps a thousand times as great as those produced by the leaf-pinning method in the two trees referred to. At the time of introducing the fungus the spring brood of adult "flies" had about disappeared and larvae of the first, second and third stages were in abundance beneath the leaves. These spraying and leaf-pinning operations at DeLand on April 21 and 22 are regarded as of great significance; because they indicate so clearly that the *best time* in which to introduce the red Aschersonia by the spore-spraying method is when young larvae are abundant. It appears that young larvae are more easily infected than the older ones of the fourth stage and pupae. The fact that rains immediately followed or preceded the operations may also be of significance; the moisture favoring the germination of the spores. The comparatively very poor growths of fungus produced in the two trees into which leaves only had been pinned, are believed to indicate that the presence of an abundance of adult "flies" is necessary in order to obtain good growths of fungus by this method. [See: *The Whitefly Spreads the Fungi.*] What has been stated here for the red Aschersonia is also believed to hold good for the yellow Aschersonia; both are very similar in all their characters except color. The same principles, with one or two exceptions, probably apply to all the fungus parasites of the whitefly larvae.

The experiments enumerated demonstrate quite clearly that the red and yellow Aschersonias can be introduced in whitefly-infested trees during the fall months with fairly good success by the spore-spraying method, but leave us in doubt if we may ever be able to successfully introduce them during the winter and early spring months. Some other sprayings made at Gainesville with the red and yellow Aschersonias and the brown fungus during January and March indicate more clearly, however, that this may be impossible since not a single growth of fungus has so far resulted from any of these sprayings. The absence of the easily infected young larvae at this time is believed to be the explanation. If the absence of young larvae is the explanation for the failures during January and March, this barren period is believed to also include December and February, since in neither one of those two months are there any but but a few [in December] young larvae. In other words, the barren period for introducing fungus will extend from December through March or until the young larvae of the spring brood of adults become abundant either in late March or in April. If larvae of the fourth stage and pupae are practically immune to the attacks of fungus as the January and March experiments indicate, then we may expect another barren period of a few weeks immediately preceding the appearance of the second brood of adult "flies" sometime in June or sometimes earlier. Preceding the appearance of the third brood of adults, there may also be a barren period, when the whitefly is in the fourth stage and pupae; but generally the separation of the second and third broods is not so well defined; larvae of all stages continuing to exist during the interval of the greatest abundance of adults. Some few trees in Mr. Wm. E. Heathcote's grove at St. Petersburg were sprayed on May 17, 1907, with spores of the red Aschersonia. A good growth of this fungus had developed from this spraying by the end of last summer, although in the beginning only a few fungus pustules could be found. This experiment clearly indicates that we can begin operations in May; and earlier as the DeLand experiments of April 21 and 22 have shown us. Better stated, the time to begin to introduce fungus in spring is when the young larvae of the spring brood of adult "flies" are becoming abundant (that is by the dozen) beneath the leaves.

Operations were begun last spring in Mr. Heathcote's grove for the main purpose of demonstrating what can be done in one season with the spore-spraying and leaf-pinning methods of introducing the fungi. The frost of the previous December together with the prevailing drought having defoliated so many citrus trees in sections where fungus had been abundant, that only small quantities of fungus could be obtained. However, continued efforts on the part of Mr. Heathcote, together with some supplies of fungus and aid from the writer, resulted in giving a wholesome sprinkling of the fungi, especially the red Aschersonia, together with some yellow Aschersonia and brown fungus, by the end of 1907. Mr. Heathcote has recently written, stating that the fungus does not appear to be as abundant in his grove this spring as it was last winter. This is quite what I expected, since it spreads but little if at all during the winter, and of course what has previously developed becomes weathered; besides some leaves drop, thus reducing the amount of fungus present in the trees.

It would be consuming an unnecessary amount of time were I to undertake to say something about all the experiments that I have started in different parts of the State. Suffice it to say that I have started spore-spraying and leaf-pinning operations for introducing fungus in the following places: Lake City, Leesburg, New Smyrna, Kissimmee, St. Petersburg, DeLand and Gainesville, in all seven localities. Taking a single grove or yard in which trees were treated in these several localities as the unit and also counting as separate experiments the different times at which operations were begun in the same grove or yard, we have in all something like forty or fifty experiments made by the writer for introducing the fungi parasites of the white fly during the past two years.

TWO OTHER FUNGUS PARASITES.

Since appearing before you a year ago, two other fungus parasites of the whitefly larvae have been discovered in Florida. These are described by Professor H. S. Fawcett in *Press Bulletins* 68 and 76, Florida Agricultural Experiment Station, and are the whitefringe fungus (*Microcera sp.*) and the cinnamon fungus (*Verticillium. heterocladum*) respectively. The whitefringe fungus has been observed mainly at Sutherland, but specimens have been sent in from other parts of the State; so that it appears to be quite widely distributed. The cinnamon fungus has hitherto been mistaken for the brown fungus, and is probably as widely distributed as the latter, though not so abundantly. Both of these fungi being new discoveries, we are not prepared to make specific recommendations as to their efficiency in reducing the whitefly or as to the best methods for introducing them. Professor Fawcett, who has so far done about all of the work on the whitefringe and cinnamon fungi, succeeded in starting both of these upon whitefly larvae by spraying the spores of the fungi suspended in water. The cinnamon fungus has also been started by pinning leaves, and this method, no doubt is applicable to the whitefringe fungus.

SIX KNOWN FUNGI PARASITES.

Following is a list of the six known fungus parasites of whitefly larvae given in their order of discovery in Florida:

Red Aschersonia (*Aschersonia aleyrodis* Webber) 1893.

Brown Fungus (spores unknown) 1896.

Red-headed Scale Fungus (*Sphaerostilbe coccophila* Tul.) 1903 [?]

Yellow Aschersonia (*Aschersonia flavo-citrina* P. Henn.) 1906.

Whitefringe Fungus (*Microcera* sp.) 1907.

Cinnamon Fungus (*Verticillium heterocladum* Pensig) 1907.

The red-headed scale fungus has been observed upon white fly larvae only a few times and cannot be said to be of much significance in its relation to this insect. It is, however, a most efficient fungus parasite of scale insects in nearly every part of the State.

The following table gives the present distribution in Florida of the six fungus parasites of white fly larvae: R, Red Aschersonia; Y, Yellow Aschersonia; B, Brown Fungus; W, Whitefringe Fungus; C, Cinnamon Fungus; S, Red-headed Scale Fungus:

Altamont Springs........		Y				
Alva....................	R		B			
Apopka..................	R			C i		
Bartow..................	R		B			
Bradentown..............	R		B	C		
Buckingham..............	R		B	C (?)		
Citra...................	R			C		
Ft. Myers...............	R		B	C (?)		
Gainesville.............	Ra	Ya		C b, c	W b	
Glen St. Mary...........	R					
Jacksonville............	R					
Lake City...............	R	Ya, i	Ba, i			
Largo...................		Yd,i	B i		W	
Leesburg................	Ra		Ba, i		W	S (1906)
McIntosh................	Re			C e		
Manatee.................	R		B	C		
New Smyrna..............	Ra	Ya, i				
Orlando.................	R	Y	B	C (?)	W	S (1903)
Oneco...................	R		B	C (?)		
Oviedo..................	Rf	Y f				
Palmetto................	R		B	C		
St. Augustine...........	R		B			
St. Petersburg..........	R h	Ya, i	Bh, i	C a, i	W	
Sarasota................	R		B	C (?)		
Sutherland..............	R g, i				W	
Titusville (Mims).......		Y			W	
Winter Park.............	R	Y	B			

a. Introduced by the writer.
b. Introduced by Prof. H. S. Fawcett.
c. Observed also on scales in forest by H. S. F.
d. Introduced by Mr. J. E. Kilgore.
e. Introduced by Mr. S. H. Gaitskill.
f. Introduced by Theo. G. Mead, about 1903.
g Introduced.
h. Introduced by Mr. Wm. E. Heathcote, Judge J. D. Bell and the writer.
i. Small quantities only.

*This table has been compiled from observations by the writer, corrected and added to by Dr. A. W. Morrill and Professor H. S. Fawcett.

THE WHITEFLY SPREADS THE FUNGI.

Observations made during the past year indicate that the whitefly itself is instrumental in distributing the fungi after once they have been started in a tree or grove. The adults, as they walk over the leaves, no doubt get many of the fungus spores attached to their feet, and as they fly away to other trees deposit them upon whitefly larvae; thus unknowingly carrying disease with them. Other insects, such as ants, and ordinary flies and beetles, may also be instrumental in disseminating the fungi. This probably accounts for the fact that pinning fungus-bearing leaves has not resulted in much success in starting the fungi during the cool and dry periods of the year, or when few or no adult whiteflies were about. It is therefore advised only to use the leaf-pinning method for introducing the fungi during the period of summer rains or at other periods when abundant whiteflies are in the trees. Most excellent results have been obtained with the red and yellow Aschersonias by pinning fungus-bearing leaves during June, July and August. The spore-spraying method can be used at any time, but it will probably be difficult to start fungus in winter and early spring by any method. There are indications that larvae of the fourth stage and pupae (in which two stages the "fly" exists from about December until March and April) are not readily, if at all, infected with fungus.

PLAN OF CAMPAIGN.

The writer's plan of campaign, based upon experiments in the field, is as follows:—If a grove is thoroughly infested with whitefly, and sufficient "seed-fungus" is available, introduce fungus into all the trees; but if the supply of seed-fungus is limited, distribute it here and there throughout the grove, so that there will be a great many centers of infection from which the fungus can spread. It may be considered advisable to treat only a few trees in each row with fungus, and it may only be possible to treat some branches of each of these trees; but any scheme of distribution that will give the fungi a good chance to spread to all parts of a grove will suffice. Later on, when more seed-fungus is available, the trees or parts of trees not previously treated may be attended to. A second, and even a third or fourth treatment may be given to the trees in order to get the quickest possible dissemination of fungus. So long as only a few fungus pustules are visible on those leaves of a tree which bear the most fungus, it will be advisable to introduce more fungus, especially should an abundance of seed-fungus be readily available. The greater the amount of fungus growth which is successfully started in a grove by artificial means, the more rapid will be the destruction of the whitefly. Whiteflies have the habit of congregating on water-sprouts and other tender growth of citrus, consequently we should give particular attention to introducing the fungi into such parts of the trees. The work should be done methodically and not in a haphazard way.

The plan of campaign for a grove just becoming infested with whitefly; or only infested in part, would be to introduce fungus into all those trees sufficiently infested (that is, whitefly by the dozen on the leaves), and later on into other trees as soon as they become sufficiently infested. Incidentally, the trees should be fertilized a little more heavily.

"Seed-fungus" becomes abundant about midsummer and lasts until midwinter and later, although some can generally be obtained somewhere at all times. The best weather conditions for introducing fungus are met with from about June to the end of August. Since the period of summer rains is also the time when "seed-fungus" is abundant it is about the best time in which to introduce fungus. It is advisable, however, to introduce fungus at other times when "seed-fungus" is available, using only the spore-spraying method when young larvae are abundant and adults not plentiful but employing either one of the two methods (spore-spraying or leaf-pinning) during the warmer months, or when adult "flies" are swarming abundantly about the trees. It will, of course, be evident from a perusal of the preceding pages that it would probably be useless to try to introduce fungus from

December to April, or until young larvae become abundant immediately following the first brood of adults in spring.

It is best to use fresh fungus, although the writer has succeeded (during the rainy season) with fungus that had been collected and dried for a month.

For further particulars in regard to methods for introducing the fungi the reader is referred to Bulletin No. 88 and Press Bulletins 68, 76, 80, 82, and 88, Fla. Agr. Expt. Station.

Fungus can probably be obtained at the following places:—Manatee, Bradentown, Palmetto, Sarasota, Fort Myers, Buckingham, Orlando, Oviedo, Apopka, and Titusville.

OTHER OBSERVATIONS.

Whitefly Matures on Dead Leaves.—On November 20 and 21, 1907, Mr. R. Y. Winters, Assistant in Botany, and the writer made a very careful inspection of some of the trees at DeLand that had been defoliated the previous February, but in which the whitefly had reappeared during the summer. Careful inspection of the vegetation in the neighborhood of the infested trees revealed no plants infested with whitefly which could have acted as carriers during the period of defoliation of the citrus. (It does not necessarily follow, however, that such carriers did not exist.) But whitefly in abundance existed in the citrus and Cape jasmine that had been defoliated the previous February. Where had it come from? The writer finally decided to carefully examine the dead leaves accumulated under a certain Cape jasmine, especially any that had collected in small hollows near the trunk. Something like several pecks of such leaves were examined by Mr. Winters and the writer with the result that well matured larvae and pupae, apparently healthy and alive, were found on some leaves that were dead and brown, but had either retained or been supplied with enough moisture to keep them flexible. Finally, the writer found an adult specimen about half emerged from the pupa case on such a leaf. The specimen appeared fresh but inactive, and with a little effort was freed from its case and found to be undoubtedly alive, since it could move its legs and feelers.

In the afternoon Mr. Winters went to carefully inspect the fallen leaves of certain citrus trees, with similar results. Seemingly live and healthy pupae were found upon dead and dried leaves generally with enough moisture, however, to remain flexible. Some of these leaves were taken to the laboratory at the Experiment Station by Mr. Winters, and after a few days, live adults were found moving about under the bell jar. Two days later the writer found apparently live specimens of pupae on a few partly dried and curled leaves of citrus in another yard at DeLand. On January 17, some of the fallen leaves under the Cape jasmine above referred to were again examined, when semi-dried leaves with plump, live larvae were found, also a pupa on a leaf that was dried and brown. It was further observed on the Cape jasmine in question, and on two citrus trees (all of which had been defoliated in the preceding February) that the greater number of whitefly larvae were low down in the trees (about the lower third) and also that the empty pupae cases of preceding brood were on the lower leaves of the trees, possibly indicating that the "fly" came up from the ground.

When at DeLand on January 17 and 18, 1908, I brought back to Gainesville several small twigs (with leaves) of the Cape jasmine before referred to, and well infested with whitefly. A portion of this material was placed in a small cloth sack and slightly buried at the foot of a large magnolia tree near the University. The magnolia was chosen because no citrus or jasmine was near at hand. On March 22 live adults were emerging and some of the leaves were still green.

Another portion of this material was placed under a bell jar (with open top and covered with cheese-cloth) on sand in the greenhouse. Live adults were obtained as before at the end of two months and a few of the leaves were still green. In both experiments, however, the larvae on the leaves which had turned dark or dried, soon died.

These observations leave no doubt in my mind that some whitefly can be carried through the winter on dead, partly dried and browned leaves, scattered under trees, especially when so placed that they do not dry sufficiently to crumble, although some of the leaves examined were quite dry. It was not possible to know how long these leaves had been in the condition in which we found them, and whether the larvae there could have matured; for when leaves are allowed to dry in the laboratory all larvae have been observed to die. In regard to the pupae there can be no doubt about their maturing, as one adult at least was caught in the act of emerging from its case while others developed into adults when taken to the laboratory, as previously stated. It is estimated that the leaves in question had fallen from the trees two weeks to two months previously, but they may have been older. The experiments with the fresh green jasmine leaves indicate furthermore, that it is possible for such leaves to become buried in the sand or otherwise protected, so that they remain green for at least two months, allowing whitefly larvae to mature upon them in time to infest the early new growth of the trees.

Extermination by Defoliation.—The previous observations and experiments indicate pretty clearly why the attempts at exterminating the white fly at DeLand in February, 1907, by defoliating the trees have failed, notwithstanding that precautions were taken to burn all the leaves. Some of the trees had been banked with earth, and as the "fly" appeared in greatest abundance in these trees after the defoliation, this again indicates the possible source of the re-infestation, since these banks of earth about the stems of the trees would be ideal places for preserving leaves, as the previously stated experiments show. That the defoliation of all the trees at DeLand at the time referred to was nevertheless useful can hardly be doubted, since it must have been at least equivalent to a season's spraying or fumigation in keeping the "fly" in check. The defoliation was completed after the partial defoliation by the December freeze of 1906, so that the burden of it was much less. I believe that defoliating whitefly-infested trees after a partial defoliation by a freeze may frequently be advisable, but doubt if the wholesale butchery of the trees at Marysville, California, of last year was advisable, and doubt, furthermore, if they will be successful in exterminating the white fly there unless they keep up the extreme vigilance now exercised for at least five or six years. No doubt the growers at Marysville, California, would have done better to have checked the "fly" as best they could during last summer by spraying or fumigating, and then in winter have undertaken to exterminate it by fumigation in the citrus trees, and by destroying all of its other food plants possible. The injury in winter caused by even large overdoses of hydrocyanic acid gas would have been trivial in comparison to the injury done to the trees by cutting off their large limbs in order to get rid of the leaves.

Honeydew Excreted.—Leaves with an abundance of whitefly larvae were placed between glass plates, and it was found that the honeydew ejected by the insects was deposited in small drops on the glass above or below them, in some instances the liquid being precipitated upward a distance of 1-8 inch or more. Pupae ready to have the adult emerge secrete honeydew as well as larvae of all stages. A lot of larvae of perhaps the third and fourth stages of growth excreted at the rate of .0005 gram each in 48 hours. At this rate 1,000,000 larvae (in round numbers) could excrete one pound of honeydew in 48 hours, which would be at the rate of 15 pounds per month or 180 pounds per year. Since no doubt a large percentage of this sweet excretion is sugar (let us assume 50 per cent., since we have not had an opportunity to test it or have it tested), at this rate 100 trees of good size on an acre of ground would lose something like 50 barrels of sugar per year, allowing 1,000,000 whitefly larvae to a tree. These 50 barrels are the equivalent of 10,000 pounds, or 5 tons; at 5 cents per pound, this would amount to $500.00. Of course, this is not the actual loss per acre, since carbon, hydrogen and oxygen, the components of sugar, come from the air; but it does represent an unnecessary amount of work that the trees are required to do, granting that they bear a full crop besides, which they probably never do. This great amount of loss of sugar and water, however, does account for the insipid and dry fruit of whitefly-infested trees, and suggests the necessity of giving the trees an extra allowance of fertilizer and, of course, sufficient water.

Two Species.—Are there two species of white fly seriously affecting the citrus trees in Florida? The writer has several times observed that the eggs of the whitefly in certain localities in Florida had a different appearance from those in other localities. Last fall and winter, while Prof. H. S. Fawcett and Mr. R. Y. Winters were doing some work with the microscope under the writer's direction on the whitefly larvae and eggs, our attention became further directed to a peculiar delicate net-like covering to certain eggs. After examining material from different localities, I found that only whitefly eggs from certain localities had this covering, eggs from other localities being perfectly smooth and shiny. A like examination of eggs of this spring's brood from the same localities revealed the same differences, together with decided differences in the external structure of the larvae of the first stage. At the time of writing this no literature on the whitefly has been found which takes note of differences such as have just been stated.

It is true that Professor H. A. Morgan in his bulletin (previously cited) figures the reticulated type of egg for the whitefly in Louisiana in 1893, and in his description of the egg mentions "a film-like covering arranged in hexagons—;" but it is evident that he was not aware of the existence of two types of eggs representing two species of whitefly seriously affecting citrus. Professor Morgan gives the name of the whitefly observed by him in Louisiana (bulletin cited) as *Aleyrodes citrifolii*, giving for his authority Riley (unpublished manuscript). This is presumably the manuscript which was later published in *Insect Life* (previously cited), the name of the insect in the meantime being changed to *Aleyrodes citri*. The description in the article in *Insect Life* clearly refers to the species with smooth eggs, since it is expressly stated that the eggs are perfectly smooth, although sometimes pruinose, while the description of the larvae of the first stage also agrees with the character of the larvae which hatch from the smooth eggs, and not with those hatched from the reticulated eggs. At first it was thought that either *Aleyrodes aurantii* Maskell, *A. Marlatti* Quaintance, or *A. spinifera* Quaintance, reported on citrus from the N. W. Himalaya Mountains, Japan, and Java, respectively, might be the species in question. However, a careful comparison with the descriptions of these species has ruled them out, as well as many other species. The writer is therefore quite satisfied that the citrus whitefly of Florida with the reticulated egg is a new species, distinct from the citrus whitefly of Florida with the smooth egg (*Aleyrodes citri*); the differences in the eggs alone are considered sufficient to make the distinction. Careful comparisons have also revealed distinct differences between the pupae and perhaps also between the adults of the two species as well as between their eggs and newly-hatched larvae.

What is the significance of this discovery? The species with the reticulated egg is found at Clearwater, Largo and Sutherland on the West Coast, and at Mims, Titusville and Geneva on the East Coast. It also occurs at Orlando and probably in other localities. The species with smooth eggs is at present known to occur at St. Petersburg, Largo, DeLand, New Smyrna, Gainesville, Manatee County, Apopka, Chipley, Leesburg, Bay Ridge, Daytona, Jacksonville and other places. One conclusion immediately follows: that there have been at least two separate introductions of the whitefly into Florida; assuming, which is probable, that the whitefly of Florida is not a native here. It indicates, also, that the whitefly in the upper part of the Subpeninsula is not altogether an introduction from St. Petersburg as is generally believed, but has had its origin in part elsewhere, probably over at Safety Harbor. Whence came the "fly" at Safety Harbor cannot at present be told, but it is believed to have infested citrus trees there for many years. On the other hand, the whitefly at St. Petersburg, in all probability, has been brought from the Manatee Country. Further research may determine many important points of difference in the life history, effectiveness of the fungus and other parasites, spraying or fumigation in the control of each species.

[This paper was followed by a demonstration with stereopticon views illustrating the eggs and first stage larvae of the two species of white fly discussed, together with views of the fungus, parasites, lacewinged flies, and excretion of honeydew.]

DISCUSSION.

Dr. Inman—I would like to ask how much damage we are likely to do this fungus by spraying with insecticides.

Dr. Berger—That would depend

upon the nature of the insecticide. Kerosene and soap solution would do very little injury unless you keep the trees sprayed all the time. Of course, very caustic insecticides and those containing fungicides may do very much harm.

Dr. Inman—Thrip juice, which is a solution of arsenic—what about that?

Dr. Berger—I do not know the ingredients of thrip juice. I cannot answer definitely whether the arsenic will do harm or not, but probably not. I have never seen arsenic recommended as a fungicide.

Mr. Mote—How about the sulphur solution?

Dr. Berger—It may be very injurious to fungi if used too frequently. Of course, one spraying or dusting of the trees with sulphur will do very little damage, especially if the spraying is not too thorough and applied only to the parts of a tree affected. The Rex lime and sulphur solution is now recommended and sold as fungicide.

Mr.——How about the resin wash?

Dr. Berger—I imagine it would be injurious, because it is generally quite caustic, but one or two sprayings in winter will probably do little harm to the fungi.

Mr. Henderson—Do you know anything about the Gold Dust solution?

Dr. Berger—If Gold Dust is nothing but powdered soap, as I believe it is, it will do very little, if any, injury to the fungi.

Mr. Henderson—I also wish to say that I visited thirty or forty orchards in the state and in every one, but one, there was scale, somewhere. I introduced the fungus into all the orchards and so far as I know, the scale is dead in all of them. My experience has shown that the fungi is not only the cheapest but the best remedy for San Jose scale and orange scale. I believe that the black fungus is really more effective and stands more hardship and spreads more rapidly than the red. The application is very simple. You just tie a small piece of wood containing the fungi to about every tenth tree, and your work is done. It is much less trouble and expense to get the fungi and apply it than it is to spray one time. One man can go over about twenty acres in a day.

Prof. Rolfs—I might say, in opening this discussion, that to use the fungi requires courage and intelligence. I know the results of Mr. Henderson's experience must be especially gratifying to Mr. Hart, since he has been harping on that for fifteen years. It must be gratifying to him to see that a large number of citrus growers are coming around to see that the fungi are of invaluable assistance to them.

Mr. Warner—I would like to ask whether it is better to combat the rust mite with a spray or dust.

Mr. Skinner—The liquid spray just hits the outside of the tree, but the dust goes into the whole tree, and I think it is more effective. Besides, liquid spray is so unpleasant to use that ordinary labor will shirk their work to get through quicker. The lime is hard on their hands and faces and gets into their eyes and they don't like to use it.

Mr. Stevens—If you use the dust spray, try sulphur and no lime. It does not increase the scale at all. The liquid spray, in my judgment, injures the fungi working on the spray, while the dust does not.

Mr. Painter—A good many complaints have come in the same as Mr. Skinner's, and one man told me he overcame that by giving his men olive oil with which to rub their faces and hands.

Mr. Longley—I don't think the sulphur solution brings scale. I spray with a sulphur solution and have been for a number of years, and in my case it killed the scale. I never have a scale even on the grapefruit, and we all know that it is a great breeder of scale.

Prof. Rolfs—I will say in connection with this subject that the lime in the dry spray is not necessary for it to be efficacious. It is pretty apt to kill the fungi and let the scale come out.

Mr. Longley—In order to keep the scale down and the rust mite down, I have found that unless you spray thoroughly you had better not spray at all. Consequently, it is necessary almost always to personally supervise it or do it yourself.

THE WHITE FLY INVESTIGATIONS OF THE UNITED STATES DEPARTMENT OF AGRICULTURE.

By Dr. A. W. Morrill.

Mr. President, Ladies and Gentlemen:

I spoke to you last year on the subject of fumigation for the White Fly, describing the methods of procedure and discussing in a general way the results obtained up to that time. As most of you know, the present investigations of the Department of Agriculture have for their object a thoro study of all phases of the White Fly problem. Such work naturally divides itself into: first, studies of life history and habits; second, control by natural enemies, including parasitic insects and fungi, third, control by spraying or fumigation; fourth, studies of miscellaneous factors in their relation to White Fly damage and control.

The early history of the White Fly is rather obscure and its origin not positively known. The evidence at hand, however, seems to show the pest to have been an imported rather than a native species and much support has been given to this theory by its recent discovery in China. The first investigation of Citrus pests in Florida was by H. G. Hubbard, who was doubtless known to many of the present members of this society. As a special agent of the Division of Entomology of the U. S. Department of Agriculture he published in 1885 a valuable report entitled "Insects Affecting the Orange," based on three years' work begun in August 1881. In connection with the White Fly, it is interesting to note that at the time of Mr. Hubbard's investigations this insect gave no promise of developing into a pest, although its existence in Florida was not unknown to the author. The first investigations of the Orange White Fly were made by Riley and Howard, of the Division of Entomology, and the results published in 1893. The scientific name *Aleyrodes citri* was given the insect at this time, and its different stages—egg, larval, pupal, and adult—were described in detail The subjects of life history and remedies were also considered in as thoro a manner as the opportunities for the investigation permitted. The next investigations of the Citrus White Fly were by Dr. H. J. Webber, who, as an agent of the Division of Vegetable Physiology and Pathology, studied the problem from the standpoint of the sooty mold which follows the attacks of various honey dew secreting insects. Of those insects the White Fly was recognized as the principal pest and in his bulletin published in 1897 important experimental work with sprays was reported and the two most useful fungus diseases of the fly were carefully described and their importance discussed in some detail. Aside from the reports published by the Department of Agriculture, the Florida Experiment Station has published two valuable bulletins, in addition to the records of the observations on the White Fly published in annual reports. Bulletins on this subject have also been published by the California and Louisiana Stations.

The investigation of the White Fly by the United States Department of Agriculture was again taken up in July 1906 as a consequence of the urgent demands for such an investigation from Florida orange growers. Five thousand dollars was appropriated by Congress for this work for the first year, ending June 30, 1907, and for the work of the present year $10,000.00 has been available. These provisions by Congress have permitted extensive experimental work and the detailed results will be published in bulletin form from time to time as conclusions are reached concerning the various phases of the subject of White Fly control. My purpose at this time is to present a general outline of the scope of the investigations at present in progress, with a summary of some of the more important results thus far obtained.

The paper here presented is based on the entire work done in connection with the investigation, including that by the various men associated with the writer during the past two years, more especially Messrs. E. A. Back and W. W. Yothers.

LIFE HISTORY.

In working out any important problem in economic entomology a thoro knowledge of the insect concerned is of prime importance. Successful control must take advantage of the more vulnerable periods in the insect's life history, while on the other hand a knowledge of the insect enables us to avoid useless efforts. Studies on the life history of the Citrus White Fly extending over a period of nearly two years, have reached a point where the most important features are well understood.

During the summer months the eggs hatch in from nine to nineteen days, averaging about eleven or twelve days. This variation is quite remarkable, inasmuch as eggs deposited upon the same day are subject to this wide range in the duration of the egg stage. The larval stages are even more remarkable in their range of variation. Dr. Back has found that the larvae hatching from eggs deposited in July will reach the adult winged stage in a period varying from a little over four weeks to a period of thirty-five weeks, the maximum period being more than eight times longer than the minimum period. The total periods from the deposition of the egg to the appearance of the adult in these two cases are 41 and 256 days respectively. In other words, eggs of the White Fly deposited by the adult on July 15 may result in a few adult flies as early as Aug. 25, while some of the larvae will winter over and produce adults the following spring as late as the 20th of March. Our observations show that the adult life under normal outdoor conditions is about ten or twelve days, altho occasionally an individual may live for more than three weeks. Egg-laying usually begins within a few hours after the adult females reach maturity and continues usually at the rate of ten or 11 eggs per day throughout life. As near as we can estimate the average number of eggs deposited by each adult female under normal conditions is in the vicinity of 100. In exceptional cases, however, individuals have been known to deposit more than twice this number. Previous to these investigations it has been generally considered that adults deposit twenty-five eggs or less and usually die in the course of three or four days. If this were correct the destruction of adults would be of slight consequence even tho accomplished incidental to remedial work directed primarily against the larvae and pupae. As it appears from our studies, however, the destruction of an adult even tho it has been depositing eggs for five days previously will probably prevent the deposition of upwards of fifty eggs. This statement should not be considered as advocating the giving of particular attention to the destruction of adults; but only as showing the value of this when it can be accomplished in connection with spraying. The foregoing facts concerning the life history of the White Fly are simply a brief resume of our records on some of the more important features. A bulletin will soon be prepared, giving full details of these studies and showing their practical bearing on remedial work.

NATURAL CONTROL.

The subject of natural control is one of more than usual interest in the case of the insect under consideration. Its exposed condition, apparent vulnerability to attack by natural enemies, and the high degree of humidity in the citrus-growing regions of the Gulf states, favoring the effectiveness of fungus and bacterial diseases, all give basis for the hope that complete control by natural enemies will be the eventual conclusion of the White Fly problem.

So far the fungus diseases of the fly have been the most useful of the natural enemies; in certain favored sections of Florida, offering assistance to the orange growers amounting in a series of years to about one-third of a complete remedy. The important problem in this connection is to develop methods whereby thru artificial means these fungus diseases can be relied upon to give satisfactory control. The experiments of the agents of the Bureau of Entomology, while extensive, and useful as adding to our understanding of the nature of these White Fly enemies, have not thus far contributed anything of value as a satisfactory method of this kind. The introduction into groves of these parasitic fungi is a comparatively simple operation under favorable climatic conditions, and is to be recommended in all cases where they do not already exist. It is a long step, however, from the introduction of these fungi into a grove to the propagation of them on an entirely satisfactory basis, and our records and experiments have not as yet led us to conclusions justifying complete reliance upon the fungus diseases in any section of the state.

The subject of parasitic and predaceous insect enemies of the White Fly are being given attention in connection with the present investigations. No true parasites have thus far been discovered, altho efforts have been made to test the parasites attacking other species of white flies, as to their ability to parasitize this species. The known species of White Flies in the United States number more than seventy; and many of these are kown to be held in check and prevented from developing into pests by these minute parasites.

The recent discovery of the Citrus White Fly in China furnishes strong evidence concerning its probable origin, and opens up the possibility of discovering natural enemies in that region. Predatory insect enemies of the Citrus White Fly are not numerous and are of no consequence as far as observed.

DIRECT REMEDIES.

The success of direct remedial measures against the White Fly is largely dependent upon concerted action among the Citrus growers. Frequently several groves form a natural group isolated from other infested territory in such a way that a local organization only is necessary. In other cases concerted action may be best obtained thru County Horticultural commissions. It is gratifying to note that in several instances organizations of one kind or another have already been affected, or are planned, with the object in view of conducting a systematic campaign against the White Fly.

Spraying is not practised by any large proportion of the owners of infested groves but as a remedial measure against the White Fly it is of considerable importance. Spraying is profitable when properly conducted, but it is in many cases impracticable on account of the difficulty of obtaining labor which can be relied upon to make the application with the necessary thoroness. When applied with care and in liberal quantities the best sprays give results considered successful by numerous orange growers. The observations of the agents connected with the present investigation and the experience of numerous owners of infested orange groves show that spraying is especially useful in connection with the checking of the spread of the fly when it first becomes established in a grove or in a new locality. In such cases money and time spent in spraying will bring manifold returns. It is evidently profitable to spend $100.00 a year on a single acre, if necessary, in order to delay to the utmost the time when it may be necessary to expend $500.00 or an average of only $25.00 per acre in controlling the fly in a twenty-acre grove. From the outlook it seems probable that spraying for the White Fly will continue to be desirable under certain circumstances. The subject of spraying constitutes, at present, a minor phase of the investigations, inasmuch as it has already been demonstrated by the experience of numerous orange growers that this can be practiced with success; and inasmuch as other means of control are either known to be more economical or are in greater need of investigation. The matter of discovering new spraying materials is not an important one since there are several already in use, which are entirely effective in that, when properly mixed, all of the larvae and pupae hit by the spray will be destroyed. Ineffectiveness, in most cases, is due to poor methods of application and failure to apply the spray in sufficient quantities. The report, soon to be prepared, to which I have previously referred, will give the results of experiments in spraying and will discuss fully those things which are concerned with obtaining the greatest efficiency from the practice.

Fumigation is far more economical than spraying and at present can be most strongly recommended for general use as a reliable method of controlling the White Fly. The principal advantages of fumigation over spraying are: first, greater thoroness; second, less expense; third, easier and less disagreeable labor. The work of the Bureau of Entomology has resulted in placing the process of fumigation for the White Fly under Florida conditions on a basis such that Florida orange growers will be able to use this method more intelligently and with more uniform results than California growers have used it heretofore. The so-called expert fumigators, relied upon in California to estimate the dosage, are unnecessary in Florida. The experimental work conducted during January and February 1907 serves as the basis for a bulletin on fumigation which will be ready for distribution in the course of a few weeks.

During the past winter more than 4,000 citrus trees have been fumigated under the direction of the writer and his associates. The complete results of the past winter's work cannot be obtained for several months; but it may be said that they have been most satisfactory, both from the standpoint of the experiments and from that of practical results in controlling the White Fly. In one small grove of two acres the results are already so striking that it is very evident that the treatment would have been very profitable even tho the expense were twice as great. The results obtained in destroying citrus scale insect pests by fumigation, conducted primarily as a measure against the fly, have fully justified the writer's assertion made at the last meeting of this society to the effect that the benefits derived from destroying the various scales in most groves are of sufficient value to offset the entire cost of the fumigation, leaving as clear gain the benefits resulting from the destruction of the fly. The agents connected with the investigations have been making careful inquiry into the matter of damage in Florida due to scale insects. Without the aid of the fungus diseases and insect parasites of these scales, it seems evident that frequent spraying or regular fumigations would be necessary to produce profitable citrus crops. With their aid the damage is reduced to an estimated average of between five and ten per cent. In some cases, however, the damage is as high as fifteen or twenty per cent. of the value of the crop, while in others there is no appreciable damage. Usually the damage by the scale itself does not justify the expense of direct remedies, but the effect on them of fumigations for the White Fly is an extremely important consideration.

In addition to the foregoing main subjects of investigation attention is being given to numerous subjects of less importance, or narrower scope. Among these may be mentioned the study of the effect of food plants, other than citrus, on the efficacy of remedial measures; the study of the result of removing water shoots from citrus trees at advantageous times; the collection of data concerning the losses from the fly; and data concerning the distribution. The results of the investigation thus far indicate that conclusive results can be obtained from most lines of the experimental work in a shorter period of time than is usually required for insects of a like prominence and destructiveness. At the present time, from the results we have obtained, we are unable to predict the results of the efforts to control the White Fly thru its natural enemies, but whatever the results obtained this line of work should be continued until every practicable effort has been made to substitute natural control for the more expensive direct means.

DISCUSSION.

Mr. Skinner—Do you have different size tents, or the same tents?

Dr. Morrill—Tents for the largest trees will do, if necessary, for the smaller trees, but if a grower has one grove of large seedling trees and another of medium-sized budded trees, it would be better for him to have two sizes of tents.

Mr.——Do the tents have to be black?

Dr. Morrill—That is not necessary. Most of our work has been done at night and after a little experience this is not as objectionable as it would appear. It is much cooler, and much pleasanter.

Mr.——What effect does the fumigation have on fungi?

Dr. Morrill—So far as I have observed, no effect whatever. It is generally considered by plant pathologists that hydrocyanic acid gas is not fungicidal. I believe Prof. Rolfs will agree with this.

Prof. Rolfs—It has no effect on fungi.

Mr.——At what stage is it best to fumigate?

Dr. Morrill—It is best to fumigate in the winter time, because at that time there are practically none of the flies on the wing. As Dr. Berger has said, there is no time when you cannot find a few adults, but there are comparatively few in the middle of the winter; too few to be taken into consideration. Occasionally, there is more or less shedding of leaves following fumigation, but of the four thousand or more trees fumigated under our supervision during the past winter, in no case was the tree injured more than was offset by the benefits of destroying the insects. In one case in Manatee county we fumigated a tree that was shedding its leaves from some unknown cause, and I believe only five per cent. of the leaves were left on the tree, but there were trees near by which were not fumigated which shed their leaves to nearly the same extent.

Mr.——How long does it take to fumigate a tree?

Dr. Morrill—The tents are left on about forty minutes.

I would like to say, in connection with the injury from fumigation, that there is some misunderstanding with regard to this, owing to injury sometimes caused by emptying the contents of the jars known as "residue" on the roots of the trees after fumigating. Of course, this should not be charged to the fumigation of the trees any more than we would charge against the cost of spraying the injury that would result from emptying against the base of a tree a half barrel of spray mixture left over at the end of the day. Such carelessness must, however, be guarded against.

Mr.——What is the cost of fumigation?

Dr. Morrill—The cost of fumigation for the average size tree, is about 50 cents. For large trees, the cost may go up to $1.00, or more. But, as I have said, it is better and cheaper to fumigate than to spray, and spraying will cost more in one year than a single fumigation that will last two years or more. The eggs of the insect will probably hatch out by the middle of December, and the best time for fumigating, I would say, would be from the first of January to the time of the appearance of new spring growth of the citrus trees in February.

In connection with the scale insects question, I would say that in one case where we have made pretty careful observation, we have been unable to find a single live pupae or red scale in any of the trees in a fifty-acre grove, though in previous years they had caused much trouble and caused injury to the extent of several hundred dollars per year.

Mr.——In your cost of fumigating, do you include labor, etc.?

Dr. Morrill—We include everything; the work, material, and the wear and tear on the tent as well.

Mr.——It seems to me the tents should be mildew proof.

Dr. Morrill—That should be done if it can be done without increasing the weight too greatly. However, I know one preparation that will do it.

Mr.——Did you ever use sugar of lead and alum?

Dr. Morrill—That is what I speak of.

Mr.——How much would it add to the weight of the tent?

Dr. Morrill—It would not add appreciably to the weight.

Dr. Inman—What is the size of the tents you use?

Dr. Morrill—The largest tents are about eighty feet in diameter, and octagonal in shape. These are large enough for seedling trees thirty-three or thirty-four feet in extreme height. Budded trees twelve feet high require tents about thirty-five feet in diameter.

Mr. Mote—After you have thoroughly and carefully fumigated a grove that is badly infected with white flies, do you consider that you have done away with the white flies for two seasons?

Dr. Morrill—From our observation of the groves we have fumigated, we believe it will take at least two years before the fly will increase to the point of smutting the leaves or fruit. By fumigating it thoroughly every other year, I think you can keep your fruit entirely free from smut, unless surrounding conditions are unfavorable. I refer to neighboring groves where no attempt is made to control the fly.

Mr.——Does it kill the rust mite?

Dr. Morrill—It kills the adult, but not the eggs.

Mr.——In spraying, how often during the season is it necessary to spray to get good results?

Dr. Morrill—Not less than three times a year. I would recommend two in the winter and one later on, about the middle of June. There are no two men who spray alike and good results are dependent upon thoroughness. The results from spraying would not be as satisfactory as by fumigation, but I believe, personally, that I could spray a grove three or four times a year and keep the white fly from smutting the fruit. The average orange grower has to depend on careless hands to spray, and it is not done carefully and thoroughly, and half the good results are lost.

Mr. Mote—What do you think will control the rust mite?

Dr. Morrill—To control the rust mite, you would have to add sulphur to the spray.

Mr.——Did I understand you to say that one fumigation would equal the results of four sprayings?

Dr. Morrill—Yes, sir. The four sprayings in one season would not be as effective as one fumigation, and they would have to be repeated each year. Fumigation has been done so thoroughly that it was impossible to find a single white fly on more than two hundred trees, but absolute extermination should not be expected.

Mr.—Can you fumigate during the summer months?

Dr. Morrill—We fumigate very little in the summer time, but two or three weeks ago we fumigated some trees that were heavily laden with fruit, and while it seemed to cause quite a large percentage of the fruit to drop, we found that surrounding trees continued to shed their fruit, and altogether the fumigated trees have not shed as much fruit as the unfumigated trees. However, it is not desirable to fumigate for scales or the fly while the fruit is green.

Report on Plant Diseases.

By Ernst A. Bessey.

Mr. President, Ladies and Gentlemen:

Owing to lack of the necessary time in which to prepare a more extended paper I shall confine my remarks to two topics, viz.: withertip fungus and nematodes.

In taking up the first-named topic I realize that I am entering upon a field well worked by our respected President, but I am sure he will pardon me if I appear to trespass upon his preserves.

As Professor Rolfs demonstrated some years ago and made known in addresses before this society, as well as in Government publications, various citrus diseases including withertip, blossom blight and tear-staining of pomelo, lemon spot, and several other troubles are caused by the fungus *Colletotrichum gloeosporioides.* Of course, not all cases of dying back of twigs, nor of the rotting of fruits are due to this cause, for other organisms as well are capable of causing these injuries, but in a large proportion of cases the fungus above named is responsible.

Under Professor Rolf's direction, before he severed his connection with the Subtropical Laboratory, inoculation experiments were begun, which have been continued with some interruptions under my direction since I assumed charge of the Laboratory. These have demonstrated that this fungus is the same one that causes the blossom-blight, leaf-spot and fruit-rot of the mango and avocado, the tear-staining of the mango and leaf-spots and fruit-rots of various other plants. These investigations make it almost certain, furthermore, that this fungus is, if not identical with, at least but a slight modification of the fungus that causes the bitter rot of apples. We see, therefore, that it is not a fungus confined to but one or two hosts in a limited area with which we have to contend, but one of wide distribution, and capable of attacking a great many kinds of plants. I have found apparently the same fungus on over fifty plants at Miami, some of them common weeds. This explains why, when the weather conditions or other circumstances are favorable, the disease springs up everywhere all at once, without any very apparent center of infection. Further complicating the matter is the fact that the fungus is not confined to living plants, but will grow with great readiness—I will not say equally well—on dead parts of the same or other plants. Often we find that citrus trees dying back from some other cause, e. g. dieback or blight, show this fungus in abundance on the dead branches, although in this case the fungus has appeared after the death or weakening of the tissues by the other disease.

In view of the above mentioned facts, we see why it is so desirable to keep the grove clean, trimming off and burning all dead branches, and destroying all trash near the trees. Even this will not prove sufficient to entirely prevent the disease from gaining a foothold unless we take other factors into consideration also. One of the most favorable factors for the spread of the disease is moist weather, but since this is beyond our control it will need no further consideration except to point out that by allowing the trees to be planted too closely and to branch too low, an artificial condition of extreme moisture may be maintained in the grove that is very favorable to the spread of the fungus. In such groves the disease can be combated only with difficulty and cannot be conquered. Another factor that we can control to a large extent is the condition of health of the trees. My observations have shown me that anything that tends to weaken the tree makes it more susceptible to infection by this fungus and so reduces the power of resistance that when it has once gained a foothold it progresses much further than is the case with a healthy tree. Among the causes of weakness may be mentioned excessive moisture, or excessive drought, starvation or overfeeding with nitrogenous fertilizers so that the new growth is soft and flabby. Injury from insecticides and even from fungicides may favor the entrance of the disease, while the presence of scale insects on leaves and twigs, or of lice and mites, is also very undesirable. Many of you have no doubt noticed the dead areas at the margins of the citrus leaves, sometimes occupying half or more of the leaf surface—marked with concentric lines of minute dots. These are mostly caused by this fungus and will in a great many cases be found to center in a group of scale insects that have weakened the tissue so that at that spot the fungus was able to gain an entrance—a thing that it does with difficulty in an uninjured mature leaf. On the other hand, any treatment that keeps the tree growing vigorously with a firm, hard growth, reduces its susceptibility to the disease and enables it, in the majority of cases, to check the progress of the fungus before very much injury has been accomplished. One frequent source of entrance of the fungus is through wounds—especially if the tree be in a weak condition, so that it may often happen when one starts to prune withertip out of his grove he finds to his dismay in a few weeks that he has more of the disease than before, infection having taken place at every cut surface and having followed down without any apparent check from the pruning. In a case like this, I would advise that a second man follow the pruner right up and spray the trees thoroughly with Bordeaux mixture within a few hours after pruning. In this way the cut surfaces will be coated by a layer of Bordeaux mixture which will prevent the spores of the fungus from germinating and reinfecting the plant. If the disease is not abundant in one's trees and they are in vigorous condition, it may not be found necessary to spray.

Recently there have come to my notice a number of cases where avocado trees have been very seriously injured by this disease. Three or four years ago a large grove of budded avocados was set out in the southern part of the state. The owner fertilized it with a great excess of phosphoric acid (18 to 25 per cent.) while but two or three per cent. of ammonia and three or four per cent. of potash were applied. The trees did not make any too vigorous growth and a year ago this spring, although not yet old enough to blossom much, came out into excessively abundant bloom. The withertip fungus attacked the flowers and, the trees being in a weakened condition, followed down the flower clusters into the twigs, destroying a great many twigs, many of the larger branches and, in a good many cases, the whole tree, the fungus continuing down the trunk to the surface of the ground. In another case, more recently, several hundred budded trees were obtained from a nursery and kept for several weeks in a lath shed before being set out. At the time they were set out the man in charge noticed brown spots near the bases of the cions on a good many of the trees. These rapidly enlarged and finally girdled the trees, destroying quite a large percentage of those set out. In this case also the withertip fungus was to blame, having gained entrance either through some wound made at the time the top of the stock was lopped off, or through some of the little lateral shoots that started shortly above the bud on the cion, or through the wounds caused by their removal. Another case was that of a little avocado tree growing in very poor, rocky soil, with no water except the scanty rainfall we had last year. No fertilizer of any kind was given to the tree and it made a very weak growth, losing its leaves this past winter before the new leaves came out. It blossomed quite abundantly and the fungus passed on into the twigs and is now entering into some of the large branches.

I have contiued my work on nematodes, on which I made a report before the Sociey two years ago, and have a few things that I would like to add. I have made several extensive trips to determine the distribution of the rootknot, and find that it is more widely distributed than anybody supposed, occurring as far north as New York, West Virginia, Michigan, Indiana, Nebraska, Colorado, Utah and California, thus being found in parts of the country where the winters are very cold, at times with the ground freezing to considerable depth. It also occurs in Europe, Africa, Asia, East Indies, Australia, New Zealand, Hawaii, West Indies, Mexico, Brazil and Argentina and doubtless elsewhere in South America. According to the reports of others and my own observations, it occurs on over 375 species of plants and if careful observations were made wherever it occurs, this number would doubtless be multiplied many times. Nearly all of the large families of flowering plants are represented by plants that are subject to rootknot, while even the comptie, which is not a flowering plant, is not exempt. Of the cultivated plants, as I mentioned two years ago, beggarweed, peanuts, and velvet beans seem to be about the only important leguminous crops that are not injured, while among the grains, corn, sorghum, wheat and rye seem to be exempt. Oats, on the other hand, which in all my previous observations showed no signs of the disease, I have found to be subject in certain cases. I have tested further the effects of different fertilizers on the rootknot injury. Those fertilizers containing large amounts of potash I have found to be of value in that they reduce the amount of injury and seem to actually reduce the amount of rootknot present, the plants not only having a more vigorous appearance, but actually showing smaller and less numerous knots. Kainit and Potassium magnesium carbonate are superior to sulphate of potash. Formalin treatment of the soil I have found to be of some benefit, using one part of commercial formalin to 100 parts of water; but it is necessary to apply several gallons of this solution to the square yard, and it is impossible to get the ground thoroughly and evenly soaked so that its use is entirely out of the question. Carbonbisulphide, about a teaspoonful poured into a hole six inches deep, at intervals of about 15 to 20 inches, the holes being immediately covered with soil, is very efficacious, but is entirely impacticable except for very small areas, on account of the expense which would would amount to $60 to $100 per acre for the chemical alone, not including the cost of applying it. I do wish, however, to report success with certain rotation experiments that were conducted at my suggestion in Denison, Texas. A gentleman was very much troubled by rootknot in his muskmelons, it becoming so abundant that he lost his whole crop in 1904. At my suggestion he planted his field that fall with winter grain. The following spring, 1905, he sowed Iron cow peas on the land, this variety, if pure seed is obtained, being absolutely immune to rootknot. In this connection, however, I must emphasize the fact that it is necessary to have pure seed, for I have observed, and so have others, rootknot in seed alleged to be Iron, though in the pure bred Iron cowpea I have never seen it. The owner of the land carefully destroyed all weeds that came up among the cowpeas until the latter covered the land so thoroughly that all weeds were smothered out. In the fall the land was again sown to grain and in the following summer Iron cowpeas were planted the second time; in the fall of 1906 the land was again put in grain and in the spring of 1907 was planted partly to melons and partly to other crops. All proved to be absolutely free from rootknot. Another piece of land in which he had Iron cowpeas but one year was found to have very many less nemadotes than before, but was not yet entirely free from the trouble.

Regarding the methods of introduction and spread of this nematode, my observations lead me to believe that to a large extent nursery stock has been responsible for the introduction. Once introduced into a man's farm, the disease is easily spread by his tools or the dirt clinging to his feet or the feet of his animals, and even by washing rains. If the proper precautions were taken on new land that had never been cultivated before to use only clean tools and to see that the horses, wagons and plows did not bring dirt with them, the disease would not prove serious. When once introduced, however, it does not take very long, if susceptible crops are grown, for it to become thoroughly established and injurious, for from the time that the egg is laid until the mature worm is laying eggs herself is only about four weeks, and one worm is able to lay from 400 to 500 eggs.

Scaly Bark Disease of Citrus.

Fig. 1. Scaly Bark Disease on orange limb severely affected.

Fig. 2. Orange showing rings and spots due to Scaly Bark Disease.

SCALY BARK DISEASE OF CITRUS.

By H. S. Fawcett.

Mr. President, Ladies and Gentlemen:

Scaly bark, a recently discovered disease of the orange tree, is becoming a serious menace to many growers in that part of Hillsboro county which is known as the Pinellas peninsula. The year before last it was estimated that from 35 to 75 per cent. of the fruit in many old groves was injured by the spotting due to this disease, and this was in addition to the injury to the limbs and trunks by the killing of the bark. Last year the disease was not so severe on the fruit. Scaly bark has been known to the Experiment Station for not more than three years, and the serious nature of the disease has been recognized for scarcely more than a year and a half. According to the older growers in the Pinellas peninsula, however, it has been known there to some extent for many years. Whether it occurs in any other part of Florida, or in any other part of the world, I have as yet been unable to determine.

About a year and a half ago I was delegated by the Experiment Station to take up, along with other plant disease work, the investigation of this trouble; in order to find the cause, if possible, and also a practical remedy. When I first took up the work the older growers told me that the disease was thought to have originated near Safety Harbor, on Old Tampa Bay, in what is known as the Phillippi hammock. In following up these reports I found that nearly all the older groves in which the disease was worst could be traced back as coming from trees that had first grown in a nursery owned by Mr. Phillippi. It was in a large tree next to this nursery as reported by Mr. Phillippi's grandson, that the disease was first noticed at about the year 1860. These trees had been planted about 1840, and were twenty years old when the disease was first noticed. Just how the disease got into the grove and where it came from, no one knows.

As to the varieties affected, I find it is only serious on the sweet orange. Grapefruit is very resistant. Tangerines are almost immune, as is also the Mandarin. I found Tangerine trees surrounded by diseased sweet orange trees, but could find no trace of the disease upon them.

This disease has three fairly distinct appearances on the tree:

(1). On the bark of the trunk and larger limbs there appear roughened, ruptured areas, in which the old bark cracks and scales off with more or less gumming, and a new bark forms under the old; and this again cracks and scales off in the same way later on. This appearance has suggested the name Scaly Bark.

(2). Another manifestation of the disease is apparent on the small branches and twigs. Small lemon-colored areas on the bark are first noticed. They turn reddish-brown, and the bark becomes brittle and cracks. They develop quite slowly, and scarcely ever appear on wood that is less than nine months to one year old. New spots form between the old ones, until in a year or two the limb becomes girdled at some point. As the limb weakens, the ever-present wither-tip fungus comes in and kills it back very rapidly.

(3). A third manifestation of the disease is seen on the fruit, on which there appear, usually in July or August, faint rings. These rings slowly become colored and sunken, while in many cases the interior of the ring remains green and apparently uninjured. The fruits so attacked color prematurely, and many of them drop before picking time.

About a year ago I began experiments on a grove near Bayview on about 175 trees, with the view of getting some definite information that might lead to a remedy. It is too soon to report definitely on these experiments, as they must be continued another year before any conclusions can be drawn; but I might say that experiments with Bordeaux mixture were made every two months through the year, in addition to other experiments of a different nature.

I found that the spraying diminished the amount of spotting on the fruit to some extent; but that where it was used every two months three times or more in all, the Purple Scale increased so rapidly that it was a question whether these scale insects did not do more harm than the disease would have done if let alone.

Considerable progress is being made in learning how the disease develops and spreads, and it is hoped that in time we shall have worked out a remedy for the trouble. Such scientific work is usually quite slow. As you know, the die-back of the orange was fifteen years under investigation before a practical way of controlling it was worked out. The Federal Government has spent $30,000 to $40,000 in the investigation of the blight of citrus; and although considerable progress has been made in finding out the nature of this disease, no practical remedy has as yet been found. In most diseases it requires years for such investigations. In rare instances a remedy may be worked out in a short time. Professor Rolfs worked out a remedy for the phytoptosis of potatoes in ten days, and this remedy has never been improved upon; but this is a rare case. It cannot be known in advance whether it will require ten days or ten years to find a remedy for any given disease.

FIG. 1. Scaly Bark disease on orange limb severely affected.

FIG. 2. Orange showing rings and spots due to Scaly Bark disease.

ORANGE TREE SCALE.

By Cyrus W. Butler.

Mr. President, Ladies and Gentlemen:

I was surprised to find myself upon our program for a paper upon Scale, for having sold my grove interest and even left, temporarily, at least, the land of the best orange, I had considered myself discharged from the army of those who battle against the enemies of the citrus; but I feel pleased to be remembered by my companions of old and, being at present in the land of that best orange, will take one more shot at the enemy, even though it is a "hot air" one and along lines that have often been over before. In approaching the subject, I do so with a sense of incompleteness of knowledge; but when I recall one orange grower, whom I found killing lady birds, and who offered me one dollar apiece for every scale that I would find upon his badly infested trees, and again another who, in advocating a certain insecticide, stated that when applied to orange trees, the scale could at once be seen leaving the tree in clouds,—I reflect that there are degrees of lack of knowledge of this, as well as other subjects.

By the word "scale," the Florida orange grower usually means the purple or oyster shell scale (*mytilaspis citricola*), which is the only species that occurs throughout Florida in sufficient numbers to constitute an important factor in the culture of the citrus, but is not now so dreaded a pest as it was before its natural enemies had become numerous, for we hear the oldest of growers tell of a time when orange groves were not only killed by them, but the entire business threatened.

With its life history most of us are more or less acquainted, but all of us are most interested in methods of making their lives entirely historical, and I will mention such methods as are known to be of value.

These methods come under three heads: first, Prevention; second, Natural Enemies; and third, Insecticides.

PREVENTION.

In the multiplication of scale, like that of all life, food is one of the great factors, which the orange tree best furnishes these parasites when the bark is soft and juicy, with large pores, this condition is most often brought about by using an excess of nitrogen, and most especially when of an organic nature, such as stable and hen manure. Even a moderate amount of nitrogen of this class is almost certain to cause an increase of scale, and quite certain to do so if used in connection with clean culture, which by admitting the air to the soil, causes rapid nitrification of the ammonia present in the manure.

Also we remember how, after the freezes of '94 and '95, the fast growing sprouts from the roots of the frozen-down trees were afflicted with scale throughout the State.

As to the idea of this pest being increased by poverty of soil and neglect of cultivation, I must differ even with such authorities as our much respected Hubbard, as such conditions produce a close bark, not favorable to scale; but what is better proof, is that I have never been able to find any neglected trees that showed any unusual amount of scale, unless around some old barn or hen house, where the ammonia may linger longer than one would expect. Of course cultivation will cause and increase scale by increasing the nitrification of any ammoniates that may be in the soil and thus causing a more sappy growth; provided the ammoniates are in the soil.

Any covering, greatly increases scale, and this true, not only when immediate, as in the case of spider webs, birds' nests, etc., but when the cover is much above the trees, as in the case of overhanging forest trees, and is well illustrated in shedded groves. Also, in shedded pineries scale abound in proportion to the amount of shade.

In addition to the above causes, we must admit, that at times we have a general increase of scale, probably owing to climatic conditions.

For instance, last year we had a long spring drouth, followed by a meager rainy season, thus seriously handicapping the fungoid enemies of the scale, which are now very numerous.

But the worst of all attacks of scale is that following the white fly, the usual dead wood inside of whitefly trees, being less due to the whitefly than to the scale that follows them.

NATURAL ENEMIES.

Upon our Sub-peninsula, at least, I would give the first place to the black fungus (*myrangium duraci*), which is well distributed with us; and, while it confines itself mainly to the trunk and larger limbs and does not become abundant until the scale are also in sufficient numbers to injure the trees, still I think it our best ally against the scale. I first saw this fungus some eighteen years ago, in the grove of Mr. Moffet McClung, of Dunedin, and scraping it from the trees, got a mixture of fungus, bark and scale. When my trees were still wet from a summer rain, I rubbed the above powdery mixture along the upper sides of such large limbs as showed scale, being careful to work high in the tree, so that the rains would wash the spores of the fungus down the limbs. All conditions must have been favorable, for every tree treated got a good start.

While we have long heard of the white fungus (*ophionectra coccicola*), it did not appear in our vicinity until the last two years, and was first noticed in the grove of Mr. W. E. Heathcote, and is now spreading. It works upon smaller limbs than the black fungus, and will thus supplement the effect of the latter. Considering that it has been doing good work during the past dry year, it promises well under more moist conditions.

As Cuba has one or two species of fungus preying upon scale that I do not think that we have, it might pay to make some importations.

Of lady birds, the only species numerous enough to be of value is our common twice stabed one, which, like our lady friends, are ever with us, and are ever busy, both in larvae and adult form, destroying what scale their stomachs will admit, but (again like our lady friends) are not quite equal to the occasion of accomplishing all desired results for our good. Incidentally, I might say that in at least one shedded pinery I found this lady bird to be a specific for the pineapple scale. The covering of this scale being quite thin, the lady bird forces its mandibles through the covering and into the scale, then drags it out through the roof of its house, eating at times as many as three scale per minute. Cuba has a small steel blue lady bird that might be of use to us.

While we always find many microscopic, but predacious appearing mites running around among scale, I have never been able to detect them in preying upon the latter.

Also, if hymenopterous flies attack the purple scale, I have never noticed it, but have seen them clean up a tree badly infested with wax scale.

INSECTICIDES.

Where man interferes with the balance established by Nature, he is quite apt to bring about a series of reactions, often unlooked for by him, and this is especially true in spraying orange trees, where the insecticide used not only often directly injures the tree, but usually destroys the natural enemies of the scale, and the grower thus places himself under obligations to do much work that Nature would otherwise do for him; but upon the other hand, where the grower is sufficiently informed, he can keep his trees clean of scale and rust mites by spraying, and without injury to the trees, but at a cost justified only by a fair price for oranges.

Of the most effective insecticides for scale, we would first place either resin compound or resin wash, but the former is apt to gum the pump: this can, however, be remedied by adding, say five per cent. of kerosene to the compound in making and thoroughly incorporating the same. Both of these washes, if used two or three times during one season, will show bad results upon the trees, probably by gumming up the pores of the leaves and bark.

Second comes kerosene emulsion, which is rather less effective upon scale than the resin washes, and is quite variable in its effect upon the trees, depending upon whether the weather be clear or cloudy and also whether the trees are thrifty or not.

During clear weather the oil evaporates quicker, and thus affects the tree less, and a thrifty tree will withstand much more kerosene than a hardened up one. Besides, kerosene emulsion has killed many large trees by being carelessly made, the oil separating and being sprayed upon the trees unnoticed by the workman.

Third, and safest of all our scale spraying compounds, comes the various potash fish oil soaps, often called whale oil soaps. At the strength advisable to use these soaps are not as effective as the above resin washes; however, its non-injury to the tree enables the grower to use it so repeatedly as to thoroughly clean a tree of all insect enemies, excepting rust mites, which for some reason seem proof against the soaps, perhaps because of their diet of oil; this can be remedied, however, by adding some sulphur and caustic potash compound to the soap. Many of these soaps are made with caustic soda, which makes a hard soap, while caustic potash makes a soft one, which is to be preferred to that made from caustic soda, for its fertilizing properties, if for no other reason, but again it mixes with water more readily than a caustic soda soap.

Personally, we have not sprayed for scale but one season during the last twelve years of our orange growing, and that one season was after using Bordeaux mixture; but, needing bright oranges, we did spray with a sulphur and caustic potash compound that not only was effective on rust mites, but was almost equally so upon young scale, even after they were partially covered.

Ever since we have been in Florida we have heard of using salt around trees, as a scale insecticide to be administered through the sap, but have made only one trial, and that on but six two-year-old trees, giving them from three-fourths of a pound to two and one-half pounds each, and for want of rain, soaking it in once per week with water from a hose. The salt did kill nearly all the scale; but it also hurt the trees so that they dropped most of their leaves, even when I used less than one pound of salt; and where I used the most salt, the small limbs died back for a few inches and the tree was a long time without foliage.

To recapitulate: We would say, first, avoid conditions favorable to a multiplication of scale, by hardening up the bark by a maximum percentage of potash and a moderate amount of nitrogen from inorganic sources—preferably sulphate of ammonia, and avoiding any unnecessary cultivation of trees.

Second, encourage all natural enemies, such as scale destroying fungi and lady birds.

Third, if justified in spraying and intending to do so but once during the season, use one of the resin washes, but do not use it while the fruit is quite small. If continued spraying is intended, use one of the fish oil potash soaps; and where rust mites are also to be destroyed, add some potash sulphur compound.

But preferably get the natural enemies of the scale to work, and do not expect immediate results; for, while the mills of the gods grind exceedingly fine, they are unusually slow, in the time ideas of man.

SAN JOSE SCALE.

By F. P. Henderson, Gainesville.

Mr. President, Ladies and Gentlemen:

The general subject of Diseases and Insects has been so thoroughly and ably discussed by persons more competent than myself that I think it more profitable to this body that I give very briefly my experience with the San Jose Scale. Perhaps no one in the State has had more loss by the San Jose Scale or succeeded better in its destruction than I have.

In 1901 I planted at Arno, Fla., a 60-acre peach orchard. In 1903 nothing could look more promising, when the San Jose Scale appeared in two or three places. I immediately cut down and destroyed the first trees infected. But this failed, as by winter several hundred trees were affected. During the winter of 1903 to 1904 I sprayed all the infected trees and all the trees around them with the Lime-Sulphur Salt solution. This seemed to destroy most of them, but during the summer and fall of 1904 they spread very rapidly. I again sprayed the whole orchard very thoroughly during the winter of 1904 and 1905, with only temporary results, so that by the fall of 1905 almost every tree in the orchard was infected so much that three-fourths of the trees died back to the trunk.

I had read the bulletin written by our Honorable President about the destruction of the San Jose Scale by the Sphaerostilbe Coccophila or Red-head Fungus, but I did not know how or where to get it. But I succeeded in getting three or four small pieces of what was told me was black fungus. I put this on some of the worst infected trees early in 1905. I paid no more attention to it. At this time I did not know the red or black fungus when I saw it. Early in the winter of 1905 I began spraying again and I kept seeing trees covered with the red fungus and I began to examine and I found where the trees looked red the scale was dead. I very carefully re-read the bulletin and found I had the red and black fungus both pretty well distributed over my orchard. I immediately quit spraying and wrote to Prof. Rolfs and stated the facts to him and asked him if I could safely trust the orchard in the hands of the fungus, and he replied I could; and I have not used my spray pump since. By January 1906 I could not find a live Scale in my orchard.

Early in the spring of 1906 I cut almost all the trees back to the trunk and by the fall of 1906 I had almost as good an orchard as ever. The Scale were so completely killed that I almost lost the fungus.

During the fall of 1907, during a long spell of dry weather, the Scale appeared in large numbers, sufficient to do a little damage; but as soon as we had some rain the fungus very soon appeared again and destroyed the Scale.

In May 1906 I introduced both the Red and Black fungus into the 300-acre orchard of the Gainesville Orchard Company, near Archer, which at the time was very badly infected with the Scale. The fungus spread very rapidly and within a few months the Scale were all dead, and the trees put on a nice fall growth of healthy wood.

In June 1906 I introduced both the Red-head and the Black fungi into the 500-acre orchard of the Griffing Florida Orchard Company at Komoko, with the same results and the fungus has held the Scale down completely ever since.

During the summer of 1907 I visited nearly all the peach orchards in the State and I only found one orchard that was not affected with the San Jose Scale. I introduced the fungus in nearly all, with the same results, so far as I have learned.

My experience has shown conclusively that the fungus is not only by far the cheapest, but also the most effective remedy for both the San Jose Scale as well as the orange Scale.

After obtaining the genuine fungus, of either variety, the application is very simple. Just tie a small piece of wood containing the fungus, in about every tenth tree, and your work is done not only for one year but as long as you have an orchard. One man can make the application on about twenty acres per day.

I very seriously doubt if spraying is the best means of fighting any of the injurious insects of Florida. What we need to do is to find out through our Experiment Station what the natural enemy of these insect pests is and then use it to exterminate it.

And here permit me to say that I do not believe we, as horticulturists, appreciate the work our own Experiment Station is doing for our fair State. They have redeemed the peach, plum and Japanese persimmon industries from complete destruction from the San Jose Scale, and I feel sure that the orange industry will be saved thousands of dollars from the ravages of the orange Scale as soon as it is learned that these same fungi will eradicate the orange Scale. Besides, they will yet deliver us from the ravages of the white fly.

DISCUSSION.

Mr. Hart—I want to again call attention to what I consider the most serious matter of all. It seems to have been slighted and has been mentioned only once or twice in an incidental way in this convention. That is, blight of the orange trees. I consider that is the most serious disease we have to contend with, and it should be given first attention. This disease is so bad and so hard a problem that it seems our professional men shy around it and do not want to say anything about it. We will have to hold them to it. It is to them that we look for relief, and without doubt they must give it to us, if we get it. But, as orange growers, we must help them.

Professors Weber and Swingle came down here from Washington because of the action of this Society, and if it had not been for the freeze I think they would have accomplished valuable results. This disease never attacks a tree until it is seven years old, or older, and it requires expert study for years to work out the necessary experiments to locate the cause of the trouble. Our professional men must work the problem out for us. We, as individuals, cannot afford to put the time and study into it that it requires. Now, can't we take some action right here and now that will bring about more effective work on that line? Our president has worked on it, but he had a whole lot of other work to do that took up his time, and although he put good study into it, we have not got the results we hoped to have. We must do all we can to get hold of this question of blight, and find out what the remedy is. If it is going to take twenty years, let's begin this year and that will cut off one of the twenty. The government is ready to help us on anything that we need help on, but we must ask for it; we must make it known to those having these matters in charge that we need help, and then we will get it.

It is perfectly astounding to me that year after year goes by, each season we dig out some of our most valuable trees spoiling the symmetry of our groves, yet little effort is made to find a remedy. It certainly does a great amount of damage. The best trees we have will show blight, and then they are gone. All you can do is to dig them up, leaving great open spaces in your groves, and plant anew. It knocks off a third of the value of the grove if you wish to sell. The buyer won't pay within a third of the value. Now, we have here those who have suffered with blight and those who are bound to suffer sooner or later. It seems to me that we should make an effort to get good work started on the matter, and we should begin where Weber and Swingle left off.

Mr. Mote—I am not suffering with it very much, but I am interested in the subject. If Mr. Hart will offer a suggestion, I think this whole body will take it up.

Mr. Hart—I *have* been offering suggestions, and have got the matter so far along that the Society has endorsed it, passed the resolution I have offered each year for several years in succession, and that is about all we have heard of it, except that Mr. Painter conferred with Secretary Wilson at one time concerning it. The thing for us to do is to press the matter as individuals. If our Secretary writes to the Secretary of Agriculture and that is all that is done, it will remain just as it is. We must pass a resolution that means business, and then we want to get right after it and stir up those in authority and get the matter before them and keep it before them so that they will say as the Southern Express agent at Savannah said of a man who had paid express at both ends of the line. The man found out what was being done and that express charges had been collected from him and from the people to whom he had shipped oranges as presents, and he grew tired of it. He started in and made such a noise with no cessation that after awhile the Express superintendent said to the agent at this man's station, "For the Lord's sake, do something to stop that d—man's mouth." If we can talk to them like that, maybe we can get them to think we are in earnest.

Mr. Mote—I move that a committee of five be appointed, and that Mr. Hart be made chairman.

Mr. Painter—If you will refer to the report of last year, you will see where I made a report of this matter. I did not trust the mails, but saw the Secretary of Agriculture in person and presented our resolution to him. About the first question he asked was, "What are you people doing?" He said, "We are willing to help you if you help yourselves along any of those lines. Just now, however, all the appropriation is used up and we cannot do anything at present." His intimation was that they were willing to help us, but they were not going to do it all.

Mr. Rose—I would suggest that it is necessary for the whole body as a body to move in this matter. The departments will receive with courtesy a letter from the secretary, but it is necessary for us to act together. If you will remember a little while ago, there was considerable agitation about the white fly, particularly in the Second Congressional District. Our Congressman was talked to by a large number of growers and the necessity of action being shown to him, he exercised himself and got an appropriation and sent a white-fly man to the state. Now, in this instance here we have representatives in Congress who are anxious to represent the people, and it is the duty of every member of the Society to correspond with his Congressman and the Secretary of Agriculture. When it is known that a people representing the orange industry of Florida require assistance in scientific work, when it comes up in the proper shape, it will be attended to. There is no doubt but that after this meeting is over, we will lose all interest; we depend on the secretary or upon a committee for effort to be made, and the body as a body does not support the men who should be supported. The thing to do is to show that you want these things, make it clear to your

Congressman, and he will help you to get them.

Mr. Gaitskill—I would suggest that Mr. Hart get up a resolution to be passed by this meeting, and the secretary do as he has done—present it to the Secretary of Agriculture. At the same time, we, each and every one, get our friends and neighbors and all to write a letter to the Secretary of Agriculture and to both Senators and to the Congressmen, asking them to see that this thing is attended to. By that means there may be something done. It is the constant dropping of water that wears away a stone. If you can't write a letter, write a postal card, but let's *do something*.

I move that Mr. Hart prepare a resolution and present it to the meeting, we pass it and put the matter before the Congressmen and the Secretary of Agriculture in the regular way. Then each and every member of the Horticultural Society, and not stopping with the members, but get all our friends who are interested in the matter, to write to the Secretary of Agriculture, to the Senators, to the Congressman from his district, and see that this resolution is acted upon.

Mr. Hart—I don't think that I could formulate any better resolution than that which has been passed repeatedly by this Association, and I think most of you remember what is in it. It states our needs and states the effect of the disease; it states the conditions that make it difficult to combat individually and without the organized effort, and I think to just readopt it would be all that is necessary. I could not, on such short time, undertake to write anything near so good.

I think, Mr. President, that Mr. Gaitskill's motion is a good one, and I second it heartily, only I am afraid that if we merely pass the resolution nobody will do anything. I would suggest that we have a show of hands of those who will act in the matter.

Prof. Rolfs—You have all heard the resolution, and those of you who are in favor of the motion, and who will write to the Congressmen and the Senators as suggested, please rise to your feet.

(Nearly every member responded by rising to his feet, thereby promising to urge it on our representatives in person or a letter.)

Mr. Hart—Now I am sure we will get something done.

Mr. Gaitskill—I know that our Congressmen are glad to help us in any way; and if they are not, we can do a lot to keep them from being sent back.

The resolutions were adopted and are as follows:

Whereas, The orange growers of Florida are annually suffering the loss of many thousands of dollars in the reduction of their fruit crop and still more in the market value of their groves through a disease known as orange tree blight, which usually selects the largest and most productive trees for the attack; and

Whereas, Though the disease has been carefully studied for many years by very able Department experts, it is not yet well enough known to allow of its positive identification, in many cases, before the second or third year after its appearance, while investigations pretty surely prove that the disease is contagious, which makes each diseased tree a nucleus from which it is carried to others when caring for or working the grove; and

WHEREAS, Progress has been made that encourages the belief that if additional help with special fitness can be sent here and allowed to devote their whole time assisting in this select work, we have reason to hope that the cause may be found for it; therefore, be it

RESOLVED, That the Secretary of this society be instructed to correspond with the Florida Representatives in Washington and earnestly request them to call upon the Secretary of Agriculture, Hon. Wilson, and urge upon him the importance of this work and the pressing need that we feel for further assistance from his Department. Be it further

RESOLVED, That each member of this society exert his or her influence as an individual to secure increased appropriation for this work and its more vigorous prosecution.

Report of Committee on Fertilizers.

By E. O. Painter.

Mr. President, Ladies and Gentlemen:

The most expensive form of plant food that the horticulturist and farmers have to buy is ammonia. Therefore I deem a little information as to the different kinds and sources of ammonia would not be out of place with the members of the Florida State Horticultural Society.

Ammoniates should be divided into three different classes: Chemical, Animal and Vegetable. The chemical sources are the most expensive per ton but as a rule are the cheapest per unit. Being soluble they are the quickest available and can be used to great advantage where quick crops are grown.

CHEMICAL AMMONIATES.

There are some chemical ammoniates that are high in plant food but are very seldom used as a source in fertilizer mainly on account of the small quantity produced.

NITRATE AMMONIA.

Nitrate ammonia contains the highest percentage of ammonia of any material that is offered as it contains on an average of 38 per cent. This nitrate ammonia is a byproduct in the manufacture of high explosives and for years has been thrown away as the manufacturers were not appraised of the value of it as a plant food. Recently 40 tons of these goods were sold for $100.00 per ton. This nitrate ammonia is made by mixing and neutralizing nitric acid of a high grade with a good grade of aqua ammonia in the same manner that sulphate ammonia is manufactured. It is very high because it not only contains ammonia from sulphate but also the nitrate from nitric acid. As stated above this article has been a waste product for years but is now bringing the manufactures a clear $100.00 a ton. It would be an excellent form for the farmers to use if it was to be had in sufficient quantities, but as the whole amount made in the entire United States is probably less than 100 tons there is not very much danger of the market being stocked with this article.

SULPHATE OF AMMONIA.

Sulphate of ammonia is another one of the valuable byproducts in the manufacturing interest of our country. Formerly the ammonia from the gas works and coke ovens was all allowed to escape into the open air but now it is caught and combined with sulphuric acid producing sulphate of ammonia, for the benefit of the farmer and mankind generally. In making gas, the coal undergoes a process of destructive distillation in the closed retort or oven. This liberates the ammonia which passes away with the gas and is absorbed by water through the scrubbing or cooling process. The liquid containing the ammonia is heated and the ammonia liberated by lime water which is led through a bath of sulphuric acid through a bath of sulphuric acid where where the ammonia combines with the acid forming the white crystals, known as sulphate of ammonia. The crystals are then taken out and by means of centrifugal forces are dried and are then ready for the market.

While a large amount of sulphate of ammonia is made from coal in the process of making coke there is a large quantity made from bone while making bone charcoal. The process is practically the same as when it is made from coke. The difference being that the bone is used in the retorts instead of the coal. After the bone is treated in this way it is used in the sugar refineries for purifying sugar.

NITRATE OF POTASH.

Nitrate of potash is another very high grade chemical and has the advantage of not only containing a large percentage of ammonia but is very high in potash and this makes it doubly beneficial to the grower. Nitrate of potash which is usually called salt peter is found in India, Egypt, Persia and Spain where it frequently appears as a white incrustation on the soil and is sometimes mixed with the soil to some depth. To extract the nitrate the earth is leached with water and the solution evaporated either by the sun or artificial heat. This develops the impure crystals which are exported as impure salt-petre. Nitrate of potash is formed wherever nitrogenized organic substances decompose in the presence of potassium hydrate. It is also manufactured artificially by exposing to the air a mixture of animal matter with wood ashes and lime moistened with stable drainings or stale urine.

The greater part of the nitrate of potash, however, is made from nitrate of soda. The recrystallized nitrate of soda is dissolved in water and an equivalent quantity of potassium chloride, is added to the mixture and the solution boiled down. While the water is hot the chloride of sodium is deposited and separated from the nitrate of potash which crystallizes while cooling.

Any one who has ever seen nitrate of potash can recognize it at once by the peculiar form in which it crystallizes. It forms into long six-sided prisms and when freed from impurities is nearly transparent and has a cool and slightly bitter taste. Nitrate of Potash is very soluble in water, the solvent power of water increasing as its temperature rises. While 100 parts of water at zero dissolves only 13.33 parts, at 100 degrees it dissolves 246 parts.

Nitrate of potash is used for a good many other things besides fertilizers. It is used in the manufacture of gunpowder, matches and as a preservative for meats. The pure nitrate of potash contains 13.87 per cent. nitrogen which is equivalent to 16.84 per cent. ammonia and 45.31 per cent. potash as K_2O.

Until within the last ten years all the nitrate of potash used in the United States was imported. It is however, manufactured in the United States now in limited quantities by the sheep dip manufacturers. It comes to them as a byproduct in the process of extracting the nicotine from the tobacco stems. For years the nitrate of potash would settle in the cans of sheep dip and became a source of annoyance until a process for eliminating it was discovered. At first this deposit was considered to be a useless product and a large quantity of it was offered to the writer at a very nominal price, which was quickly accepted, but he was unable to renew the contract two years later when the true nature of the goods was known to the manufacturers. Nitrate of potash manufactured from tobacco stems does not usually analyze as high as the imported article on account of the impurities in the shape of fine particles of tobacco that accompanies it. It could be made as pure as the imported goods by filtering and recrystallizing but the increased price would not warrant the increased expense. The tobacco contained in the nitrate of potash is not detrimental as a fertilizer consequently the manufacturers have no trouble in selling their entire output at a good price without going to the trouble of recrystallization.

NITRATE OF SODA.

Nitrate of soda is more largely used than any other form of commercial ammoniates because of the large quantity obtainable and the fact that the Chilian government several years ago instituted a nitrate of soda propaganda which has spread over the United States by advertising and otherwise, information in regard to the use of same.

All the nitrate of soda used in fertilizers and the arts comes from Chile although it has been reported at various times that nitrate has been found in other parts of the world. On the high elevated plateaus of Chile the nitrate of soda is found in beds varying from a few feet deep to 25 or 30 feet mixed with earth and other foreign material. The mining is a simple process of blasting the earth and sorting it out and hauling to the mills where it is run through the crusher and dissolved with boiling water in tanks. When the material reaches the desired temperature it is run off into huge vats where it crystallizes. It is then taken up from the evaporating pans and stored in immense piles where it is ready for sacking and shipment abroad. The nitrate of soda is left out uncovered and no warehouses are built for its keeping. There is no fear from loss on account of rains or dews as it has never been known to rain on the plateaus and they are not troubled with dews. If the case had been the reverse Chile would not be giving us this valuable plant food because the rains would have dissolved it and carried it down and out to the sea.

The use of nitrate of soda is increasing wonderfully and will continue to increase more and more as the people become familiar with its value. In 1844 there was 14,646 tons of nitrate of soda shipped from Chile and in the year 1903 there was 1,384,349 tons, the average increase being about 50,000 tons a year.

There are two grades of nitrate of soda imported to the United States, one called the 95 per cent. goods and the other 96 per cent. The former is used more exclusively by the fertilizer trade while the latter is used in the arts and the manufacture of sulphuric acid.

ANIMAL AMMONIATES.

It was only a few years ago when the present forms of animal ammoniates were a waste product and it was a burden on the producer to get rid of same. Now it is a source of revenue that is adding not only wealth to the producer but aiding the farmer to add to his wealth.

DRIED BLOOD.

It is hardly necessary for me to go over the different stages that lead up to the separating and manufacture of dried blood, tankage, blood and bone, etc. The enormous amount of blood that comes from the slaughtered animals is now saved and is used as a source of ammonia in almost every section where fertilizer is used. The blood is run through presses which extract a large amount of the moisture and the residue is put through a drier and screened. The value of the blood depends on how carefully the separation of other materials is made in the slaughter houses. Dried blood frequently analyzes as high as 17.75 per cent. ammonia and it's not unfrequently as low as 14 per cent. Dried blood is one of the best sources of animal ammoniates and is considered by chemists and agriculturists to be first on the list of value as an animal ammoniate.

BLOOD AND BONE.

The name blood and bone is familiar to the users of fertilizers but to the manufacturers and trade the name is tankage. All blood and bone is tankage but all tankage is not blood and bone. In the slaughter houses every scrap of meat, bone and blood that cannot be used for some other purpose is gathered together and put into a large tank and cooked. The cooking process is continued for some time or until all the matter is so broken up that the grease will float on top. The grease is then drawn off and the residue dumped into large hydraulic presses and the water squeezed out and the remaining material run through a drier, ground and screened. Then we have tankage or blood and bone.

The value of the blood and bone depends of course on what goes into the tank. The more bone that goes into it the higher in phosphoric acid and the lower in ammonia and vice versa. The many uses to which bones can be put outside of the use for fertilizer has made a valuable market for same consequently but a small proportion of the bone produced at the slaughter houses goes into the fertilizer and the tankage now produced usually runs high in ammonia and low phosphoric acid. The most popular kind on the market now is what is known as 10 and 10 tankage, that is 10 per cent. ammonia and 10 per cent bone phosphate of lime.

The small slaughter houses, however, do not as a rule produce as high grade tankage because they do not have materials enough to warrant close separation, consequently their tankage contains more bone and less ammonia, usually running 6 to 6 1-2 per cent. ammonia and 25 to 30 per cent. bone phosphate of lime.

When the slaughter house managers found an outlet for their waste material they thought their troubles were at an end, but the enormous amount of water that was pressed out of the tankage found its way into the city sewers and polluted the streams, which soon called for a change. This was brought about by putting in large evaporators and evaporating the water that comes from the presses. When this water is evaporated it leaves a thick substance in the pans which is almost equal to dried blood in its value as an ammoniate. It has a very objectionable quality, however in not being "consistent." It will not remain in a mechanical condition any length of time after it is made up, without the addition of foreign material. From its stick nature and tendency to dissolve and become solid it has been called "Stick" or concentrated tankage. In recent years, however, methods have been discovered for handling this concentrated tankage so it is added to the other tankage and remains in a good mechanical condition and makes in every way a very desirable source of animal ammoniate.

STEAMED BONE.

Notwithstanding every piece of bone in the animal that is large enough for buttons or knife handles is used for that purpose there is a large accumulation of knuckle bones and bones from the head that are put into tanks and thoroughly cooked to extract the grease and glue. This cooking not only puts the bone in a better condition for grinding but it also adds to its value as a fertilizer. The value of steamed bone depends entirely on how the material is graded when it goes into the tank. The average steamed bone will analyze 3 per cent. ammonia and 45 to 50 per cent bone phosphate of lime. Where the bone is carefully separated the analysis will average 1 to 1 1-2 per cent. ammonia and 60 per cent. bone phosphate of lime. The latter is usually termed degelatinized steamed bone.

RAW BONE.

The demand for bones by the farmers has caused the ends of the earth to be searched for this article. For years the plains of the West gave up carloads after carloads of buffalo bones. South America and India have also been the source of large quantities of bones. These fields however, have been pretty thoroughly gone over so that the supply of bones from that source in the future promises to be very small indeed. At present the raw bone that is on the market is made from bones gathered from the small butcher shops and slaughter pens scattered over the country. A carload here and a carload there, not very much at any one place but all together making a considerable quantity.

While the raw bone analyzes higher in ammonia than the steamed bone it is not considered as valuable owing to the fact that the grease and glue is still in the bone. The grease retards decomposition consequently delays the time when the plant food will become available. For crops that are a long time growing or for fertilizing orchards the raw bone is not only a good source of ammonia but also of phosphoric acid. On crops that are grown in 60 or 90 days raw bone would be of very little use as a fertilizer.

GARBAGE TANKAGE.

The demand for fertilizer of all kinds and the continued increased prices of same has caused the manufacturer, chemist and any one interested to be on the alert for some material which would furnish plant food.

One of the articles that comes in this line is garbage tankage. For years the garbage of the large cities has been gathered and dumped into waste places, the sea or burned. Now nearly all the up-to-date cities have large garbage plants where all the garbage of the city is gathered together. The tin cans, glass, chinaware, rags, etc., are all separated from the kitchen garbage. This latter is put into large tanks along with any dead animals, spoiled fish and meat and cooked in the same manner as the blood and bone in the slaughter houses. The grease is skimmed off and the residue pressed and dried and we have what is known as garbage tankage. This tankage is usually low in plant food containing 3 to 4 per cent ammonia and 5 to 6 per cent bone phosphate of lime and about 1 per cent. potash. The farmers who live close to the city have an opportunity to get their source of ammonia cheap, as the price the tankage is sold at is usually below the market price of ammoniates of higher grade. It is also a cheap source of ammonia where freight rates are not high. Whenever the goods are shipped any distance the freight rate makes the cost per unit run up so the goods cannot be used to advantage very far from the garbage plants.

FISH SCRAP.

Fish has been used as a fertilizer long before any other material. The New England Indians were the first to discover the value of fish as a source of fertilizer. They buried a fish at the base of a hill of corn with the idea that the spirit of the fish would enter the corn stalk and encourage it to produce a larger yield. They were satisfied of this fact because they knew that a hill of corn under which reposed a good-sized fish gave a more abundant yield than when no fish was put there.

The fish scrap produced now is quite a different article from what it was ten years ago. The old method of handling the fish was so crude and the stench so great that the factory was almost unbearable to all except those constantly working in it. Their methods were crude and the fish was usually dried by the sun after coming from the kettle. It frequently happened that before the fish was thoroughly dried a rain would come and wet it and the flies would blow it and it would become a putrified mass. When this class of material was finally dried and sacked it is no wonder that the odor was not only penetrating but very objectionable to anyone. Under the present method for quick handling of the fish and the quick process of drying it, it is delivered in perfect shape without an objectionable odor, no more objectionable than the smell of dried herring.

Fish scrap is a byproduct in the manufacture of Manhattan and fish oil. The oil is the finest article sought after but the scrap has proven to be of such value as a fertilizer that the revenue from same goes a long ways towards keeping the balance on the right side of the ledger.

Fish scrap produced at the present time very seldom analyzes below 9 per cent. ammonia and frequently as high as 12 per cent. So great has been the demand for fish scrap that whale meat from the whaleries has been saved and made into whale tankerage or whale meat, which like fish makes a splendid source of ammonia for general farm crops, especially where it can be applied and worked into the ground. Anyone who has once become acquainted with the odor of fish scrap or whale meat tankerage can readily detect it, not only when they are using it themselves but when their neighbors are using it some distance away.

HOOF AND HORN MEAL.

Hoof and horn meal has been used for a long time as a source of ammonia and yields in the neighborhood of 18 per cent. If the ammonia were quickly available, this would be an excellent source, but unfortunately it takes some time for hoof meal to decompose and give up its ammonia. The hoofs and horns of the slaughter houses, after being steamed and ironed out and the better parts cut out and saved for the manufacture of "tortoise-shell" combs, the balance is ground and sold as hoof meal. It is sometimes mixed with blood and bone to bring up the percentage of ammonia. For long-feeding crops, or for use on moist land, the hoof meal is an excellent source of ammonia. It decomposes slowly and there is no danger of its being leached out by moisture, consequently it can be used on land where nitrate of soda or sulphate of ammonia would be a loss. On the other hand, if it were applied on quick growing crops or on soil that was dry and inclined to be thirsty, very little good would be derived from its use.

LEATHER SCRAP.

There is always some one on the lookout for something that they can put on the market at a less price than the market is paying and still give them a good profit. It has been known for a good many years that leather contained a considerable quantity of ammonia and it was also known that a piece of leather will remain in the ground for years and the plant would be no better for its being there as the ammonia was inert. The demand for ammoniates has caused a number of experiments with leather to be made and different methods have been used to put it into marketable shape. This has been effectually done during the last few years. The leather is scorched and pulverized and treated in different ways so from the appearance you would never recognize it as once being leather. The nostril is the only means of detecting it. Notwithstanding all the treatment you give it it still holds the leather odor. In some states it is against the law for fertilizer manufacturers to use leather scrap as a source of ammonia in their goods and it is well that it is so. A manufacturer who uses leather scrap can guarantee a given analysis and the chemist will bear him out in the guarantee by showing the fertilizer to contain that amount but the plant would be unable to assimilate any very large portion of the ammonia. As ammonia in leather scrap is sold considerably below the market of other ammoniates it is very easy to understand why a brand of fertilizer can be cheaper than another and yet have the same analysis. While an analysis is a good method of recognizing the value of a fertilizer the true value is the ability of the plant to utilize or assimilate it under climatic and soil conditions in which it is used. 10 per cent. ammonia from leather scrap would not give the grower of lettuce and cabbage one-half the service that 5 per cent. from nitrate of soda or dried blood would.

GUANO.

One of the first fertilizers used to any extent in this country in a commercial way was Peruvian guano which was imported from Peru. The first deposits that were discovered had been hundreds of years in accumulating and were thoroughly rotted, frequently analyzing as high as 12 per cent. ammonia. When this grade of guano was used on the garden the results were wonderful as the ammonia, owing to the long time the deposits had been there was in an available form. The demand for Peruvian guano soon exhausted the supply of the higher grade goods. It is now very seldom that we find guano analyzing 10 per cent. ammonia on the market. There are guanos offered that analyze from 2 to 8 per cent. ammonia, from 8 to 18 per cent. phosphoric acid and from 1 to 2 per cent. potash.

At different times we hear considerable about bat guano that has been discovered in caves on different islands. This guano when it is in caves that are perfectly dry is a very valuable article often analyzing as high as 17 per cent. ammonia, but there are very few caves of this kind, indeed nearly all of them, contain more or less moisture. When the guano becomes wet with lime water the chemical action is to free the ammonia, consequently it is of very little value. Those buying bat guano should only buy it on a guaranteed analysis as one ton may be worth $40 while another would be dear at $5.

VEGETABLE AMMONIATES.

COTTON SEED MEAL.

Among the most valuable of the vegetable ammoniates is cotton seed meal. This like other fertilizer products for years was a waste product but now is a source of much profit not only to the oil mills but to the farmers themselves. The process of making the cotton seed meal is a very simple one. The seeds are crushed and passed into a hot tank or receptacle and heated and from there it goes into a hydraulic press where the oil is pressed out and the cotton seed cake is the result. This cake is then ground and we have cotton seed meal.

The value of the meal depends on how much lint is ground in with the meal and also on the general condition of the seed when they were ground. Bright cotton seed meal will average 8 per cent. ammonia when properly made but the increased price of meal of all kinds has been a great temptation to the mill people to increase their tonnage by increasing the amount of hull or lint in the meal. This reduces the percentage of ammonia and where the meal should analyze 8 per cent. it frequently goes as low as 6 1-2 and 7 per cent. During the last few years the demand for meal has increased and the price advanced so the mills are not very particular about making 8 per cent. goods and are satisfied with 7 1-2 per cent.

The bright meal is made from the short staple cotton while the dark meal is made from the long staple and does not contain as much ammonia at any time as the bright meal owing to the hull being much harder and forming a larger proportion of the hull. The analysis of the dark meal is from 5 to 6 per cent. ammonia. The dark meal is as good as the bright for fertilizing purposes unit for unit.

CASTOR POMACE.

Castor Pomace is now very largely sold as an ammoniate and is made in a similar way to cotton seed meal, that is the castor beans are ground and the oil pressed out and the cake pulverized. The analysis of castor pomace varies from 5 1-2 to 6 1-2 per cent. ammonia with a small percentage of phosphoric acid and potash. It is considered a valuable source of plant food where crops are long feeders. This is especially the case in raising pineapples.

TOBACCO STEMS.

In former years tobacco stems were used more largely as a fertilizer than now. Formerly they could be purchased at $2.00 per ton in bulk at the stemeries and now their value is placed at from $16.00 to $20.00 according to the kind of tobacco. The nicotine extract has become so valuable that the manufacturers can afford to pay a much higher price for the stems than the farmer. They are considered a very good source of fertilizer where the price will warrant their use.

TOBACCO DUST.

In the manufacture of all kinds of tobacco there is more or less dust which heretofore has been thrown away but is now carefully saved and sold to the growers. Besides containing ammonia and potash it is also used as an insecticide and is considered of considerable value for that purpose. The ammonia, however, of the average tobacco dust does not exceed 4 per cent. and frequently is not over 1 1-2 to 2 per cent.

GROUND TOBACCO STEMS.

The sheep-dip manufacturers had an accumulation of soaked tobacco stems on their hands which were very hard to get rid of and learned men were put to work to devise a means by which the nicotine could be extracted and the remaining stem handled without loss to the company. This work resulted in the pulverized or ground tobacco stems that is now on the market which is very high in potash and contains a good percentage of ammonia. This was somewhat of a surprise to everyone as no one supposed that the tobacco stem could be so manipulated as to give an analysis of 3 per cent. ammonia and 10 per cent. potash, yet this is a fact and today hundreds of tons of ground tobacco stems are used and it is considered one of the best sources of ammonia and potash. It is easily applied and quickly available.

Besides the information gathered above we should take a lesson from what has been said, not only from a fertilizer view, but from an economical standpoint. There are only a few of the products mentioned above that are not byproducts. The great wealth of the fertilizer business is from byproducts or things we are now saving that were formerly thrown away. If one goes to the slaughter house he cannot help being impressed with the carefulness with which everything is saved even to the minutest piece of bone, drop of blood and even the hairs. Everything is preserved to add to the profits of the company. If our growers and farmers were as careful in preserving everything on the farm as the slaughter house people are to save and care for the waste products, they would be able to live closer at home and not have to ask the fertilizer men for credit for his yearly supply of fertilizers.

DISCUSSION.

Mr. Kilgore—I would like to know if there is not a commercial value on our muck beds on account of the ammonia there is in muck. It seems to me there should be plenty of by-products to render the investigation of this phase of the question profitable.

Mr. Painter—The problem has been looked into, but the trouble is that there is no main product that can be derived from the muck that would make the by-product profitable. There is about 3 per cent. ammonia in a ton of muck when it is thoroughly dried, but that ammonia is inert; almost as much so as in the leather.

We are getting sulphate of ammonia in a ton of coal varying from one to one and one-half per cent. I do not from coal. The amount of ammonia think we can ever get any ammonia from the muck except to use it on the farm and let the ammonia be freed by decomposition. Lime applied to the muck will hasten that decomposition.

Adjourned.

SOME PROBLEMS OF FERTILIZING.

By E. S. Hubbard.

Mr. President, Ladies and Gentlemen:

In presenting this individual report as a member of the standing committee on fertilizers I shall depart from the question of fertilizers as mixtures to their effects in fertilizing.

The A. B. C. of fertilizers is well understood by all intelligent horticulturists. The nature of the various materials, their percentages and the proportions necessary for complete or special fertilizers have been fairly well worked out in practice but our knowledge of the physiological effects and defects of their action on plant life is in its infancy and I wish to suggest a few of the problems that have occurred to me on which exact scientific knowledge would be of great value.

The primary elements of plant growth are nitric and phosphoric acids. Nitric acid to nourish and stimulate the life principle and phosphoric acid to act as a clarifying and transferring medium in the interconversion of carbon dioxide into fluid gums and sugars to the fixed forms of starches and cellular tissue.

These acids, however, are corrosive and unstable. They can only be assimilated as acids in a high state of dilution in small quantities. They must be neutralized by combination with alkaline bases when they are gradually dissolved or absorbed by the plant rootlets.

They are most healthfully assimilated as nitrate of potash and phosphate of lime. This is the ideal condition of plant fertilization. The other salts found in plants are either accidental or of small tonic value. Unfortunately, however, our soil conditions are hardly ever ideal and we have to use many commercial materials that must undergo chemical changes either by bacterial nitrification in the case of ammoniacal compounds or of decay and disintegration in the case of phosphates before they can be most healthfully assimilated by plants and there are several commercial chemical salts one element of which is unnecessary or detrimental.

In a state of nature the equation of plant nutrition is self-regulating. Given a soil with sufficient mineral bases, moisture and drainage, all the plant waste and decay remains as humus to hold the nitrogen and other food elements and the soil increases in fertility till limitations of room, light and air define the amount of vegetation that can flourish.

In agriculture and horticulture all this is changed. Plants chiefly foreign to the soil and climate are grown and the marketable products are removed, thus carrying away the stored-up fertility of the soil, while the remaining fertility is often still further dissipated in the air and drainage by improper exposure and culture.

Here man, to continue growing crops, steps in with artificial fertilizers composed largely of unassimilable, unnecessary and even detrimental materials and often applies them far in excess of the plant's needs or requirements.

The commercial results are then measured by the endurance or tolerance of the plants.

I consider this the great unwritten

chapter of the agricultural chemistry of the future, for which only scattered and unharmonized data have been gathered, the tolerance of plants for unsuitable fertilizers.

To illustrate: Some twenty-five years ago when I first began orange culture on my own account, when the spring growth was pretty well matured, some time in April, I dumped about four quarts of brine from a mackerel kit near the trunk of an orange tree that could carry a box of oranges, as an experiment, to see what effect it would have as a fertilizer.

In a week's time all the leaves had dropped from that tree and most of the new growth was dying. It was two months before the tree had got back half its foliage again and the effect was as bad as a severe freeze. This was a most striking example of the tolerance of an orange tree for chlorine and soda. I say chlorine and soda because it is a well known chemical fact that there are points of saturation in common salt solutions in which the chlorine and soda are in very loose combination and there might be some separation in the sap of a tree.

Some people have an idea that plant rootlets have considerable power of selection of the solutions with which they come in contact and take only what they need or is beneficial. This experiment convinced me plants have to take whatever is offered them in the soil water and that plants with green foliage or in a growing condition are continually susceptible to sap poisoning.

In the case of the orange tree and the brine it is evident that as the brine ascended in the sap to the leaves and was evaporated from them a point of saturation or crystalization was reached that killed the life principles of the sap and the leaves dropped off.

In this most simple case a chemical analysis of the leaves for salt and a computation of the total foliage on the tree would have determined the extreme tolerance of a tree of that size for chloride of sodium. After the leaves were all fallen there still remained the salt solution in the twigs, branches, trunk and roots. As the fresh growth of twigs had an evaporation function partly as great as the leaves the solution was strong enough to kill most of them also.

The solution in the branches, trunk and roots being weakest of all had probably to be mostly excreted by the roots and the solution in the soil leached out at one-half the cost of imported nitrate by rains before the tree could grow again. This brings us to the root excretions of plants.

Root excretions of plants have long been recognized but so far as I know no exhaustive experiments have been conducted to determine their character and effects. It is well known that many crops cannot be grown successively on the same ground without losing so much vigor as to be unprofitable or suffering from disease.

In my opinion the study of diseases has drawn attention away from the specific salts and humic acids these plants may leave in the soil that are poisonous to succeeding crops of the same variety.

There is also, of course, the natural acidity of some soils that is detrimental to many crops unless corrected with lime and it may be lime would be a good application for root excretions. Lime has succeeded in some cases where tomatoes grown successively have been affected with blight. Tomatoes will not do well on very acid soils and lime is not a cure for blight. An acid soil is not very detrimental to Irish potatoes, and stable manure or lime favors scab, of Irish potatoes in Florida grown successive winters seems to fall off even with intermediate summer crops.

There are a great many questions in plant nutrition that ought to be settled and as to which we can only conjecture.

Rev. Lyman Phelps discovered that an excess application of sulphate of ammonia in summer or a spray of bi-sulphate of soda prematurely sweetened oranges. Winogradsky of Zurich, the discoverer of nitrifying bacteria, found that liquid grown plants would healthfully assimilate considerable sulphate of ammonia. The ammonia of sulphate of ammonia takes the place of an alkaline salt like lime or potash combining with the sulphuric acid.

What becomes of the sulphur? When sulphate of ammonia solution is absorbed by orange trees? Small percentages of sulphur are found in the nitrogenous protoplasm of the sap of the plants.

Reasoning from analogy, is it not probable enough sulphuric is freed to have a similar effect in sweetening oranges to sulphuric acid in the manufacture of glucose or grape sugar from starch?

There must be considerable sulphuric acid excreted by the roots. Is a small yearly application of lime to orange trees indicated to neutralize the unstable sulphur acid compounds if they exist?

I found premature sweetening of oranges with sulphate of ammonia depressing to the trees.

Nitrate of Soda.—In an Irish potato fertilizer experiment years ago on the plot using nitrate of soda alone, the foliage had a sickly, gray color and the tubers a soapy taste. A recent German experiment shows that grains and grass largely absorb the soda of nitrate of soda, but Irish potatoes, beets, etc., excrete it from the roots, leaving soda in the soil.

Organic Nitrogen.—The albumens of organic nitrogen compounds in decay split up into poisons similar in chemical composition to strychnine and morphine and decompose still further to ammonia. The soil must not be too acid and nitrifying bacteria must be present under favorable conditions of tillage, moisture and alkaline bases to secure nitrification. Who has not had plant roots burned by organic ammonia?

Die-back and foot-rot of the orange tree are often traced to the use of organic nitrogen and there is no doubt in my mind that the trees absorb so much of these decomposition poisons that the sap is wholly or partially paralyzed, the sugar, starch and wood forming functions deranged and similar symptoms exhibited to animal blood poisoning.

Phosphoric Acid.—Experiments have shown that a small percentage of the phosphoric acid needed by plants can be absorbed in its water soluble state. A full ration of soluble phosphoric acid in pineapple culture on the East Coast spruce pine ridges is corrosive and poisonous. There is little lime or humus in these soils to revert or hold the acid for root acid action. On the other hand, I consider the partial sterility of bog ore iron hard pan soils due next after their acidity to the immediate iron basis reversion of the soluble phosphoric acid of fertilizers, so that quick-growing plants cannot get phosphoric acid fast enough to harden and perfect their growth.

Potash.—Potash, besides forming a

base for nitric acid before entering the plant also forms a base for the plant's organic acids after being separated by the sap from the nitric acid and is carried along till it finally forms part of the plant's tissues. Impure nitrate of potash can be bought as fertilizer, but the supply is limited. It leaches so rapidly as to be desirable only for fractional applications.

Nitrate of potash can be formed by mixing heated solutions of nitrate of soda and muriate of potash and recrystallizing the resulting nitrate of potash and chloride of sodium. It would be a boon to horticulture if this could be done with little increase in cost. We need information as to the effects of the sulphuric acid and chlorine of sulphate and muriate of potash both before and after nitrification.

The cheap nitrate of the future promises to be the electrolytic nitrate of lime. It is said a 20,000 horse water power will soon be used for this purpose in Sweden, and that nitrate of lime can be produced of soda. Experiments on the efficiency of these new lime nitrogens are being conducted in Germany with results averaging about the same as nitrate of soda and sulphate of ammonia. There is no doubt moderate quantities of nitrate of lime can be healthfully appropriated by most plants and that its use will open up new problems in plant nutrition.

In this paper I have touched on only a few of the more prominent problems of fertilizing but enough I trust to stimulate thought on this subject. There is no doubt in my mind that we are entering an era of soil and fertilizer specialization in plant growing that in thoroughness will compare favorably with the intricate manufacturing processes of the industrial arts.

By B. M. Hampton.

Mr. President, Ladies and Gentlemen:

For some reason unknown to me I have been asked to contribute a paper on "Fertilizers" to be read before this meeting. Now, I can assure you I would very much rather have sat still and listened to the other fellow, and let him have written this up. You have, or a good many have, had a trial at this fertilizer business; and while it is something that is vital to every farmer, truck grower, and especially so to those who make a specialty of Citrus culture that I am loath to attempt to write on a subject that is of such vast importance to one and all.

But, after all, perhaps I am not expected to tell what I know, or rather what I might think I know about fertilizing, and was perhaps expected to write about what I didn't know; but that would be a still greater task, so I will strike a happy medium between what I don't know and what is just possible I might know, and what those have known before me.

There is one point I think you will all agree with me on, and that is, it is one of the most vital questions of the day, and one that after all the centuries that have rolled away since man became a tiller of the soil, the least understood; still we are gaining ground a little, a ray of light here and one there, in time it will become of much more of an exact science than it is today. It seems strange when we come to think of it that so little was known by the first settlers of this country of the importance of fertilizer, even of the three main ingredients, Nitrogen, Phosphoric Acid and Potash; these three ingredients did not seem to be understood at all by our Pilgrim Fathers when they first landed on the rather bleak shores of the New England coast. It must have humbled their pride and lowered their self-conceit when they had to turn to the Savages, as they termed them, for assistance to keep from starving; for it seems that a friendly Indian came to their aid and showed them how, not only to prepare the ground, but to fertilize it as well. So here was the beginning of "How to Fertilize," so far as the people of this great nation are concerned. The advice as to how to prepare the ground was crude and the fertilizing was then meager; but meager as it was then, it was in advance of what the colonists themselves knew; at least, they had not been able to raise corn, the great staff of life, even more so then than now. So they were compelled to turn to the aborigines and learn of them, so when one Squanto, an Indian well versed in the mode of corn culture, came to their aid and gave them a practical lesson of the land to choose, and how to prepare it, then how to use the fertilizer so as to produce corn as well as stalk. This may be said to have been the first practical Farmers' Institute ever held in America, and it seems odd to think that it was the Indian teaching the white man the art of successfully raising corn on the New England coast. Even at that day the fertilizing question was of great importance as it is today, for without the fertilizer the corn was so slow of growth that it failed to mature in their short season.

It was much in knowing what kind of soil and where to locate it and how to prepare the land, crude though it was, yet it was vital to the colonists to learn even this much, and even more so to learn how to fertilize it; so you see the fertilizer question was a vital one then, as it is today. The clearing of the land and burning of the brush on the ground was part of the fertilizing, but this did not seem to be thoroughly understood even by the teacher of the "Institute;" yet he did know it was necessary that the brush should be burned on the ground intended for corn, but the wherefore neither he nor his pale-faced pupils understood that it was the Potash and the Phosphoric Acid in the ashes of the hard wood burned on the ground that caused the grain to mature; but he did know it was needful to burn the brush, and in this he was ahead of the Pilgrims.

Then, again, he knew that fish was a good fertilizer for the corn, and while he did not understand, as we do today, that it was the nitrogen they contained that was needed to give the grain a more rapid growth, he did know and so taught, that "no fish, no corn." This latter assumption on his part, it seems, was resented by the settlers at first, but after failing they were glad to take the advice from this first Institute and Experiment Station Instructor. So Squanto taught them to fertilize the hill for the corn with a couple of fish, first placing the fish in the soil, then covering it with dirt, then to drop the corn and cover with the fine soil, then to firm the soil with the foot and the operation was completed, and in due time the harvest, and thus ended the first Institute.

And so the colonists thus had learned all there was to be learned in the art of fertilizing and growing corn; but once more they had to go to the Experiment

Station to ask for further information as to the cause of their once prolific fields failing to bring forth their usual yield of the precious grain; and once more Squanto came to their rescue and proved equal to the occasion after hearing their story. He held another Practical Institute, showing them that though they put an extra quantity of fish in the hill for the corn, and though they still had fine stalks but no corn, that the land was worn out as we say today, and they must clear new land, burn the brush as before, drop their fish and corn as before and all would be well. This they seemed loath to believe, but they had but one experiment station to go to to get information that was so vital to their very existence, and so they started anew as before, and—lo!—Squanto was right, as at first, just as our Experiment Station should be today. It must have been humiliating in the extreme to the Pilgrims to get their information from such a source, but they must learn or starve.

But time rolled on and the Pilgrims taught their instructor; for they noticed that the corn was always the best where there had been the most ashes left on the ground near some large brush-heap; this gave them an idea perhaps, after all, it was just the ashes, as they had learned from the Indians that a field worn out would be as good as new after it had been allowed to grow up again with a young growth of timber, this in turn cut down and burned as before, and presto! the land yielded crops as before, with the aid of the fish to supply the nitrogen. When they first noticed the fact that the corn was the best near where an extra large brush-heap had been burned, that was a step forward in the art of fertilizing; the next step was to save the ashes from their log piles and from chimney corners, and in the following spring these ashes were applied to their worn-out land and the usual amount of fish to each hill, when—lo!—a better crop of corn than they had grown at the start was produced on this worn-out field by applying Nitrogen in the form of fish, Phosphoric Acid and Potash in the form of hard-wood ashes, and thus a long step in advance in fertilizing had been made. But neither the colonists nor the Indians knew the why or wherefore; they knew such was the fact and so were content. So for a long period but little advance was made in the art of fertilizing as a science, that is, in furnishing the crops with the commercial fertilizer as we know it today. But some fifty years ago or so an awakening seemed to take place, then came Guano, Bone Meal, and such like, more into general use. I remember quite well when both were introduced in my immediate neighborhood in Pennsylvania. Lime and Plaster had long been used in a haphazard way; I don't think any of the farmers of those days had little, if any, idea why they used Lime, Guano, Fish-scrap, Bone Meal, etc.

They knew, like Squanto, that such and such things gave certain results, and I think that was about all there was to it; but the use of these various ingredients showed they were feeling their way, slowly but surely, so that in the last twenty-five years there has been a tremendous awakening, until today the art of fertilizing is becoming more of a science, not an exact one by any means, but far in advance of what it was a few years ago. But we have much to learn, we are just in the A. B. C.'s as yet so to speak, and it is of this uncertainty that I hesitated to produce this paper before this assembly of progressive farmers and fruit growers today.

Had I been called on twelve or fifteen years ago to write this article, I would have given vastly more information on the art of fertilizing than I can today, at least I thought so. If you want to know just how to fertilize an orange grove for any purpose under the sun, always go to some novice, some one that has not been in the business more than five or six years, and you can generally find out just what you have been striving for all these years to learn; rank ignorance on your part. But in a few years go to this same person and broach the subject, and he is mute as a clam. Squanto and the Pilgrim Fathers would be outclassed by him for a lack of exact information, and yet he is learning.

I very much doubt if we could find half a dozen in this house who could agree as to the exact way to treat a grove for the best results; some would stand out for a clean culture the year round, and others seem to think to get best results from your grove and from the commercial fertilizer applied there is nothing like Humus. Humus is a term we understand for all decaying vegetable matter in the soil; to my way of reasoning it is the storehouse of Nitrogen, one of the most expensive and most necessary of all plant foods. It contains the food upon which the soil organisms live, whose function is to convert organic nitrogen into nitrates in order to be available for the use of plants. It even assists in decomposing the mineral constituents of the soil, thus making them available for plant food. It serves to increase the drouth-resisting power of sandy soils; it also conserves the fertilizer we apply to the soil and holds them within reach of plant life to feed in; so I can't help but think that Humus is especially needful to our high pine lands. You all know the history of the grove of Dudley W. Adams, how he took an old worn-out farm and by the use of all kinds of vegetable matter changed the soil from a barren waste to one of the most prolific tracts of land in that vicinity.

Of course, he added Phosphoric Acid and Potash. Of the many ingredients that enter into plant life, from carbon to iron, none of them are so vital to the average fruit grower as Nitrogen, Phosphoric Acid and Potash. I wish our experiment stations would go to work and analyze a box of oranges, for instance grown on the average sandy soil in Florida, and let us know in plain English just how many pounds of Nitrogen, Phosphoric Acid and Potash that box contains; give it to us in plain figures in the pounds and ounces, so those not versed in chemistry may understand at a glance just what that box contains. Don't carry out the analysis in the hundredths and thousandths of parts, but just say a box contains so many pounds or so many ounces of each ingredient, without any technicalities attached to it at all; then send this broadcast over the state, and a long step will be made in the art of citrus culture. I well remember when I was in the West, engaged more or less in the mining business. I used to analyze the different samples of rock for myself and others. Now, it would have been useless for me to have given an analysis as a rule of a sample of rock in the technical terms that I used in the office.

What they wanted to know and paid for was to find out just how much of the valuable minerals the rock contained, and wanted that in dollars and cents, or in pounds and ounces, as the case might be. I very much doubt if I could make out one of my own certificates today as I took them down in my book at the time. So now let the Experiment Station give us one, two or three analyses of a box of citrus fruit from different sections of the state, grown on different soils and, as I said, give it to us in plain English; just say right out: box No. 1, for instance, contains so many pounds and ounces of each of the ingredients, then we will know what we are doing.

We will know for every box of oranges we expect to get from a tree we must apply to the soil so much Nitrogen, Phosphoric Acid and so much Potash. Of course, we must give the soil enough to supply not only the fruit, but the natural growth of the tree as well. After we have learned just how much to apply, we can soon find out when to apply it. I used to think I knew just what to apply to make my fruit small or large, sweet or sour, or to make it bright or otherwise. I am not so sure now, so we will pass that by.

Again, as to the time when to apply, if the season is normal I prefer November for the fall application, and of late I have been using a fertilizer heavy in Phosphoric Acid and Potash, with a low per cent. in Ammonia; in the fall this has given me quite satisfactory results. But so many questions spring up that I am loath to set any cast-iron rule. But if I were going to apply it myself, little and often, first when the tree seemed to need it; but if I were going to hire it done, and only give one application, then I should give it in November. For one application, I think, this would give the best satisfaction.

Here in South Florida, if you apply the fertilizer much earlier and weather continues warm, the trees are likely to start to grow and in the end cause an injury. Farther north it might be applied earlier, but as I said before, there are so many sides to this question that it is hard to give any iron-bound rule that will apply to every section or locality. The seasons often are so different that what would suit one year might not the next; then again there is so much we don't know for sure, as intimated at first; we are just in the a b c department as to fertilizers and fertilizing. But I must draw this, to me, interesting subject to a close, and yet I have just begun. But the time is precious. You notice I have departed somewhat from the beaten track usually followed on this subject and gone out into the by-ways, so to speak, thinking a little variety might not be amiss to one and all.

I am like the Pilgrim Fathers, still seeking light on this most vital question up before the American farmer and fruit grower of today.

So, thanking you for your kind attention, I am sincerely yours, seeking for more exact knowledge on this subject.

By Mrs. Nettie M. G. Prange.

Mr. President, Ladies and Gentlemen:

I am assured it is the wish of the Society to have a plain talk on fertilizer and its value, by a beginner, to those even newer to the work, so I will make no excuses, but gladly relate my humble experience.

When I decided to make a grove I wrote to several prominent orange growers to ascertain which was, in their opinion, the best nursery in the state. In the spring I engaged the best trees in that nursery, to be delivered the next fall. My land lay beside a flourishing grove, so I thought, after securing my trees properly, I had settled all vexing questions, for, *of course,* all good groves were made with "Smith's" fertilizer.

A valued correspondent wrote: "Though 'Smith's' fertilizer is good, he asks more per unit of plant food than 'Brown' does." About all I understood of this sentence was that there might be a chance to save some money; and you know that idea appeals to any of us. *But,* was "Brown's" fertilizer as good? I felt the need of being able to judge for myself. My first step was to take prices from a list of agricultural chemicals, and get cost of contents in the two formulae under discussion. I struck all the averages, finding price per pound of each ingredient, and worked it all out in regular schoolma'am fashion. The figures showed my correspondent to be right, but for further information I submitted the work to a person experienced in that line. I do not begrudge his quiet smile, for he wrote me the kindest of letters, telling me the easy way to reckon fertilizer values, and many other things of interest and importance. Neither do I begrudge the work I did. Try it yourselves and you will see it is just what one needs to make him realize that fertilizer is not *just fertilizer!*

When one sees it is a combination of plant foods, mixed in stated proportions; that three of these nutrients, ammonia, phosphoric acid, and potash, have a market value, and *only* these three; and that the name of Smith, Brown or Jones has nothing to do with it beyond his reliability as to work and materials, and that, as we shall see later on, we do not have to trust him very far even in this—one next wonders which of the numerous formulae presented is best suited to his purpose. This calls for a knowledge of the effects of the different plant foods.

There are many good books on this subject for sale, but I will speak only of those to be had for the asking, though I am to append a list of the others I have found useful.

Send to German Kali Works, 93 Nassau Street, New York, for their "Orange Culture," and then for the other dainty booklets listed in it. Peruse carefully the pamphlets from all the fertilizer firms. There is something to be learned in every one. To be sure, one must always bear in mind, the firms issue these books to sell their goods, and while all presented may be facts, yet each emphasizes that fact which is to its own interest; also remember, no law controls these statements, and if a company wants to misrepresent its goods in the pamphlets, it can do so. It is the *tag on the fertilizer* that has to tell the truth.

Write to the Secretary of Agriculture, Washington, D. C., for a list of Farmers' Bulletins, and ask to have your name put on the monthly mailing list. Also to the Experiment Station, Gainesville, Fla., for a list of the publications issued from there, and to the Commissioner of Agriculture, Tallahassee, Fla., for the Quarterly Bulletins sent out from that office. I secured a copy of every available bulletin, circular and press notice, pertaining to this subject and have learned from each one.

From our State Bulletins, Nos. 22 and 43, both by A. A. Persons, we gain a very good knowledge of plant food, its sources and effect on different soils. But they were written years ago and the proportions given were based on chemical analyses of the soil and the crop desired; so it was a pleasure to find in United States Farmers' Bulletin, No. 238, by our Prof. Rolfs, statements of the effect the different foods have on trees and fruit, and other necessary knowledge. In fact, it is a description of the citrus industry in a nut shell. While in Farmers' Institute Bulletin No. 2, which will be sent from our Experiment Station on receipt of postage, I marked on page 23, in the interesting address of Chemist Rose, his statement of the need of—

> "Nitrogen to produce foliage, succulent leaves, * * * and immature wood.
>
> "Phosphoric acid * * * to produce mature wood in fruit trees.
>
> "Potash to assist in formation of starch and sugar * * *"

Later I learned farther that while nitrogen is most essential, it has to be used with the greatest of care, for too luxuriant a growth means weakened tissues, and weakened tissues are prey to insects and diseases, organic nitrogen being especially likely to produce bad effects on the citrus family.

Too much phosphoric acid may bring about abnormal conditions, such as profuse bloom, or an over-supply of seeds, and thus be detrimental to the general health of the tree; while too much potash may retard growth somewhat by hardening the fibers too soon; but the worst effect of an excess of either phosphoric acid or potash is on the pocketbook. When we pay for more than we need we are out just so much money.

The discourses by Brother Painter in Farmers' Institute Bulletin No. 1, and by Brother Wilson in our Annual Report 1906, are instructive; especially the latter. Study carefully United States Farmers' Bulletin No. 44 by Dr. Voorhees. It is a thorough discussion of comcial fertilizers. I could name many more free helps, but time is passing. Without cost one can lay a good foundation upon which to build the *real* knowledge which comes only by *experience*.

When needing help on any point, write to our advanced brothers. They show unfailing patience and kindness in helping the weaker ones. Up to the point I have taken the study of plant foods in this talk, all authorities are practically agreed. Beyond, there is a great diversity of opinions of those seemingly equally well-posted, as to proper formulae and methods of cultivation. It seems to me that this is caused by different situations, and that we must each adapt the general principles to his own need.

But we *all* have to *pay* for our fertilizer. Now we come to this:

How are we to know we get what we order, and which formula gives us best value for our money?

The state protects us in this if we avail ourselves of the privileges given. Our worthy Commissioner of Agriculture at Tallahassee will send you copies of the fertilizer law and bulletins containing just what we are looking for. The law allows us to have the fertilizer analyzed free of cost, so we need never be in doubt of what is sent us; but read instructions carefully and send samples for analysis *just* as they direct. Florida is the only state in the Union that gives this chance for free analysis. The out-of-state fertilizer companies have striven hard to have the Legislature strike out this clause. We, as horticulturists, ought to see that the law remains as it is. The inspection costs us an exceedingly small amount. I say "costs *us*," for since the fertilizer companies add the inspection fees to their expense accounts, we, who use the fertilizer, pay the bills, so *why* should a company object *unless* it wants to *hide the true content* of its product? The honest manufacturer is protected as well as the consumer.

If the statements on the *tag* are proven untrue there is trouble ahead. *Study* the *tag* and believe exactly what *it* says. Don't think "animal matter" on the tag *has* to mean what is described in the pamphlet. It means "animal matter" and probably the cheapest animal matter obtainable, or the description would be more explicit. *Study the tag* for all these points and doubt any obscurity; for trade does not "hide its light under a bushel."

Well, if the materials are all right, let us see about the formula. It reads: Moisture, 8 to 10 per cent. "Ah ha!" says our neighbor, "Jones' fertilizer has only 5 to 8 per cent moisture. You must like to buy water!"

We tell him with a superior air that one pays only for actual plant food when he buys fertilizer; and never "let on" that a few weeks ago we made the very same mistake ourselves. Next comes: "Ammonia, 4 to 5 per cent." and we remember that ammonia is sort of an inflated nitrogen. Sounds like they give us more for our money, when they call it "Ammonia." "Available Phosphoric Acid, 6 to 7 per cent." That's the phosphoric acid we get. "Insoluble Phosphoric Acid, 1 to 2 per cent." That's the phosphoric acid, we don't know sure whether we get or not. "Potash, Actual K^2O, 5 to 6 per cent. H'm, this has it all in "Potash, Actual K^2O." Another calls it "Potash Actual," and another "Potash K^2O;" but we have found out it's all the same.

Those scientific fellows would have a good laugh could they look into our minds and read our "translation" of the formula; but so long as we understand the meaning, our crude expression does not matter.

Now, let us see what this ton of fertilizer is worth. We have learned to use the smallest per cent. given; 4 to 5 per cent doesn't guarantee a bit better content than a plain 4 per cent., so our formula is:

Ammonia	4 per cent.
Available Phosphoric Acid ..	6 per cent.
Insoluble	1 per cent.
Potash	5 per cent.

Perhaps we "hate to figure," but any of us can turn to the State Chemist's work and read: *"A unit is 20 lbs. or 1 per cent. in a ton,"* and find prices he gives per unit.

Ammonia	$3.30 per unit
Available Phosphoric Acid	1.00 per unit
Insoluble	.20 per unit
Potash	1.10 per unit

Therefore:

4 units of Ammonia are worth...	$13.20
6 units Available Phosphoric Acid	6.00
1 unit Insoluble	.20
5 units Potash	5.50

The least plant food that can be in this ton of fertilizer, legally, is worth at sea board Jacksonville, $24.90; and we take this value in comparing with other formulae. But when comparing with the catalogue price, we must remember the analysis runs above the lowest figure, really, and every ounce of plant food has cost the manufacturer and is worth money to us. Then there are the handling, storage, mixing and bagging, the inspection fees, the general ups and downs in trade, and so forth. Don't for a minute think the manufacturer can sell the fertilizer at this price, still he must not ask too much, for now we know when he claims too big a profit and save many a dollar by that knowledge.

But the financial saving is the lesser gain from our study, after all; for as one learns he looks more and more to the how's and why's, and his whole life is broadened by the study of Nature's wondrous ways.

List of Books.

Voorhees' "Fertilizers"—McMillan Co., N. Y.

Snyder's "Soils and Fertilizers"—Chemical Pub. Co., Easton, Pa.

Hume's "Citrus Fruits and Their Culture"—Prof. H. H. Hume, Glen St. Mary, Fla.

Clarke and Dennis' "Elementary Chemistry"—American Book Co., Atlanta, Ga.

White's "Outline of Chemical Theory"—American Book Co., Atlanta, Ga.

Gray's "How Plants Grow"—American Book Co., Atlanta, Ga.

Gray's "Lessons in Botany"—American Book Company, Atlanta, Ga.

DISCUSSION.

Mr. Skinner—I notice this lady made a statement in her paper that potash stopped growth.

Mrs. Prange—I do not claim to know anything by experience. What I have presented here is gathered from authorities and experts on the subject.

Mr. Skinner—I might give you a little experience I had in the potash line. It was the first lemon crop I grew. I thought I would mature that lemon crop early and get it on the market in nice shape; so I gave it a dose of high-grade sulphate of potash. Well, my neighbors gathered and shipped their lemons, and while my lemons looked nice, they kept on growing, and they grew, and they grew, and they grew, and they grew. I was not able to market them until the first of December, but I got a good price for them. My experience has been to show that too much potash makes late ripening fruit.

Mr. McCarty—In pineapple culture, in the summer application of fertilizer we do not use much potash, but in the fall application we use a higher percentage of potash. We find that the more potash we use, the closer the texture of the fruit and the better are the carrying qualities. It is said that it hardens the pineapple, but I don't know.

Mr. Griffing—The peach also carries much better. We know that an excess of potash for peaches will retard the ripening. This we know by sad experience, as when we used too much of it we came in a week or ten days later than some of the orchards adjoining us. But potash does materially aid in the carrying quality of the fruit.

Mr. Hart—My experience with oranges in the free use of potash is that it has a tendency to prevent softening of the fruit.

Mr. Longley—My experience in using potash was in the fall. I fertilized in the fall and didn't think there was enough potash, so I sent to Brother Painter and got a carload. The next summer we got the finest crop of lemons I ever saw. They were big and fine looking, and brought a good price in the market. I think a good deal of it was due to putting it on in the fall. I also put on an extra amount.

Mr.——In the spring, my trees set a good crop of fruit, and I gave them a good application of potash. As the result, I lost nearly the whole crop of fruit. A friend of mine said he had the same experience. It was just about this time of year that I put the potash on; perhaps a little earlier.

Mr. Hart—Was it a dry year? Perhaps that was the cause of your losing the crop instead of too much potash.

Mr.——No, it was not a particularly dry year. I saw no reason except too much potash. The season was an average season.

Mr. Jones—One fall we had drops to the tune of 500 boxes. They began to drop in September. Somebody told me what the ground needed was potash, so I got five tons of high-grade potash and put it on the grove, which was about nine acres, and the next year I could not get a box of drops. They were fine oranges; clear and smooth and fine.

Mr.——Did you put on in the fall?

Mr. Jones—No, it was put on in June.

Mr. Griffing—I understood the lady to say that potash had a tendency to harden the wood fibre. Now, take it in the growth of nursery trees. In the early season we use fertilizer more largely composed of nitrogen, and in the fall we increase the potash very materially, running up to eight and nine per cent. We find the trees will carry better and stand more cold than trees that have been given more nitrogenous matter. In the fall we leave out one per cent. of the ammonia and increase the potash three or four per cent.

For the orange nursery trees, we fertilize them in the early part of the season, then give them about two more applications during the season; in all, about three or four times a year, increasing the potash every time. We fertilize the peach seedlings as soon as they are about four or five inches in height, giving a strong potash fertilizer in the fall, and it undoubtedly hardens the wood fibre.

Mr. Skinner—Why do the formulae run so high in phosphoric acid for young trees? All the formulae run very high.

Mr. Rose—I can only surmise that it is a business proposition. The phosphates are the cheapest source of plant food that we have, particularly in Florida, and it is the predominating material in all fertilizers, and is used as a filler. It is the basis of fertilizers.

Mr.——It seems to me there have been many conflicting statements made. Now, suppose I fertilize this year's crop; does this year's crop or next year's crop get the benefit of it?

Mr. Hubbard—You fertilize both crops. That is, if the application is put on before the fruit has matured. The fruit keeps on growing and maturing and the sap takes up the food elements and carries them to the fruit already on the tree. If you use a well-balanced fertilizer, you fertilize the present crop and also put in the foundation for the next year's crop.

There has been a good deal of experimenting done since we have begun using commercial fertilizers, both as to discovering what constituents a complete fertilizer should have, and with the different elements used separately. It is generally agreed that the office of phosphoric acid in the sap is to assist in the transference of sugar and starch to build up plant tissues. I believe the general experience in using potash alone after midsummer or early in the fall after the trees have stopped growing, is to increase the acidity and retard the ripening of the fruit. Liebig, the father of agricultural chemistry, stated in substance that after the alkaline salts had served as bases for nitrates, they were used by the plant as bases for the organic acids that are transferred into the starches which build up the plant. Potash without nitrogen misses its first office in plant growth.

Mrs. Prange—As I understand it, it is better to start the growth with the ammonia and harden it with the potash. My father's grove was afflicted with die-back until he used more potash.

Mr. Rose—In the last few years we have gradually increased the potash until now we are using ten per cent. in many instances. The method of applying is the question. It depends very much upon the condition of the tree, the location of the grove, etc. No two are alike any more than two cases of illness present the same aspect to a physician. Now, we have fought this out at session after session ever since I have been a member, and we will never agree upon a general proposition. If a specific case were given where the condition of the tree, the season, the former treatment of the tree, its present growth, and everything known about that tree, it might be possible to tell just exactly what that tree needs, and when and how to be applied. The general supposition, as our Professor Hubbard has said, is that potash is a vehicle for the transference of sugar and starch from the root to the foliage and tree.

Mr. Longley—I have been fertilizing my trees in November, usually, for the next year, and have met with very good success. My trees bear a good crop right along. This year I fertilized in October, for the reason that help is very scarce and I had get my trees plowed before the orange packing began.

As Mr. Hubbard says, he thinks it retards the growth to put on too much potash. I think it retards the ripening of the fruit.

Mr. Reaves—I fertilized with potash after the fruit had set, the blooms had shed and you could see little oranges.

The prices were good and we thought it would be a good thing for us to get some oranges in to market right away. So we put on a good application, and lost the fruit.

Mr. Painter—That experience has been had by a good many, not only with potash. Some time ago, a man wrote me that his trees had just put out a fine bloom and wanted to make an unusually fine crop of fruit. He ordered an extra amount of fertilizer, applied it, harrowed and worked it in, and the result in due course of time was that the young fruit dropped. You can do that without the fertilizer if you happen to have a good rain about the time you do the cultivating. It is the stimulating effect given to the tree that causes the dropping. My experience has been that the orange trees ought to be left severely alone during the setting period.

Mr.——How long do you consider the setting period?

Mr. Painter—Until the orange reaches the size of a good-sized marble. Of course, up to that time there will be a good deal of fruit dropping on account of being imperfect.

Mr.——Will the cultivation of trees alone, without fertilizer, cause the fruit and foliage to drop?

Mr. Painter—I have known of cases of that kind.

Prof. Rolfs—I congratulate the author of the paper, which has brought on more discussion than any other we have had.

Controlling Capilliary Moisture.

By A. W. Blair,

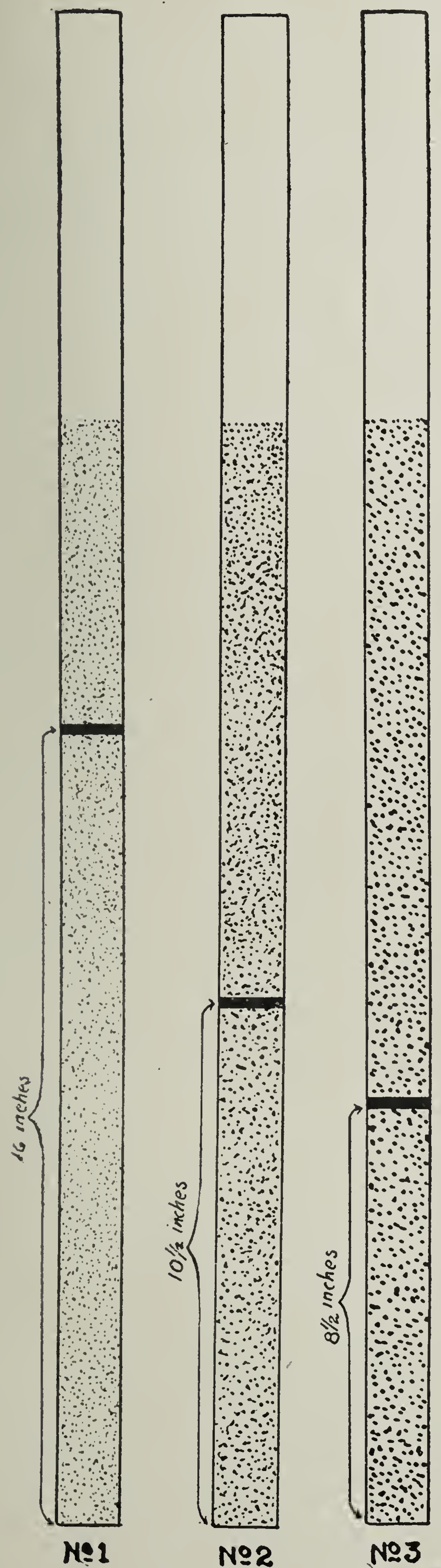
Mr. President, Ladies and Gentlemen:

When rain falls upon fields and groves a part of it runs off to the lower places, and a part sinks into the soil and permeates it. The amount which runs off is determined by the condition of the surface and the rapidity of the rain. If the surface is hard and compact and also somewhat sloping, much of the water will run off. If the surface soil is loose and mellow, and contains much organic matter, it will absorb much of the water that falls on it. When the rains are heavy and continue for some time, a part of this absorbed water will continue its course downward until it reaches the water-table or ground-water.

Another part remains distributed in the soil, and it is this part that is thus held in the soil against the force of gravity that we call capillary water. As the surface of the ground dries out, some of the water that has filtered through to the water-table may be drawn up into the soil again and become capillary water. This may be illustrated as follows: Close one end of a glass tube by tying over it a piece of muslin, then partly fill the tube with soil, and pour on water; the entire mass of soil becomes saturated and a part of the water runs through, provided a sufficient quantity has been added. If now the soil in the tube is allowed to dry for a few days, and then the end over which the muslin was tied is dipped into a basin of water, the water will slowly rise in the tube, being lifted up by capillary attraction against the force of gravity. The water in the basin may be compared to the ground-water in the soil; though the cases are not strictly parallel, since under natural field conditions the soil is constantly in contact with the ground-water. The principle however is the same. It is from this capillary water, for the most part, that trees and plants obtain the water necessary for their growth. We can readily see then the importance of knowing how best to control this source of water supply. The principle on which the water, known as capillary water, rises in the soil, is a well-known law of physics. When small glass tubes of different internal diameters are placed in water, the water will rise highest in the smallest tube. That is, the height to which the water rises is inversely proportional to the diameter of the tube. A knowledge of this law helps us in the study of the movements of soil moisture. The small spaces between the soil particles or grains, may be likened to fine tubes; though in this case the tubes are neither straight nor of uniform bore. By capillary attraction water is drawn up through the pore spaces or fine tubes, to take the place of that which is lost by surface evaporation or used by plants and trees.

The size of these tubes will be determined by the size of the particles or grains that make up the soil; that is, if the soil is composed largely of coarse particles, the capillary tubes will be

DIAGRAM I---Showing Height to Which Water is Raised in Different Soils by Capillary Attraction.



NO. 1.—HILLSBORO COUNTY.
Fine Soil.

Sizes of Particles	per cent.
2—1½ m. m.	0.00
1½—1 m. m,	0.06
1—¾ m. m.	0.08
¾—½ m. m.	0.78
½ m. m. and less.	99.08

NO. 2.—ALACHUA COUNTY.
Moderately Coarse Soil.

SIZES OF PARTICLES.	PER CENT.
2—1½ m. m.	0.20
1½—1 m. m.	1.90
1—¾ m m.	4.00
¾—½ m. m.	53.67
½ m. m. and less	40.23

NO. 3.—ST. LUCIE COUNTY.
Coarse Soil.

SIZES OF PARTICLES.	PER CENT.
2—1½ m. m.	0.05
1½—1 m. m.	2.45
1—¾ m. m.	12,20
¾—½ m. m.	66.49
½ m. m. and less.	18.81

large, and if it is composed of very fine sand or clay loam, the tubes will be much smaller. Then, according to the law already stated, the water will rise highest in the soil that is made up of the finest grains. This is well illustrated by tying muslin cloth over the ends of glass tubes as described above, filling each tube with a different soil, and letting the ends of the tubes dip into a basin of water for a few days. The results of such an experiment are shown in diagram I. In the coarse sand from Saint Lucie county the water rose in four and a half days to the height of eight and a half inches. In the moderately coarse soil from Alachua county it rose ten and a half inches in the same time; and in a very fine soil from Hillsboro county it rose sixteen inches in the same time. The tables which accompany this diagram show the relative amounts of the different sizes of soil grains in these three soils. It will be seen that over 99 per cent. of the particles which compose the Hillsboro county soil are one-half millimeter (about 1-50 inch) or less, in diameter. However, the odds are not all against the coarse soil. True, it does not lift the water so high as the finer soil, but neither does it allow this water to evaporate from the surface so rapidly. It has been shown that a mulch of coarse, dry sand is more effective in preventing surface evaporation than one of finely pulverized clay loam.

Furthermore, we have shown by experiments similar to those already described that while a coarse, sandy soil (Alachua county soil) lifted water to a height of nineteen inches in sixty-eight days, the same soil when it had 4 per cent. of muck intimately mixed with it, lifted the water to the height of twenty-seven and a half inches in the same time. Stable manure, muck, cover crops, straw, or leaves, may be used to increase the capillary power of the soil.

TABLE I.—Showing Moisture in Cultivated and Uncultivated Land.
(CALIFORNIA.)

DEPTH OF SOIL	CULTIVATED		UNCULTIVATED	
	Per cent.	Tons Per Acre	Per cent.	Tons Per Acre
First foot	6.4	128	4.3	86
Second foot	5.8	116	4.4	88
Third foot	6.4	128	3.9	78
Fourth foot	6.5	130	5.1	100
Fifth foot	6.7	134	3.4	68
Sixth foot	6.0	120	4.5	90
Total for 6 feet	....	756	....	512

Difference in favor of Cultivation—244 Tons Per Acre.

DIAGRAM II---Showing How Plowing Conserves Moisture.

UNPLOWED SURFACE. PLOWED SURFACE.

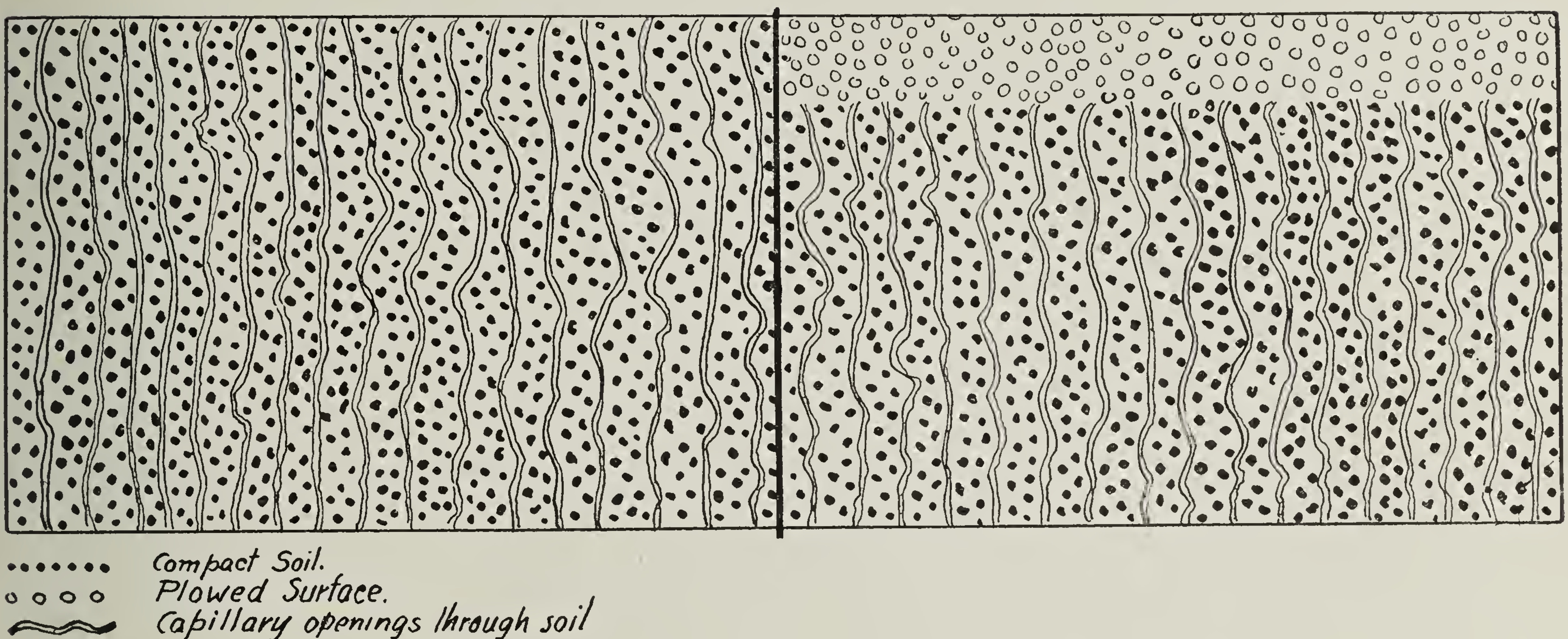


TABLE II.—Moisture in Cultivated and Uncultivated Land.

Florida Agricultural Experiment Station.

		APRIL 18		APRIL 24		*APRIL 28		† MAY 1		‡ MAY 7		Average Tons
		Per Cent	Tons	Per Cent.	Tons	Per Cent.	Tons	Per Cent.	Tons	Per Cent.	Tons	
CULTIVATED LAND	1st Ft.	5.35	107.0	4.71	94.2	6.66	133.2	7.69	153.8	8.57	171.4	
	2d Ft.	5.73	114.6	5.67	113.4	5.63	112.6	5.69	113.3	5.83	116.6	
	3d Ft.	5.17	103.4	5.28	105.6	5.17	103.4	5.00	100.0	5.19	103.8	
	4th Ft.	4.94	98.8	4.95	99.0	4.98	99.6	5.00	100.0	5.07	101.4	
	Total.	......	423.8	......	412.2	......	448.8	......	461.1	......	493.2	448.98
UNCULTIVATED LAND	1st Ft.	2.81	56.2	2.91	58.4	4.83	96.6	6.87	137.4	6.66	133.2	
	2d Ft.	3.17	63.4	3.20	64.0	3.40	68.0	3.37	67.4	3.82	72.4	
	3d Ft.	2.92	58.4	2.99	59.8	2.95	59.0	2.94	58.8	3.25	65.0	
	4th Ft.	2.83	61.6	3.19	63.8	2.91	58.4	2.80	56.0	3.19	63.8	
	Total.	......	239.6	......	246.0	......	282.0	......	319.6	......	334.4	284.32

Cultivated Land, average.............448.98 tons
Uncultivated Land, average...........284.32 tons

Difference in favor of Cultivated......164.66 tons
Equivalent to 1.45 inches rainfall.

* Rainfall early in the morning of 28th, .86 inches
† Rainfall early in the morning of 30th, .30 inches
‡ Rainfall early in the morning May 6, .70 inches

Mention has been made of the loss of capillary water by surface evaporation. The loss of water in this way is great, but it is possible to very materially reduce this loss. This may be accomplished, as is generally known, by plowing and frequently stirring the surface. King, in Wisconsin, has shown that a piece of ground lost in seven days, in consequence of not having been plowed, no less than 9.13 pounds of water per square foot more than an adjoining piece that had been plowed; an amount equivalent to 1.75 inches of rain, and to more than 198 tons of water per acre. Hilgard, in California, reports some investigations of moisture conditions in adjacent orchards differently treated in regard to cultivation. In one case investigated, two orchards of apricots were separated by a lane only, and the soils were identical; but one owner had omitted to cultivate while the other had cultivated to an extra depth in view of a dry season apparently impending. Table I shows the difference of the two fields in moisture content in July to the depth of six feet. This difference of 244 tons of water per acre he regards as quite sufficient to account for the observed difference in the cultural results. These results were that on the cultivated ground the trees made about three feet of annual growth and the fruit was of normal size, while the trees on the uncultivated ground made barely three inches of growth, and the fruit was stunted and wholly unsalable. Hilgard adds that, instructed by the season's experience, the owner of the uncultivated orchard cultivated deeply the following season. His trees then showed as good growth and fruit as his neighbor's. Hilgard attributes the cause of this difference to the fact that in the uncultivated field there was a compact surface layer of several inches in thickness which forcibly abstracted the moisture from the substrata, and evaporated it from its surface; while the loose surface soil on the cultivated ground was unable to take moisture from the denser subsoil.

In diagram II I have undertaken to represent this condition graphically. In the unplowed ground the capillary tubes or openings, through which the moisture is brought from the deeper subsoil, extend all the way to the surface, and thus permit the evaporation of this moisture.

Where the ground has been plowed, the capillary tubes are broken a few inches below the surface, and much of the moistture is thus prevented from escaping into the air. However, the movement of capillary moisture may take place in any direction, even downward, if the conditions are favorable.

Note.—The diagram is necessarily very much exaggerated, and represents only very imperfectly what takes place in the soil. It is not intended to convey the idea that cultivation will entirely prevent surface evaporation.

At the Experiment Station we have recently determined the moisture in plowed and unplowed land with the results shown in table II. The plowed land selected is a cotton field that was plowed about March 24, and harrowed twice between that date and the time of planting the cotton on April 16. The unplowed land lies just across a path from the cotton field, and has not been plowed since last December. Samples for moisture determinations were collected on April 18, 24, 28, May 1 and 7. (On the twenty-eighth of April, 0.86 inch of rain fell. On the thirtieth, 0.30 inch fell; and on May 6, 0.70 inch fell; making a total of 1.86 inches from April 28 to May 6.)

We find here a difference of 164.66

tons per acre, to the depth of four feet, in favor of the plowed land, which is equivalent to 1.45 inches of rainfall. If we consider for a moment what it would mean to have missed 1.45 of the 1.86 inches of rain that fell during this period, we may have a better conception of the importance of conserving soil moisture by means of cultivation.

In Table III will be found a comparison of the tons of water per acre in the first foot of soil, in different places and under different circumstances.

The low moisture content in Grove A at Lake Weir may possibly be explained by the fact that here the roots of the trees are unusually near the surface of the ground, and as a consequence cultivation has been shallow; and by the further fact that for several years past the grove has received practically no nitrogenous fertilizers, with the result that the soil is very much depleted of its store of humus, which, as has been pointed out, is a valuable ally in the work of conserving soil moisture.

TABLE III, SOILS.—Tons of Water Per Acre in the First Foot.

	DATE OF COLLECTION	TONS	
Grove A—Lake Weir.	Apr. 24, '08	24.2	
Grove B—Lake Weir..........	Apr. 25, '08	62.0	
Unplowed Land—Exp. Station.	Apr. 18, '08	56.2	
Plowed Land—Exp. Station...	Apr. 18, '08	107.0	
Poor Cultivation—Grove, Kissimmee	Apr. 30, '07	76.8	
Good Cultivation—Grove, Kissimmee	Apr. 30, '07	93.0	
Sub-Irrigation—Sanford	May 1, '08	246.2	
Unplowed Land, California	....	86.0	
Plowed Land—California......	....	128.0	

Report of Committee on Tropical Fruits.

THE EAST INDIAN MANGO IN FLORIDA.

By John B. Beach

Mr. President, Ladies and Gentlemen:

The East Indian Mango, with its spicy, resinous sap and luscious pulp, stands pre-eminent the king of all fruits. The only reason it has not assumed the position that belongs to it centuries ago in the markets of Western civilization is the fact that it cannot be reproduced true from seed. Consequently it has been confined to its home, Hindustan, and adjacent countries to which trees could be transported. For the past ten or fifteen years, with the aid of fast steamers, the fruit has been finding its way into the London markets from Bombay via the Suez Canal. Its remarkable keeping qualities render this long journey possible, yet the fruit surely cannot develop its full flavor when gathered so long before maturity, as is necessary in this instance. For the past twenty years I have made a hobby of the East Indian mango, and have ridden it pretty hard at times. I rode it into the ground at Melbourne in 1894. Then I moved to Palm Beach and conducted pretty exhaustive experiments for five summers in propagation methods, assisted by Mr. J. F. Bergin, who is now manager of the Tropical Fruit Association's mango plantation at Bayamon, Porto Rico. It was our object to ascertain the cheapest and most feasible method for commercial production of East Indian Mango trees. I am informed that the results of our work have proven the same as those conducted in the greenhouses at Washington. We have fallen back on the old East Indian principle, though we greatly improve on the method of inarching. Under certain conditions budding is perfectly feasible, also root-grafting or root inarching. But when it comes to turning out a maximum percentage of healthy, vigorous trees, fitted for long-distance transportation at a minimum cost, inarched pot-grown trees take the lead. A half-inch seedling tree can be grown in a five-inch pot, a two or three-foot vigorous East Indian top can be grown on it in six or eight weeks, and this tree properly planted and cared for will in three years produce several dozen fruit. They can be packed very light with sphagnum and oiled paper in pineapple crates and will readily stand four or five weeks' shipment through the tropics in the Spring and Fall.

Up to the last few years the only specimen of this wonderful fruit that had ever been produced in Florida was a Mulgoba tree (and its descendants) which was imported with a number of others by the Government. This tree was the only one that survived the cold of '94 and '95 and is growing on the place of the late Rev. A. Gale at Mangonia. I have just seen the tree (April 25th) and it has enough fruit set to make five bushels if they all mature. Mr. Geo. Gale has orders for all he can produce at 25 cents each f. o. b. The tree is two feet in diameter and has a spread of twenty-five feet. It is on the very poorest kind of spruce pine land, coarse and white, without fertilizer or irrigation. It is wonderful that anything could live and grow under such conditions, and speaks well for the vigor of the East Indian Mango.

I have a tree budded from this ten years ago, that stands twenty-five feet high, and has yielded from 500 to 1,000 inarches per year, since I began to propagate from it. Before I began this it had produced two crops of fruit, but since then I have been working it so hard on propagation that it only sets a few fruit each year. It is on spruce pine land, but I give it fertilizer and water, which everything here needs to produce maximum results. If Mr. Gale's tree had had the same treatment that mine has had, it would undoubtedly be yielding 25 to 30 bushels of fruit per year. All the imported trees that we have bearing produce fruit that is free from fibre. There is a little down on one side of the seed, but no fibre at all in the body of the fruit. You can cut around the seed and lift off a fruit cup just as you would with a free-stone peach or an avocado pear. The pulp is far richer than the finest peach, melting and juicy with a spicy flavor not to be found in any temperate fruit.

The Mulgoba weighs fourteen to sixteen oz., has a fine red cheek, and is a fine market fruit. Shape is often nearly cylindrical, and never very lopsided. The Alphonso, one of the recent importations via Washington, is considered in India the best of all. It is superior in flavor to the Mulgoba but inferior in size and appearance. Sundersha weighs from two to three pounds, but is not equal to Mulgoba in quality. Fernandez, one of my own importations, has a distinct subacid flavor, unusual in mangoes, and which will make it popular when known, though the size is only 6 oz. It is a most prolific bearer, and I have to pick off half the fruit to give the rest a chance. Young trees just inarched will often start to bloom the first year. There are quite a number of other varieties imported by the Department, by Mr. E. N. Reasoner and by myself that have not as yet fruited, selected from the finest in India that may develop other qualities that may appeal to the taste of the public, but it will be hard to beat the Alphonso. The development of these we await with interest, and next year expect to hear from some of them, as many have blossomed and set fruit.

PINEAPPLE GROWING AND SHIPPING.

By B. K. McCarty.

Mr. President, Ladies and Gentlemen:

Growing and shipping—these two words represent the nucleus of the pineapple industry, upon them rests success or failure; and I will treat the subject as fully and clearly as it is possible to do in a limited address.

The first and most important step in the growing of pineapples is the choosing of the land. There are two kinds of this that are best adapted to pineapples, viz.: Spruce Pine and Hammock. Spruce Pine, as the name implies, is high dry land covered with spruce pines, the best having an undergrowth of scrub oak and hickory. Hammock land is more densely grown with larger timber usually of hickory and oak. Opinions differ as to which is the best, but it is generally conceded that the hammock land raises the largest pines both as to plant and size; the spruce pine land does not seem to have as much humus in the soil, but the plant seems to last a greater number of years upon it. A combination place containing some of each kind of land is desirable if you can obtain such. After the careful choosing of the land, the next step is the clearing, i. e. placing in proper shape; this is done by first removing the tree's brush, etc. The process of grubbing the land consists in taking a tool known as a grub hoe about six inches wide and shaped like a mattox; with this implement all the roots are removed to a depth of about fourteen inches. Ground should be grubbed during the winter for the summer planting; do not, however, remove the roots and brush until summer when you fork the land, because this shades the ground and prevents the sun from baking the same. Pine stumps are not grubbed out, only the roots are cut up to the stump and the tree is cut down. This stump soon rots and makes humus for your land. Hickory, Bay and all other stumps are dug out either with a grub hoe or a stump-puller. All brush and large roots are forked into the trails which are from four to six feet wide, six feet preferred; here it is burned. The land is now ready for raking. Before this is done, in order to level, a harrow is run over, thus removing all bumps; the land is now raked; all the fine trash and rootlets are raked into where your trail is to be, or the same place that the trash was burned. When these rootlets and fine trash are worked into the ground by rolling over it with the wheelbarrow and other work done in the trail, it forms a hard path which enables the man who wheels to carry bigger loads. We have now reached the point of setting.

Select good plants; of whatever variety you wish to plant, the universal opinion is that Red Spanish are the most desirable both from the commercial and safety point of view. The slips range in length from eight to fourteen inches; the stocky heavy-butted ones are the best growers; slips are shucked or the hard butt is cut off, and the first eight or ten shucks are removed, thus allowing the roots to be exposed so when the slip is planted they will start quicker and be rooted firmer. Usually about 12,500 Red Spanish slips are planted to the acre; twenty inches square being the proper distance.

The ground is laid off with a marker which is pulled by a man, thereby giving you an even and symmetrical field. Planting is done by the use of a trowel; the ground is simply broken and the slip is inserted to the depth of about one inch. Be sure not to set too deep. A slip set too deep becomes choked by the sand working into the bud and the plant does not make the proper growth. Equally as bad, however, is shallow setting, because the wind blows the unrooted plant from its place. The point of proper setting cannot be overestimated and should receive the careful attention of every pineapple grower. We have three methods of working pineapple plants; the most popular as well as the best is shufflehoeing. This is done by means of a shuffle-hoe. When the plant is young you work carefully up to the base of each plant, being sure to stir all of the ground. Opinions differ as to how often young plants should be shufflehoed; as for me, I do this early and often, every three weeks, if the ground is in the proper condition, until the plant becomes too large to permit. A small plough is used also to stir the ground in young fields; a rake is also used by some people, but it is much slower and more expensive.

The shuffle-hoe is our most used tool, for with it are the trails kept clean of weeds and stirred, as well as the fields.

Upon our sandy soils we have to fertilize extensively, almost from the time the plant is set, and continue to do so until the field has grown too old to bear properly. The question of fertilizing is an intricate one, requiring a great deal of study and close attention to details. I have used Painter's fertilizers for some time, with the best of results. It seems to be the census of opinion that a bearing field of pines should be fertilized twice a year. What is called the summer application is usually put on about July 10th to 30th; and the fall application is put on about October 15th to 30th. It is almost impossible to tell formulas, because of the differences in fields, age of plants and, last, the difference in land; there are not any two pieces of land which would require the same kind of fertilizer; climatic conditions change the whole status of affairs.

The watch-word in shipping pineapples is carefulness in handling. Let it ever be the foremost idea in your mind, that a fall which will injure an egg will do the same to a pineapple. The first thing in shipping pines is the picking; upon this point lies success or failure; i. e., how to pick, when to pick, color and methods of picking. There are two ways to pick; first to snap the apple from the stalk; this is done by placing your knee or wrist against the stalk at the base of the apple and giving a quick downward motion toward the body. If there are slips around the base of the apple, one should be removed. The snapping process is a very good one where the slips are not thick and when there has been rain, thus making the stalk brittle. The second method is by cutting with a knife; an ordinary all-metal oyster knife is the best; one or more slips, if necessary, are pushed off from the top of the stalk, the point of the knife is here inserted and the apple is removed by this method, the slips are saved, and it also prevents the apple from becoming plugged so it leaks and rots while in transit. The census of opinion is that the first-named method is the best, although many of the best growers use both; the grower will have to use his own judgment in this matter to a large extent. When to pick the fruit so as to get it to the market in the best possible shape is one of the all-important points of the industry. The apple should show a light greenish cast around the base. It should always be remembered that a Red Spanish pineapple always ripens from the outside in; also from the base to the top of the apple. When pines are picked in this condition they will keep for some time, even in the heart of the summer, if they are not bruised.

Step number two is the method of getting the apple from the field to the packing house. Some people use a wheelbarrow with a rack; into this the apples are placed where they are then taken to the house; others use pineapple crates that are filled by the wheeler as they are thrown by the picker. These crates are picked up and hauled to the house with a wagon, where they are carefully laid into the bins, being now ready for wrapping. Baskets are also sometimes used in place of crates on the wagon. When the pines arrive at the packing-house they are placed in long bins about four feet wide and three feet deep; from this they are packed. If the fruit is wet when it is brought to the house, it is always let dry in order to save spotting the paper. Pineapples are packed in crates 10½ by 12 by 36 inches; they are wrapped in strong paper 15 by 20 inches. Most growers use plain white, because it is stronger; still many growers use the colored paper with varied success.

Sizing is all done with the eye and is a most particular job; the crate must be packed snug but not full enough, so when the covering is put on that it bruises the apples. The point should be carefully borne in mind, that the apple in transit shrinks a trifle, so that what seems to be a perfect package on leaving your packing-house will not be so when it is received by your commission house. Experience is one's only teacher in the matter of packing and the man who feels that he is shrewd enough to beat the buyer on his pack will find, to his sorrow, that he is receiving from 10 to 25 cents less for his fruit than his neighbor.

Pineapples run in size from 18 to 48 to the crate; they are laid in the crates crossways, alternately apple and crown; this is done to prevent bruising if one apple came in direct contact with another. The crate is made the wide way, so as to give the apple more room. Each package should be packed with carefully selected fruit both as to size and quality. Never pack an apple that is the least bit doubtful, because you not only lower the price on that crate, but you lower the reputation of your brand which is priceless.

An ordinary packer packs 100 crates a day and does it well. Of course, size has a great deal to do with the number a man can pack, but for all season's work 100 crates a day is plenty.

Your crate should be stenciled or, if you prefer, stamped with your name, variety, etc., so as to present a neat and attractive appearance.

My whole article has dealt with the Red Spanish Pineapple, which is king of all varieties; it has won its place justly in the great markets of the world against the bitterest competition. Cuba with her immense crops of pineapples combined with both Florida's and Porto Rico's form a stupendous business. It is sufficient to say that if we are to retain our enviable position as producing the finest pineapple in the world we must watch our fields, watch our competition and watch our packs.

I trust I have in some small way cast a little light on the methods of growing and shipping pineapples.

PLANTING OF FRUIT TREES.

By Aubrey Frink.

Mr. President, Ladies and Gentlemen:

Early in April I received a letter from President Rolfs asking me to prepare a paper for the Horticultural meeting, but he did not suggest a topic. After some correspondence with Prof. Rolfs, we decided upon the subject of Planting Fruit Trees.

My reason for selecting this topic is that there seems to be a very general desire for information along this line. Scarcely a day passes during the planting season that I don't receive inquiries as to when to plant, how to prune for planting, about fertilizers and fertilizing, best sized trees to set, etc. And, no wonder, for the success of an orchard depends to a considerable extent on proper methods in planting.

WHEN TO PLANT.

The best time for setting fruit trees is one of the first things to be considered. As a general rule fruit trees do better when set during late fall or early winter—as soon as they have hardened up their growth and become dormant. Trees planted then will have time to become established in their new positions and nearly all of them will have put on feeder rootlets before time for growth to start in the spring; thus enabling them to start promptly and make and sustain a good first growth in the spring, as well as succeeding growths, and to withstand drouth.

Many people suppose that when a tree is dormant, it is dormant in root as well as in top, but if you care to test this, dig up a few trees during the late fall and heel them in or transplant them, and then during late winter or early spring before top growth has started, dig them up and examine the roots. You will nearly always find small rootlets long before the top shows any signs of starting.

If planting is left until spring, the top will start out immediately and before the roots have time to throw out feeders, thus drawing severely upon the stored-up sap within the tree, with the result, too often, that the vitality of the tree is weakened and not infrequently it succumbs, especially in case of a severe drouth.

Deciduous trees can be planted successfully only when dormant, during the late fall, winter or early spring. But Citrus trees can be planted at almost any time when conditions are favorable; that is, when the ground is moist and weather cloudy, although they, too, generally do better for being planted during late fall or early winter. Some planters like to plant during the rainy season of midsummer.

It is desirable always to plant all kinds of trees only when the ground is in good moist condition.

PRUNING.

The pruning of fruit trees at time of planting, or before, is a matter that is given entirely too little attention. A very large percentage of trees are set out exactly as received from the nursery, whether pruned at all or not, in an endeavor to save as much of the top as possible. This oftentimes results in losing a large percentage of trees, for the root system of the tree has been deranged while the top is left as it originally was, with the result that the tree has to draw upon the sap stored up within itself to support the top and, if evergreens, all the foliage, while the roots are getting started. This heavy drain upon the vitality of the tree not infrequently causes it to die. Nearly all fruit trees should be severely pruned when planted. They will start out better, make better and quicker growth, and actually form good heads sooner than when planted with all their tops left on, besides materially reducing the percentage of loss in planting. Fruit trees should nearly always be cut back to a straight stem of about twenty to thirty inches. This gives the point at which the top will form, thus making a low branched tree, giving a larger fruiting surface than would be possible were the top started four or five feet or higher. It also allows of the fruit being picked with greater ease and less expense than from high-topped trees, because a good portion of the fruit can be picked without the use of a ladder.

The roots should also be pruned to some extent, but I do not believe what is known as the Stringfellow method of pruning off all the roots is good practice; in fact, it has not proven so in my own planting of many thousands of trees annually, except in some instances where trees are very small and the top is also cut to within a very few inches of the ground.

In pruning citrus trees, it is advisable to cut out the fibrous roots almost entirely, the belief of many planters to the contrary notwithstanding. These fibrous roots are but feeders and are an annual growth, and when a tree is transplanted with these fibrous roots left on it, they will simply rot off before new rootlets will start, thus hindering the starting of new feeders. If anyone doubts this assertion, let him heel in a few orange trees during the early winter, and then examine them during the late winter. He will find the fibrous rootlets rotted off, and new rootlets starting. In making the test, try a few with fibrous rootlets cut out and see if he does not find that they have started new feeders much sooner than those with the fibrous roots left on them.

A pretty good plan, when ordering trees from a nurseryman, is to instruct him to have the trees pruned ready for planting. He will seldom make any charge for this, and the plan has several advantages. In the first place the trees will be properly pruned; with many planters it takes considerable nerve to prune as hard as trees should be pruned. In the second place, this will save you the trouble and expense, and will save considerable useless weight and, consequently, transportation charges. And in the third place, evergreen trees will be the better for being pruned and defoliated immediately when dug. This stops, to a large extent, the evaporation of sap, always going on through the foliage, and reduces considerably the drying out in transit that would otherwise be hard to overcome. Evergreens should nearly always be defoliated when transplanted, for otherwise the evaporation of sap is so great through the foliage that the trees have a hard struggle for life, and if shipped during hot weather they are apt to scald in transit, especially if out for some time.

PREPARATION OF THE GROUND, AND FERTILIZING.

The preparation of the ground for the tree is of great importance and is too often neglected. The ground should have been broken up very deep with a turn plow and thoroughly pulverized some time in advance of planting. If the land is new, this will enable it to mellow and sweeten up, that is, lose the acidity which so often occurs in our Florida soils. And, right here, I want to say that new land should always be used for trees subject to attacks from the root-knot nematode, such as peaches, mulberries, figs, etc. The root-knot nematode is generally plentiful in old lands, while new lands are fairly free from it. By using new land your trees have a chance to get started well before this pest becomes sufficiently abundant to do any damage, and then the tree is generally able to resist its attacks.

It is a pretty good plan to use half a pound to one pound per tree of some good high grade commercial fertilizer at time of planting or before, mixing it thoroughly with the earth in the holes where the trees are to be set. This puts the fertilizer right where the tree can take advantage of it immediately it puts out new feeders, thus enabling the tree to put on and maintain a good first growth, and by reason of this good first growth, the succeeding growths will be much better. In other words, this will get your tree established in a way impossible if you depend upon using the fertilizer after the tree has started growth.

The particular brand of fertilizer does not so much matter. There are a number of excellent brands sold by manufacturers and dealers in the state. It should, however, contain about the following proportion of chemicals: Ammonia 4 to 6 per cent.; Phosphoric Acid 7 to 9 per cent.; Sulphate of Potash 3 to 5 per cent.

SETTING THE TREE.

In setting the tree, generally considered a simple task, care should be used to see that roots are placed as near as possible in the same positions they originally occupied, and to have the earth packed very firmly around them. It is a good idea to place your tree in its proper position, then pack earth around the lower roots with your hands, then pour in a bucket of water and allow that to settle into the earth. This will firm the earth around the roots far better than you can do it otherwise. Then fill in the hole, and pack the earth down hard by stamping it with your feet. After the hole has been filled, make a basin of earth around the tree, say, a couple of feet across and pour in another bucket or two of water, and after that has soaked in, throw some loose earth over that to prevent scalding.

Ordinarily trees should be set the same depth in the ground they originally were in nursery. Nature marks the proper earth line, and it is generally a good idea to accept this, not trying to put the tree either deeper in the ground or higher out of it.

PROPER SIZED TREES TO SET.

As to the most desirable sized trees to plant. This is a question about which there are many different opinions, but my experience and observation has been that sizes usually listed in nursery catalogues as Standard, are about as good as can be used. In deciduous trees, like peaches, plums, pears, mulberries, apples, persimmons, etc., this means 4 to 6 feet; while in citrus trees one year buds 4 to 5 feet. Either medium size, 3 to 4 feet, or extra size, 6 feet and up, is all right, and some planters prefer smaller sizes, while still others want only two-year old buds in citrus trees. Two-year buds of deciduous trees are seldom as desirable as one-year buds and nothing is to be gained by using them, for the one-year buds, if thrifty, should give you fruit just about as soon and as much as the two-year olds.

But, if good thrifty trees are planted, and sizes within reason, the size does not count so much. It is the proper care at time of planting and afterward that makes for success in fruit-growing, provided always that proper varieties have been selected.

DISCUSSION.

Mr. Hart—Do you make it a point to plant trees in relation to the points of the compass; that is, do you plant them in exactly the same position as they were originally, with the north to the north?

Mr. Frink—No, I don't think that makes any difference. Of course, I have not had a very long experience, but I never could see that it makes any difference whatever.

Ornamentals.

SELECT BULBOUS AND TUBEROUS-ROOTED PLANTS FOR FLORIDA GARDENS.

By H. Nehrling

Mr. President, Ladies and Gentlemen:

Florida is the land of "unlimited possibilities" as far as ornamental horticulture is concerned. We are able to grow in the open hundreds—no, thousands—of species of tropical and subtropical plants which farther north can only be grown with considerable trouble and many expenses in glasshouses. I have wandered through many parts of our country in quest of birds and plants. I have sojourned in Texas, and made my home for a number of years in the Ozark region of south-western Missouri. I have lived on the prairies of Illinois, and spent my boyhood days in the idyllic forest regions of Wisconsin, my native state. I have seen all the elaborate gardens around Boston, New York, Baltimore, Philadelphia, Chicago, Milwaukee, Washington, and New Orleans; but nowhere have I found such a wealth of beautiful native and exotic plants as in Florida, very aptly called the land of sunshine and flowers. Even if we were deprived of exotic plants, we could make glorious gardens from the material found in our woodlands and along our watercourses. Native plants should form the foundations of all our gardens. Plant first of all the cabbage palmetto, the noble Magnolia grandiflora, the sweet bay (Magnolia glauca), the loblolly bay (Gordonia Lasianthus), the holly (Ilex opaca), the dahoon (Ilex Cassine), the red cedar (Juniperus Barbadensis), the laurel cherry (Prunus Caroliniana), the wild olive (Osmanthus Americanus), the live-oak (Quercus virens), and do not forget that jewel among climbers, the Carolina or Yellow Jessamine (Gelsemium sempervirens). This greets you on New Year's day with a wealth of deliciously sweet-scented, yellow flower-trumpets.

Our worthy president has suggested to me to read a paper on bulbous and tuberous-rooted plants adapted to our soil and climate. This suggestion is very timely, because only a very limited number of our people really know what has been done along these lines in recent years. It is true, gifted writers of high intellect, like P. W. Reasoner and E. N. Reasoner, Theo. L. Mead, Walter N. Pike, W. C. Steele, Mrs. Jennie S. Perkins, and others, have pointed out, time and again, the great possibilities of growing bulbous and tuberous-rooted plants in Florida. Many and important have been the articles that have appeared from time to time in *The Florida Agriculturist,* and in the older volumes of *The Farmer and Fruit Grower;* but as far as I am aware the subject has never been treated in a systematic manner.

I begin with the *Lily Family* (*Liliaceae*).

This is a very large group of plants, comprising the true Lilies (Lilium), the Gloriosas, Sandersonias, Littonias, the Tulips, Hyacinths, the Lily of the Valley, the Mariposa Lilies (Calochortus), the Blue African Lily (Agapanthus), etc. The genera Trillium (Wake Robins), Erythronium (Dog's-tooth Violet), Bessera, Blandfordia, Funkia, Milla, Allium, Kniphofia (the Tritoma), Albuca, Hemerocallis, etc., all belong to this family.

Though I have experimented quite extensively with almost all the genera of this family, I have not been successful with most of them. The Tulips and Hyacinths, which form such an important part of all the gardens of the North, are a failure in Florida. It is useless to meddle with them. We have numerous tropical bulbous plants, outrivaling them in beauty and in easy culture, and only these should be largely planted in our gardens.

The true Lilies (Lilium) are the gems of this noble family. They all belong to the Northern Hemisphere, being numerously represented in the cool mountain glens of the Californian Sierra Nevada and Coast Range, and reaching their greatest beauty and highest development in Japan. China is likewise rich in fine Lilies, and some of the most beautiful are found in the Himalayas. They abound in Europe and Northern Asia, and some of the species attracting the attention of all flower-lovers grow in our northern meadows (L. Canadense, L. superbum and L. Philadelphicum). One species, Catesby's Lily (L. Catesbaei), grows abundantly in the flatwoods of our own State. Its large, orange-yellow, upright flower chalices, spotted with deep-brown, form glorious masses of rich color in September. The bulb is small, but is easily transplanted to our gardens in rich, moist soil. It seeds freely, and batches of young plants are usually found around the old bulb. Though I have experimented quite extensively with most of the species of the true Lilies, I have not found their behavior encouraging. This was, however, at a time when I did not understand the soil and climate of Florida thoroughly. Even at the North, most Lilies are very capricious. They thrive splendidly for a time; then they suddenly disappear. Since I began the cultivation of bulbous plants in a systematic way under sheds and in well-prepared soil, I have had better results.

None of the European Lilies, not even the chaste Madonna Lily (Lilium candidum) of Southern Europe, will grow here. The species of our northern states are also a failure. The gigantic Humboldt's Lily (L. Humboldtii), and the fragrant Washington Lily (L. Washingtonianum), being sojourners of the high and cool mountain regions of California refused to grow with me. The only American Lilies which may finally, after many generations, adapt themselves to our soil and climate, are the Californian L. Parryi, a very fragrant lemon-yellow species, and the vigorous L. pardalinum. Both have flowered with me, but they died shortly after the blossoms had faded.

The Golden-banded Lily of Japan (L. auratum) and its varieties, the most imposing and beautiful of all the Lilies and the most fragrant, has not proved a success with me; though some bulbs made a vigorous growth at first. The Japan Lily (L. speciosum) and its varieties, L.

speciosum album, L. speciosum rubrum, and Melpomene, grow much better and bloom abundantly. They seem to do best in pots on verandas; but I have had them frequently in flower in the well-drained, rich and moist soil of my shed. All are very beautiful and exhale a delicious perfume.

Henry's Lily (L. Henryi), discovered several years ago in the mountains of Junnan, in southern China, by Dr. Augustine Henry, grows vigorously in Florida. It has been termed the "Orange-yellow Speciosum Lily." Its constitution is robust; the plant growing four to six feet high and bearing from ten to twenty rich, orange-yellow blossoms, well set off by its ample deep-green foliage. I have crosses now growing vigorously between this species and L. speciosum rubrum.

The Tiger Lily (L. tigrinum), a Chinese species which has been repeatedly reported to be successfully grown in our State, never made itself at home in my garden.

The most satisfactory of all the true Lilies, growing admirably in Florida, provided they are well cared for, are those belonging to Endlicher's Eulirion group—the Funnel-flowered Lilies. We all are acquainted with the Easter Lily (L. Harrisii), a variety of the Japanese L. longiflorum, carrying a magnificent crown of long-tubed, snowy-white, fragrant blossoms, usually at Easter time, on a stem two to three feet high. L. longiflorum has branched out in quite a number of distinct and superior varieties. The type usually only bears one or two flowers; the Easter, or Bermuda Lily (L. longiflorum Harrisii), usually from four to six. L. longiflorum giganteum is an improvement on the last-named variety. It is of very free growth, carrying from six to ten flowers on each stem. They are large and well-formed, of great substance and purity, lasting a long time when cut. The finest variety of all is undoubtedly L. longiflorum Takesima grandiflorum, very strong-growing, with glossy foliage and dark-brown stems, bearing from six to ten long tubular flowers, white inside and tinged with brown externally. All these Lilies have proved a perfect success with me, flowering abundantly in the latter part of April and early in May.

Have you ever seen the beautiful L. Brownii in bloom? The form of the flower reminds one of the last-named species, but the outside is a deep chocolate brown. Of still greater beauty is its variety, L. Brownii leucanthum. It is more or less ruddy-brown externally, milk-white inside, with a rich yellow throat. The type is rather difficult to grow, while its variety grows as easily as the L. longiflorum varieties.

In 1872 the celebrated botanical collector, Gustav Wallis, discovered a beautiful funnel-shaped Lily in the Philippine Islands, the L. Philippense, which was scientifically described by Baker in 1873. At that time it did not attract much attention. Only recently, since the United States has taken possession of the islands, this lily has become better known and American firms have distributed it largely. Though occurring in a tropical country it has proved hardy even in Ohio. The stems are rather slender, and the grass-like leaves grow all along the stems, as in all true lilies. Usually only one pure white flower is carried on the extremity of each stem. The flowers exhale a delicious perfume. It grows well in my garden, and I have raised quite a number of seedlings from it.

The Neilgherry Lily (L. Neilgherrense) is another species adapted to our soil and climate. Coming from the mountains of the Indian peninsula, where it grows in great abundance, in the rich vegetable mold of half-shady positions, it is not quite hardy here in Florida. It insists on pushing up its stems late in autumn and during winter, and therefore is easily damaged by one of our cold spells; though it can stand a few degrees of frost with impunity. The flowers are pure white and very fragrant.

Wallich's Lily, also known as the Sulphur Lily or the Himalayan Lily (Lilium sulphureum, syn. L. Wallichianum) is a native of the Himalayas, at an altitude of from 3,000 to 4,000 feet, growing in the same places with the tree-like Rhododendrons (R. barbatum, R. arboreum, R. grande, R. Falconeri, etc.) which are awaiting introduction into our gardens; when in bloom it transforms the mountain sides into an earthly paradise. It is a vigorous grower, with large funnel-shaped flowers, rich yellow inside, tinted rosy and brown outside, of a rich fragrance; it produces small bulbs at the base of the leaves like L. tigrinum. I have had this lily in good condition for years; but a species of burrowing mouse, so common in Florida, destroyed these and many other Lily bulbs last winter. A few days ago I received another consignment of bulbs of this and the next species from Burma. This species, with some protection, has proved perfectly hardy near Boston.

The Nepal Lily (L. Nepalense) is my special favorite. It grows wild in the western and central portions of the Himalayas, and has recently been collected in quantity in Burma. The slightly fragrant flowers have a purplish crimson tube, and the segments are broadly tipped with creamy white—a most beautiful color combination. Though growing at a higher altitude than the last-named species, it is much more delicate.

For all the true Lilies I have found the following mode of culture the one most likely to give good results. Prepare a bed under half shade. Dig out the soil to the depth of three feet, and place on the bottom a layer of oak trunks. Cover this with a mixture of rich muck, leaf-soil, old cow-manure, along with some lime and a liberal quantity of crushed charcoal. Fill up to the rim. Mix thoroughly, and dig the bed repeatedly before planting. All the bulbs should be planted in November or early in December. Surround each bulb (which should be covered with three inches of soil) with crushed charcoal, and press the soil firmly around it. When in full growth, I apply a small quantity of Painter's Simon Pure garden fertilizer. This also helps to keep out the burrowing mice, which are so destructive to all the Lily bulbs. Never order Lily bulbs in spring—they are always a failure. I also surround all my choice Lily plants with broken bricks and stones. This helps to keep the soil cool, an essential point in Lily culture. The Lily will never flourish where the surface of the soil becomes hot. Almost all the Lilies are in full growth in our dry season. If the growth is in any way checked during this time, they invariably perish; with the exception of the L. longiflorum section. For this reason they must be kept well watered.

THE GENUS GLORIOSA, OR CLIMBING LILIES

In the foregoing I have pointed out that the true Lilies need careful attention, if success is to follow. It is quite different with the Gloriosas. They are perfectly at home in Florida. No plants are grown more easily and with less care. Deep rich soil, and a support to climb upon are all they require. They are all tropical plants, one species being found in India and the others in Central Africa. This genus, evidently so closely allied to the true Lilies when we consider the foliage and flowers, is a puzzle to the biologist as far as the rootstock is concerned. In the Lilies we have typical bulbs made up of numerous loose scales; while Gloriosas have peculiarly shaped solid tubers, giving no clue to their relationship.

The most magnificent of all the species is the new Uganda Climbing Lily (Gloriosa Rothschildiana). It starts into growth with me by the middle of April, and is in full flower by the middle of May. (Some varieties, however, start much later.) It is a very vigorous grower, climbing to a height of from six to ten feet. The flowers, as in all the species, are axillary, near the ends of the stems. The points of the leaves are provided with tendril-like apices, with which the plant fastens itself to bushes and tall herbage. The flowers are large and very gorgeous, lily-like, with reflexed segments, and of a dazzling orange-scarlet color with yellow edges. Each stem bears from eight to ten flowers, which open successively; the lower ones first and the terminal ones last. This species was discovered several years ago in Uganda, Africa, and was introduced into cultivation by Lord Walter Rothschild of Tring, England; from whom I received about a dozen tubers in the spring of 1905.

The Malabar Glory Lily (G. superba) starts into growth much later, usually not before the beginning of June. It is also a very strong grower and exceedingly floriferous, each stem producing from ten to thirty of its showy blossoms. The stems, attaining a height of from six to ten feet, often throw out side-shoots at their tops. The flowers are rather disappointing at first, from the predominance of green in them; but after a few days, bright orange-yellow hues supersede the green almost entirely. Nothing can be more striking than this lily in full bloom, clambering over a flowering specimen of Pleroma macranthum. The bright, glowing, orange-yellow flowers of the Gloriosa, and the large, glossy, bluish-purple blossoms of the Pleroma, show a charming and strikingly beautiful contrast. I have fertilized this species with the pollen of G. Rothschildiana and vice versa; and I have now quite a number of promising hybrids from both species. In 1906 I raised several hundred seedlings of the Malabar Glory Lily, and most of them flowered last year. I have never noticed such a variation as was displayed here, though the plant was crossed with its own pollen. Some plants were strong growers; others showed a weak constitution. Many had broad, large leaves; others small and narrow foliage. But the greatest difference was displayed in the blossoms; the color ranging from a dull yellowish green to the deepest orange-yellow. Some of the flowers even were pure yellow.

The Mozambique Glory Lily (G. virescens), as its name implies, was introduced from Mozambique. Its prevailing color is yellow, with some green.

Leopold's Glory Lily (G. Leopoldii) seems to be intermediate between two already mentioned. The flowers are pure yellow when opening, changing finally to a much brighter and deeper hue. The segments show rosy-red streaks and spots in the center.

A friend of mine in France sent me this spring an evidently new species, which was collected on the Congo. The tuber is very thick and shaped like a wedge, not branched in tomahawk-like fashion as in other species.

Plant in deep, rich soil; either near a shrub over which the plant may clamber, or give a bamboo stem with branches left intact as a support. Do not disturb the tuber for a number of years; and give, each spring, an application of good commercial fertilizer.

Sandersonia aurantiaca and Littonia modesta are allied plants from Natal. Both have bell-shaped, yellow-orange blossoms; both are climbers and both grow well in Florida.

Tritomas (Kniphofia) grow well in Florida, and flower in profusion; but they need attention and good soil rich in humus, not too dry and not too wet. An application each spring of cow manure as a top-dressing is essential to their welfare. Several years ago I had a collection of about twenty-five different sorts. They were planted out on rather high and dry pine-land, where they grew fairly well. A few years later I intended to improve their condition, and prepared a bed in the rich soil near the lake. When the rainy season came, the bed was soon entirely submerged; and my entire collection, consisting of several hundred plants, was lost. All the Tritomas are natives of Africa.

The Day Lily (Hemerocallis) grows as well in Florida as anywhere else, soon forming large and conspicuous clumps of great beauty. Though the individual flower only lasts one day, the blossoms are produced in such abundance, and are so showy, that Day Lilies should find a place in every garden. The most vigorous grower is the common Tawny Day Lily (H. fulva), with large lily-like, tawny-orange flowers. The double form of this (H. fulva fl. pl.) and another double form from Japan (H. Kwanso fl. pl.)—the latter with strikingly variegated foliage—deserves extensive dissemination.

The Lemon Day Lily (H. flava) is an exceedingly beautiful plant, with large lemon colored flowers, strongly fragrant.

I also grew H. Middendorffii with golden yellow flowers, and H. Thunbergii with sweet-scented bright yellow blossoms, and some hybrids which I raised from the various species.

Day Lilies require a very rich soil. They are splendid objects among, or in front, of shrubbery.

THE IRIS FAMILY (IRIDACEAE).

This very large family is rich in first-class garden plants, comprising such well-known genera as Gladiolus, Watsonia, Antholyza, Crocus, Babiana. Ixia, Sparaxis, Moraea, Tigridia, Montbretia, etc.; but the most important is the genus Iris itself. About 175 species of Iris are known to science. With the exception of a few North African species, all are natives of the North Temperate Zone, inhabiting North America, Asia and Europe. The most important of all, and the most easily grown, is the German Iris (Iris Germanica), the glory of northern gardens in June. It is a failure in Florida. When I made the State my permanent home, in 1902, I brought with me about a thousand rhizomes, in about forty distinct and beautiful garden forms. They died out one after the other, and in three years none were left. This Iris is so beautiful that it is worth all the trouble to grow it. I have had the dwarf Iris pumila in flower in the autumn months. Some plants which were set out on my place in 1886, were still in existence in 1896; but they never made much growth.

In moist rich soil the Japanese Iris (I. laevigata) flourishes with all the vigor of a native plant. It will not grow on high dry pine-land or in poor soil. The soil must be rich in humus. A rich black vegetable mold near the edge of the water is just the right place for this exquisitely beautiful plant. Before planting add a very liberal amount of old cow-manure to the soil; also apply good commercial fertilizer early in spring, just before flowering. There is such a wealth of rich and delicate colors in the different varieties, and they flower so abundantly, that it seems strange that they are not grown more in Florida. There are hundreds of fine varieties, single and double, which almost all originated in Japanese gardens.

Our Florida Iris (I. hexagona) should not be omitted from this list; as it is a very beautiful and easily grown plant, growing well where the Japanese species flourishes. There is also a pure white form of it. This species offers a good field for the hybridizer.

The Roof Iris (I. tectorum) of Japan thrives finely in my garden in half shade and in rich moist soil. As its name implies, it grows largely on the straw roofs of Japanese houses.

There are undoubtedly numerous species of the rhizomatous Irises which will thrive splendidly in our gardens. I only experimented with them in a limited way; but hope to take up the genus as a specialty in the near future.

I have never planted the bulbous Irises, such as the English and Spanish, and I have found Iris Susiana, I. Iberica, I. Nazarina, I. Sarii and I. Bismarckiana a failure. In their native home they rest in a dry hot soil during the summer and autumn months; while here they grow and flower in the dry season, April and May, and rest in the rainy season, which invariably makes the thick rhizomes rot.

To Mr. E. N. Reasoner belongs the credit of having introduced to our gardens an Iris-like plant, which is at once a most vigorous grower and an abundant bloomer. It is at home on our high, dry pine-land, and also in moister soil, but it will not flourish in places where our wild Iris and the Japanese Iris thrive best. This is the Natal Iris (Moraea iridioides), a veritable jewel for our gardens. If well cared for, it will soon form large clumps and will flower four or five times during the spring and summer months. In order to see it at its best, it should be planted in groups or large beds. The flowers are three to four inches across, pure white, and marked with deep yellow on the claws of the outer segments; the style is marked with blue—a very striking combination of colors.

The Blackberry Lily (Pardanthus Chinensis) comes up from self-sown seed everywhere in my garden. Antholyza Aethiopica and other species, Watsonias, and Montbretias grow all well, but I never have been successful with the Tigridias, which grew to perfection in my garden in Texas.

The Gladiolus (the Gandavensis as well as the Childsii and Groff varieties) grows as well in Florida as in other southern states. I prefer the Gladiolus Childsii varieties on account of their vigorous growth, large and finely formed flowers, and gorgeous colors. This strain was produced by the celebrated hybridizer, Max Leichtlin, of Baden-Baden, Germany.

Last year I received from my friend, Dr. Walter Van Fleet, another celebrated hybridizer, a number of tropical African kinds. Among them G. Quartinianus, with dazzling red flowers having an orange-yellow throat. These flower in October and November, at a time when all other Gladioli have gone to rest. They are all vigorous growers, and the stems attain to a height of from three to five feet.

The Gladiolus also does best in half-shade, and the soil should be made rich with old cow-manure. The flowers are not of long duration here in Florida, and therefore the stem should be cut when the first flower opens. Placed in the house in a vase, all the flowers will open, and they last much longer in this condition and give much better satisfaction.

THE AMARYLLIS FAMILY. (AMARYLLIDACEAE.)

The word Amaryllis sounds to me like poetry. No other word is so charming to my ear. The mere thought of it carries me away into the world of my ideals. Noble form, gorgeous colors, indescribable beauty, refinement, delicacy, delicious fragrance—all these attributes are combined in the Amaryllis. I have given up the cultivation of Orchids in order to devote all my time, my undivided interest, to these plants. I came to Florida with the sole object in my mind of growing and hybridizing Amaryllis. I bought my place in 1883 with the view to make the cultivation of Amaryllis my specialty. When I say Amaryllis, I mean the word in the broader sense of the Amaryllis family. This noble family comprises such superb genera as Amaryllis, Hippeastrum, Crinum, Hymenocallis, Pancratium, Ismene, Griffinia, Eucharis, Haemanthus, Ammocharis, Buphane, Brunsvigia, Sprekelia, Lycoris, Nerine, Vallota, Habranthus, Zephyranthes, Cooperia, Clivia, Alstroemeria, etc.—all names sounding familiar to those who take a deeper interest in floriculture, all very important and beautiful garden plants. Though closely allied to the true Lilies—which they not only rival but eclipse, alike in beauty and fragrance—they are of much easier culture, and flower more abundantly.

I am sorry to say that I have not been successful in flowering the true Amaryllis or Belladonna Lily (Amaryllis Belladonna) a native of South Africa. I am of the opinion that this is the most exquisite of all bulbous plants. It invariably flowers in August, before the leaves appear; and the large finely formed blossoms, varying from a delicate pink to a deep purplish rose, exhale a very strong and delicious perfume—the very ideal of perfumes.

About ten years ago, I planted several hundred bulbs, partly on high dry soil, partly on lower land, and partly in a half shady position. All grew well and multiplied rapidly and those on low ground flourished best; but not one bulb ever flowered. In Texas, and even much farther north, and also in California, the Belladonna Lily flowers profusely. Evidently it needs a heavier soil, or it may dislike our wet summers.

The most valuable, the most gorgeous, and the most showy of all bulbous plants are undoubtedly the Hippeastrum species and hybrids, everywhere known as the Amaryllis. The scientific name which was given to this genus by Dean Herbert, the great Amaryllis specialist, means

Knight's Star. They are all natives of the American Tropics, occurring in a wild state in the rich vegetable mold of the primeval forest; in cool mountain glens; among the grass of the llanos; or even as epiphytes on trees, among Orchids, Bromeliads, Aroids, Ferns, etc. One species, the Blue Amaryllis (Hippeastrum procerum), grows in the full tropical sun on rocks near Petropolis, Brazil. When in flower all the species are strikingly beautiful—so beautiful that even the dull Indian or the indolent peon cannot help pausing a moment to admire them. With the exception of the fancy-leafed Caladiums, no plants in our Florida gardens are admired as much or create such enthusiasm as the various Amaryllis and their still more gorgeous hybrids. When I saw the first clumps of Johnson's Amaryllis in a garden in Houston, Texas, in May, 1879, I stood speechless. Their enchanting beauty, their brilliant color and refined form overpowered me. From that time on to the present day, I made the cultivation of this class of plants my specialty. I entered a field with unlimited possibilities. I began to collect the various species from their native countries, and added the best hybrids from European collections. I began myself to hybridize with excellent results from the start. This was about thirty years ago; and at present my own hybrids rival in beauty of color, perfect form and substance, the best European collections. I grow at present all the species that could be obtained, with all the best old and recent hybrids of European plant breeders; and my collection of named hybrids consists of about a thousand different varieties.

All the species are most valuable garden plants here in Florida. There are about fifteen species in cultivation, and about as many varieties or local forms of the different species.

In April, most of the Florida gardens are aglow with gorgeous masses of the Orange Amaryllis or Orange Lily (Hippeastrum equestre). It revels in the apparently poor sandy soil, soon forming imposing clumps which produce numerous stems, each carrying two large, somewhat nodding, bright orange-red flowers, with a yellowish-white star. Planted in large groups or beds, these Amaryllis in full flower produce a magnificent sight, being far more beautiful than Tulips and other bedding plants of the northern garden. Planted around palms and in front of shrubbery, they are particularly effective. They form a charming picture in long lines on borders, and along verandas, backed by such beautiful shrubs the sky-blue Eranthemum (Daedalacanthus nervosus), and the deep-blue Thunbergia erecta, which flowers at the same time. This species is a native of the West Indies, Central America and Northern South America. A beautiful form (H. equestre Wolteri) was lately introduced into cultivation from Costa Rica. Its flowers are glowing deep orange-scarlet.

The double Orange Amaryllis (H. equestre Alberti) is common in the gardens of Havana, and is frequently found under cultivation in Florida. Its flowers last considerably longer than those of the single form.

Johnson's Amaryllis, the so-called Scarlet Lily (Hippeastrum Johnsoni), is one of our most valuable garden plants. It does not thrive as well in our state as in Texas, at Mobile or at Charleston, but I have seen magnificent clumps, beds, and long borders of it in Orlando. With a little care it will thrive everywhere in the State. The flowers are produced on stems about two feet high, and each stem carries a magnificent umbel of from four to six large trumpet-shaped blossoms. The ground color is a very brilliant cherry-red, and each segment has a distinct white band. It exhales a delicate aromatic fragrance, which becomes quite powerful when thousands of flowers are open at the same time. This is the first hybrid that was ever raised. In the beginning of the last century, an English watchmaker by the name of Johnson, crossed Hippeastrum vittatum with H. Reginae, and the result was this fine Amaryllis, which flowered for the first time in 1810. Thousands of hybrids soon followed, but this is the only one which has held its own—"the survival of the fittest." It is so beautiful that it should find a place in every garden in Florida.

Hippeastrum Reginae is said to be a native of Mexico and the West Indies to Brazil and Peru. I have not succeeded in obtaining it from its native wilds. A bulb received from Europe about ten years ago has only formed two offsets so far. It grows well and flowers regularly each year. The color is a glowing scarlet, with a greenish-white star. My plants are evergreen.

H. vittatum exhibits funnel-shaped, slightly fragrant flowers. The ground color is pure white, with broad white bands, which are bordered on each side by a very distinct purplish-crimson stripe. Its native home is in the rather dry regions of the Andes of Peru. This species grows much better in California than in the humid climate of Florida, and most of the Amaryllis hybrids, have originated in the former state, are productions of this species. No other species has been used so much for hybridizing purposes in bygone days. Very beautiful forms were frequently obtained. They were, however, weak growers. They had small, long-tubed flowers with narrow segments, and the form was invariably imperfect. For this reason, neither the species nor its hybrids are used any longer by the best plant-breeders. I have abandoned its use long ago.

The Funnel-shaped Amaryllis (H. solandri florum), I have received repeatedly from Caracas, Venezuela. It is deciduous, like the last-named, and grows abundantly on the grassy plains or llanos. The color is greenish-white and the tube is about ten inches long. It exhales a very strong fragrance.

H. solandri florum conspicuum. This is one of the most beautiful Amaryllis in existence and deliciously fragrant. The flowers are long trumpet-shaped, somewhat reminding one of the Easter Lily; and its stems, which carry a magnificent umbel of from six to eight flowers, grow three to four feet high. The ground color varies from pure white to deep pink, striped and lined with deep purplish-red, and suffused a little with scarlet. It is much superior to the type. Some years ago a friend of mine in San Jose, Costa Rica, whom I had asked to keep an eye on the different wild and cultivated forms of Amaryllis in Costa Rica, informed me that only H. vittatum was growing abundantly in the gardens. He sent me at the same time a few bulbs. When opening the box, I saw at once that it could not be H. vittatum, as the bulbs were of different form, and they were covered, moreover, with deep brownish-black tunics, while in H. vittatum they are light grayish-brown. When the bulbs began to bloom a few weeks later, I recognized them at once as the above-named variety. A little later I received another lot of a hundred bulbs, which are now growing beautifully here in my garden. I have used them largely in my hybridizing work, with the following points in view: first, to introduce vigor and strong growth into my strain; second, to make my Amaryllis hybrids fragrant; and third, to obtain a more numerous flowered umbel. After having accomplished this, I never used the variety again. The first and second generation of seedlings had comparatively long tubes, but in the third, the wide open form and the short tube predominated. I still grow this Amarillis, however, for its own sake, and I always greatly admire it when in bloom. The long blunt leaves have a decidedly glaucous green color.

The Parrot Amaryllis (H. psittacinum), from southern Brazil, is not a gorgeously colored species; but it has been very fruitful in the production of first-class hybrids. The celebrated hybrid, "Empress of India," raised by De Graaff Bros., of Leyden, Holland, one of the parents of the new race of show Amaryllis, was raised from this species. The tube is very short. The ground color is greenish-white and all the segments have a crimson edge and a green keel, with crimson stripes radiating from the keel. At one time, common in cultivation, it is at present difficult to obtain true to name. It grows vigorously in Florida, and is very interesting.

H. rutilum is perhaps the most common Amaryllis in the forests of southern Brazil near Rio de Janeiro, Sao Paulo, etc., branching out in a number of very beautiful and distinct varieties. All are stoloniferous, producing numerous blind offsets around the base of the bulb, which may lie dormant for years. In the type the flowers are bright crimson with a green keel extending half-way up the segments. In Milwaukee, where the Amaryllis belongs to the most popular house plants, I frequently noticed a beautiful bright yellow Amaryllis suffused with orange. It was even more common than Amaryllis Johnsoni. I frequently saw specimens with 10 to 20 flowers all open at the same time. These specimens usually flower twice a year and the bulbs multiply rapidly by offsets. This Amaryllis proved to be H. rutilum fulgidum, from southern Brazil. I procured a few bulbs and planted them out in my Florida garden, where they soon formed imposing specimens. A former Floridian, a graduate of Rollins College, now in the employ of the Brazilian Government as a horticultural expert, Prof. Adolf Hempel, sent me another beautiful variety, H. rutilum equestriforme, a very strong growing kind. The flowers remind one somewhat of an Orange Amaryllis. There is also a yellow form, H. rutilum citrinum, and a saffron colored subspecies, H. rutilum crocatum. These two forms, which would be very important for hybridizing purposes, I have not yet been able to add to my collection.

H. aulicum, the Lily of the Palace, and its fine variety, H. aulicum platypetalum, are natives of the Organ mountains, Brazil, where they grow abundantly among old rotten wood in shady places. Another still more floriferous variety, H. aulicum robustum, comes from Blumenau, southern Brazil. They all have beautiful glossy evergreen leaves, and all flower about Christmas or New Year's time. The form of the large, widely open flowers is rather unsymmetrical from a florist's point of view, and the color is a deep, dazzling crimson, very glowing and rich. My first attempt to grow these plants in the open proved a failure. They need a rich vegetable soil, and a liberal supply of old, well rotted cow-manure. As they all are evergreens and flower in winter, they also need some protection. I now grow them in beds surrounded by boards, so as to be easily covered, when cold weather sets in. The soil consists of half-rotten wood, old cow-manure and black soil from the mucky edge of the lake. In this compost the plants grow vigorously and flower abundantly. When in full growth they also receive a liberal application of commercial fertilizer, preferably bone-meal. This species and its varieties belong to the most important ancestors of our new race of show Amaryllis.

H. Organense, also from the Organ Mountains, is similar to the above, though quite distinct when closely studied. It is a vigorous grower and flowers in winter with H. aulicum. It thrives luxuriantly with the same treatment.

H. pardinum. This exquisite species was discovered in 1866 by the late Mr. Pearce, in the Andes of Peru. It flowered first in 1867, and created a sensation among flower lovers, on account of its fine form and unique coloration. The short-tubed, star-like flowers have a greenish-white ground color, and are profusely and minutely spotted with crimson. Some of the varieties have a decided yellowish ground color and some are, in addition to the spots, flushed with red. This species has opened a new field for the hybridizer. The progeny, however, though of very beautiful form, is of weak constitution. I have used it at first but have finally abandoned it. The influence of this species is still noticeable in many of my hybrids, which are minutely spotted with deep red on a white or pink ground.

H. Leopoldi, Leopold's Amaryllis. This species was also discovered by the late Mr. Pearce, in the Andes of Peru, and it flowered first in cultivation in 1870. It is so beautiful and distinct, so perfect in form and so refined, and its color is so unique and so strikingly gorgeous, that Amaryllis lovers at once placed it at the head of the entire group. The ideal of perfect form and exquisite color combination had at last appeared, and it was used at once in cross-breeding. The very large flowers are short-tubed. The ground color is a beautiful bright red in the center, with a bifid white keel in the lower half of the red, and a large greenish-white throat; the tips of all the segments are white. The beautiful perfect form of our new race of show Amaryllis, their broad rounded segments, and their great substance have been derived from this species. No other species has influenced the progeny in such a decided manner. The grand hybrids raised by James Veitch and Sons, London, the still finer Aigburth hybrids, produced by Robt. P. Ker and Sons, of Liverpool, and the Westorbirt strain of Col. G. L. Holford, the finest of all, were only possible after H. Leopoldi had been introduced. I also used this species largely in my cross-breeding. Many of my hybrids show its influence, not only in form but also in color, though I have lost the species long ago.

The foregoing is a list of Amaryllis which I have grown, and which I mostly still grow. All of the species and varieties mentioned have been used in cross-breeding. Though the blood of H. vittatum has been avoided, it is still traceable through H. Johnsoni, a hybrid of this species and H. Reginae. I have not been able to use H. aulicum, but its blood, nevertheless, flows in the veins of my strain, as I used H. Ackermanni pucherrimum largely in my hybridization work, and this is a cross between H. aulicum and H. Johnsoni.

Though I have cultivated and raised Amaryllis since 1879, I did not start cross-breeding on a large scale before the year 1890. In the year named, I added to my collection a few dozen of De Graaff's best hybrids and many of Veitch's new productions, such as Southey, Enchantress Madonna, Giant, Giantess, etc. Empress of India, a magnificent kind with broad rounded segments, and of a glowing orange-scarlet color with broad white bands, was my starting-point. My aim was to produce a vigorous strain with short tubes and broad rounded segments, of symmetrical form and good substance. The first attempts were very encouraging and the resulting hybrids were far superior to their parents. But the seedlings were very much alike. In order to obtain new breaks of color, I used these hybrids as well as those obtained from Europe, in crossing them with the various species in my possession and vice versa. Finally many thousands of seedlings were growing in my greenhouse in Milwaukee. The first began to flower at an age of three years. I watched their development with a restless anticipation. Most of these hybrids were inferior to one or both of their parents, but new colors were abundant. I only kept a few of the best, and all the rest were discarded. The most beautiful of all were the crosses between the best show Amaryllis and H. Leopoldii. Hybrids between Empress of India and H. equestre exhibited fine orange and salmon-red tints. This cross-breeding and weeding out of all inferior kinds was continued for many years, until the colors were fixed. Since 1900, I have not made much use of the species any longer, only using now in cross-breeding the best of my own hybrids. I also employ frequently, as pollen plants, such English hybrids as have received a first-class certificate or an award of merit from the Royal Horticultural Society of London.

All my hybrids at present combine a vigorous growth and brilliancy of color with a fine open symmetrical form and great substance. The usual size of the flowers of the true species is from five to six inches, in the new race of show hybrids it ranges from seven to eleven inches. They range in color from an almost pure white to a deep glowing crimson, without a trace of any other color. There is rarely a poor flower in a batch of a thousand seedlings. The green star in the center of the tube, so prevailing in the species and the older hybrids, and so objectionable to the florist and exhibitor, no longer mars the beauty of the flowers. It has given place to a pure white or a yellowish tint. The variety of colors is really marvelous in these new hybrids. There are numerous kinds with a deep glowing crimson, a dazzling scarlet or vermilion, a bright orange red and a delicate salmon ground color. Then we have deep pink and deep rosy purple varieties. Most of the brilliant red colors sparkle in the sun as if overlaid with gold-dust. Many are crimson selfs. Others have broad pure white bands; others a white or lemon yellow star. Some of the red hybrids have segments with a pure white edge; others are tipped with white. There are flowers mottled red and white, and a crushed strawberry color is by no means rare. I have obtained a few hybrids with a sulphur-yellow ground color, lined and penciled with red. Some almost pure white ones with a narrow red band around the edge of the segments are particularly valuable and so are other white ones which are densely and minutely freckled with red. I have succeeded in raising quite a number of an almost pure white color, showing only a few traces of delicate red on the segments. These are very effective. Many of my hybrids show the influence of H. Leopoldi in their form and color; having either a deep crimson, a scarlet or even a salmon ground color, with a white star and white-tipped segments. All are evergreen and of vigorous constitution. The leaves are from two to three feet long, and are of a deep green or glaucous green color. When grown in rich soil, they often exhibit deep reddish-brown or chocolate-colored tints. In many varieties, the entire lower part of the leaves shows a deep purplish-brown hue.

This strain of Amaryllis is of very easy cultivation, but in order to do their best, they must have some attention. They grow as well in sunshine as in half-shade; on high pine land as well as on lower soil. On a bed a hundred feet long and three feet wide, three hundred bulbs can be easily planted. Two loads of cow-manure should be spread over this bed, and then it must be deeply spaded. Some clay mixed with the soil will prove beneficial. The bulbs should be planted in such a way that the point of the neck is covered with at least one or two inches of soil. After having finished their flowering, and again in September or October when in full growth, they require either a top dressing or two inches of cow-manure or some good commercial fertilizer, either bone meal or, still better, Painter's Simon Pure garden mixture. If in any way neglected after flowering, the bulbs become so weak that they do not flower the following season. These Amaryllis are gross feeders, but manures too rich in ammonia should be avoided. They rather require foods rich in phosphoric acid and potash.

Hippeastrum Johnsoni is hardy as far north as Washington, if given some protection. In the gardens of Raleigh, N. C. it is a rather common plant. The Orange Amaryllis is much more tender. My show hybrids I think will prove hardy in all the southern states bordering the Gulf of Mexico. They will not suffer by cold if the soil does not actually freeze. They may lose their foliage, but the bulbs will remain unhurt. A large bed of these Amaryllis in full bloom will outrival in beauty and brilliancy all the true Lilies, and most other plants.

All the Amaryllis, and even the Crinums and particularly the Hymenocallis (Spider Lily), suffer a good deal from the ravages of the Amaryllis caterpillar and the lubber grasshoppers. The former often appears in countless numbers on the underside of the foliage. Here they can be easily killed. If left undisturbed they will soon defoliate the entire plant. When larger, they even damage the bulbs by eating into their centers. Usually on March 15, when the Amaryllis are in full bloom, the earliest hordes of lubber grasshoppers crawl out of the ground; at first small and brownish, then black with red stripes on their backs, which change into brighter yellow stripes a little later. They are ravenous feeders from the beginning, preferring the members of the Amaryllis family, particularly Hippeastrums, as food plants. They mar the foliage, eat holes into the flower-stem and greedily devour the flower-buds. A constant vigilance is necessary. They take their meals twice a day—the first right after sunrise, and the second a little after noontime. After having fed, they crawl upon a bush or a small tree where they can easily be seen and killed. The young ones are gregarious. In dense masses they alight on slender stems where all can be killed with one stroke. After two and a half months have elapsed, they again change color. This mature color is a yellowish gray. Their wings are short and red. Being very clumsy in their movements, they are easily caught and killed. It is surprising how much damage a full-grown lubber grasshopper can do. Ismenes and Eucharis Amazonica, as well as the beautiful and deliciously fragrant Hymenocallis macrostephana, H. fragrans and H. speciosa are perfectly at home in our garden; but on account of the lubber grasshoppers it is scarcely possible to enjoy their flowers or the beauty of their luxuriant foliage. Hand picking is, as far as I know, the only way of getting rid of these two pests.

The late afternoon hours of spring, summer and autumn in Florida have an indescribable charm, a charm peculiarly their own, and the early morning hours are scarcely less enchanting. This is the time to enjoy nature, to enjoy our gardens and flowers. In the evening glow or very early in the morning, I am fond of wandering through my Amaryllis and Caladium garden to meditate on the ineffable glory of nature, to think of my ideals and of all that makes life beautiful. How charming is this Florida evening glow as it falls on the brilliant blossoms of the Amaryllis or on the gorgeous leaves of the Caladiums! In the cedars near by, the cardinal sings in jubilant notes its evening hymn, the mockingbird pours forth its unrivaled melodies from the top of an orange-tree, and the loud whistling calls of the chuck-will's widow resound from the thickets of near woodlands. It is twilight. The air is wonderfully soft and salubrious, and the bright stars appear and shine as they only can shine in Florida—the land of flowers, the land of my ideals in horticulture.

PLANTING FOR HOME ADORNMENT.

By W. C. Steele.

Mr. President, Ladies and Gentlemen:

When I was notified that I had again been appointed as a member of the standing Committee on Ornamentals, I felt that there was nothing which I could say that would be worth the time which it would occupy.

So many able committees have already made reports covering the entire subject that it did not seem that there was anything left for me to say.

After some study, I thought that I would recommend the planting of native trees for home adornment; but that would leave out some things which I wanted to mention, therefore, after changing my plan several times, I finally settled upon the title given at the head of this report, which will admit of the introduction of anything which can be made useful for the purpose.

Those of you who heard President Taber's address to this Society at the meeting in May, 1905, or who read it as printed in the annual report for that year, will remember the eloquent tribute which he gave to the beauties of the natural growth in a thicket near his home. It is a fact, greatly to be regretted, that the American people do not appreciate the beauties of the natural growth around them. If they can get something which has been imported at great expense, they will buy it at a high price, when the woods are full of much more beautiful things which may be had for the trouble of going after them and digging and bringing them home.

I am a believer in the use of native plants so far as possible, not to the exclusion of the many beautiful and desirable foreigners which have come to stay, but rather to supplement them, or to take their place around many homes where the expense of these foreign beauties cannot be afforded.

Of course, the evergreens stand at the head, the list including Magnolia grandiflora and Magnolia glauca, the latter being known as Sweet Bay. Both are indispensable where the space can be spared to allow them the room needed for proper expansion. To them I would add the Hollies, the common species Ilex opaca, is so well known that it needs no farther mention, but it may not be so well known that there are other species, Ilex Dahoon and I. cassine which are quite as valuable and are even more showy, when in fruit, as the red berries are borne in greater profusion.

It is often desirable to have a tree during summer where shade is not wanted in winter, a deciduous species is much more desirable for such a situation.

One of the best, if not the very best, of our native species is Acer rubrum, the soft or swamp maple. It usually blooms in February or early in March, but this year it blossomed in January. A single flower of this tree is small and inconspicuous, but a large specimen covered with clusters of blossoms, which are found at the end of every twig, is very showy and attracts a great deal of attention. The flowers are bright scarlet and the seeds as soon as formed, and until ready to drop, retain the same bright color. The only objection to it, is the fact that it produces large crops of seed which drift a long ways when the wind blows hard and as they germinate readily they become a nuisance, unless there is a drouth at the time when they fall. Although this maple is a native of swamps and low land, its common name being swamp or soft maple, still it will grow well on dry soil if it is not too poor.

Probably the next most desirable native deciduous tree for ornamental planting, is the Sweet Gum, Liquidambar styraciflua. Like the maple described above, it is found naturally, in swamps or moist land, but it still more easily adapts itself to dry land culture and is not so dependent on rich soil. It is one of the most symmetrical trees that we have, when allowed space in which to develop itself properly. In autumn it shows the most brilliant coloring of any of our native trees. Although it is a deciduous species, it retains its foliage later than most species; often the old leaves hang on until pushed off by the swelling of the buds as the new leaves open. Occasionally the same thing happens with the soft Maple. I had a small maple this season which retained much of last year's foliage on the upper twigs, when the lower part of the tree was in bloom, and a few still hung on when the seeds were grown and the new leaves were more than half grown. I have more than a dozen of these trees on the place, and this spring was surprised to notice that there was a great difference in the time when they opened their leaves; on some the leaves would be almost grown, while on others not forty feet away, on exactly the same soil, the buds were but little more than fairly open.

While on this subject of curious variations in the habits of growth of trees, I will call attention to a fact which may or may not have been noticed by you. All evergreen trees shed their leaves, but usually it is done so gradually, while the new ones are coming, that it is not noticed. This year some Magnolia glauca trees near my house shed their leaves so nearly all at once, that they were quite bare and looked for a time like deciduous trees; it happened just as the first flowers were opening, and their almost leafless branches showing here and there scattered blossoms were a striking contrast to their usual appearance.

Another plant, also a native, which is usually classed as a shrub, but which can easily be grown as a small tree, is the common Elder, Sambucus Canadensis. At the north it is called a weed, but here it is an evergreen shrub or small tree and is almost everblooming. A specimen on my own place trained to a single stem, stands between eighteen and twenty feet high with a trunk over six inches in diameter. It is seldom out of bloom, except for a short time in the coldest weather of winter. During the summer it usually has flowers and fruit of all sizes from that just formed to fully ripe berries, though the latter are soon taken off by the birds.

Vines, especially woody perennials, are always favorites with all flower lovers. Three native hardy climbers are worthy of special mention. Bignona capreolate sometimes called Cross-vine, is perhaps the most showy in the early spring. The individual flowers are rather dull red in color, but when you come to a large oak literally covered with a sheet of Bignonia capreolata blossoms, it is a sight worth going miles to look at. I have good-sized oaks when there was hardly a leaf visible so thoroughly was the top covered with the bloom of this vine.

Tecoma radicans, usually catalogued as Bignonia radicans, is another vigorous growing native vine; the flowers are scarlet, a much brighter color than those of capreolata, but it is not so profuse a bloomer at one time; that is, while it may produce as many blossoms in a season, yet as they are scattered over a period of several weeks, instead of all opening at once, they do not make so great a display. Bignonia capreolata is found in high hammocks on dry soil, while Tecoma radicans is generally found in cypress ponds; but, like many other natives of low land, it easily adapts itself to circumstances and will grow well on high land, if not too poor.

Last, but by no means least, I will mention the Yellow Jessamine, Gelsemium sempervirens. The wild species is so well known that I should not mention it at all, were it not that I wish to call attention to the fact that the double-flowered form is much more desirable than the single. It is not quite so profuse a bloomer as the wild form, or at least it does not show as many at one time, but as the blooming period is much longer, it may produce as many in a year. Last fall my double-flowered vines began to bloom in November, and kept it up until the latter part of February or the first of March.

So far I have confined myself to native species which anyone can have for the trouble of going into the woods and digging them; the last mentioned is an exception, it is not offered, so far as I know, except by the P. J. Berckmans Nursery Company of Augusta, Ga., and they will not send any plants by mail. I hope that some of our Florida nurserymen will propagate and offer for sale this very desirable variety.

Three years ago, Mrs. Gates, in her report on Ornamentals, recommended a wild vine, a species of Smilax, very highly. I do not think that she said a word too much in its praise. Unfortunately she did not know its botanical name, nor have I been able to learn it; it is a wild Smilax and that is all that I am able to tell as to its name; but I can tell you how to find it. If you will watch the hammock woods very closely, in early spring, until you find a vine that is a strong, vigorous grower and bears a profusion of small greenish flowers which have the fragrance of Mignonette only intensified, that is the one for which you are looking.

While on the subject of vines, I want to recommend some which are not natives and therefore must be purchased or procured by exchange with some neighbor. Foremost stands Rhynchosperum Jasminoides, sometimes called Star Jessamine, although it is not at all related to the Jessamine family. The vine is a strong, vigorous grower, perfectly hardy throughout this state, and for several weeks in early spring it covers itself with a sheet of pure white, very fragrant blossoms; the flowers are so thickly set on the branches that the foliage is hidden from sight. The only objection which I have ever felt towards this vine was that in the evening the perfume is so strong that it is almost overpowering. If you are at all sensitive to strong odors, do not set this vine very close to the house.

Bignonia speciosa, Bignonia Thunbergiana, Pithecoctineum clematideum, usually catalogued as Bignonia alba, and Pithecoctineum Kayense (?); the last name was given me provisionally by the Missouri Botanic Garden from specimens which did not reach them in very good condition. These four species are all hardy, are vigorous growers and bear a profusion of beautiful flowers in the spring. When I say that they are hardy, I mean throughout the orange belt; they will not stand an indefinite amount of cold, but have not been killed on my place for several years.

Ampelopsis tricuspidata, the A. Veitchi of the catalogues, and commonly called Boston Ivy or Japanese Ivy, is perfectly hardy, but not evergreen. This vine has every desirable feature for a screen, except that it sheds its leaves in winter. In some situations this is not a drawback and for such places no better plant can be found. The north-east end of my house is covered from the ground up to the roof by this vine, except parts of two windows which it is difficult to keep clear enough to allow the light to enter. The light green leaves are so close, lapping like shingles, that no rain can reach the siding during the summer. When the wind blows strong, from either side, the foliage moves up and down like waves of water.

Another climbing plant which I have tested quite thoroughly, deserves to be more generally cultivated. I refer to Gloriosa superba, the climbing Lily, this plant is a member of the true Lily family, and is so gloriously beautiful that it well deserves the name Gloriosa. The flowers are perfect Lilies in form and when fully developed are a rich scarlet in color. The opening buds are a greenish yellow, which changes to pure yellow and then to scarlet. No lady who has ever seen it on my place has failed to express great delight at its wonderful beauty. The plant is an herbaceous perennial, the bulbs live over in the open ground without any protection, coming up year after year.

One caution is necessary; when growth starts be careful that the tip of a shoot is not broken off, for if it is, then all growth stops. Most plants will sprout from the axil of a leaf, if the end is broken off, but the Gloriosa never does.

My subject is a fascinating one, and when I begin I hardly know where to stop. There are so many plants worthy of cultivation which are but little known, that it is difficult to know what to mention and what to leave out. Probably the best plan will be to stop right here and tell you to study the uncultivated lands around you; you will be surprised to find how many beautiful things are growing there which are unknown to you.

THE COMMERCIAL SIDE OF THE FLOWER GARDEN.

By Mahlon Gore.

Mr. President, Ladies and Gentlemen:

Horticulture, as a commercial asset, should not be underestimated. With us, who are interested in this Association, horticulture, in its refining and elevating influence upon the human family, is no less valuable. We seldom see a real lover of flowers who is coarse and vulgar in his nature. How many of us can trace our first noble impulses to Mother's flower garden? How many of us plucked flowers from that garden with which to win the smiles of our chum's coy little sister? Babies love flowers and are attracted by their beauty and fragrance. We ornament our houses and our tables with them; we bedeck our bride with flowers, and we place flowers on the graves of our departed loved ones.

The flowers of Florida have already attracted thousands of visitors who, later on, have cast their lots with us and are now counted among our most desirable citizens. "There is a use in beauty," and nowhere is the adage exemplified with more force than among horticulturists. And still we do not make the most of these gifts of the Creator in adding to the attractiveness of our homes and our state. As a purely business proposition I believe that we might add twenty-five per cent. to the commercial value of our possessions if we would give sufficient time and attention to the cultivation of flowers and ornamental plants and shrubs. What is of more value still, would be the added charm of home to our children; their greater interest in and love for home, and the refining effect upon their developing intellects. The boy who loves flowers to such a degree that he will delight to cultivate them, will find little time to spend in the saloon, and will have little inclination to go there for amusement.

We old men know that the girl who cultivates flowers for love of them is far more lovable than her sister whose chief delight is matinees and social excitements, although these last are not to be tabooed by any means, for they give the girls the opportunity to add to their own charms through dainty floral adornment.

We all love beauty, and we are richer in mind for this love. We might be richer in purse if we would devote more time and attention to aesthetic horticulture. I believe that one hour a day on the part of each member of this Association, devoted to the cultivation of flowers and ornamental plants, for the period of five years, would add one hundred thousand intelligent, refined people to the population of Florida. Every city and town in the state should vie with all the others in adding to its attractions for new settlers. The competition should be sharp, determined and continuous. Each home should have its floral gem of a flower garden. Each resident should try to outdo his neighbor. Each town should try to outshine all of the rest. Every country home should have its little ornamental park.

With such a state of things, Florida would be the most charming state in the

Union, the most talked-about, the most thoroughly and favorably advertised spot in all the world. This is no flight of fancy. It is easily within our reach if we but wake up. I would make the work State-wide; organize floriculture associations in every community, with floral exhibits at each monthly meeting; study landscape gardening and floral and plant effect; and, finally, forever end those oft-heard and oft-repeated expressions of disappointment indulged in by tourists and visitors over the fact that "there are so few flowers in Florida."

Irrigation.

By Francis L. Wills.

Mr. President, Ladies and Gentlemen:

In reply to your letter asking me for a paper on irrigation, would say that we installed our irrigating plant on this grove in April, 1905. The plant consists of a twenty-horse-power, White-Blakeslee gasoline engine and a No. 4 Rumsey Improved Rotary Pump, located in a house thirty feet from the pond and about two hundred feet from the grove. The pump has a five-inch suction and a four-inch discharge giving two hundred fifty gallons of water per minute; we have a four-inch main pipe, running the entire length of the grove, every 150 feet; laterals branch off from the main, running the entire width of the grove; the laterals start out with two-inch pipe, running down to one-inch pipe, at the extreme end.

Our stanchions consist of a three-quarter-inch pipe, with a hose valve on top, and are 150 feet apart throughout the entire grove. When irrigating we use 100-foot sections of three-quarter-inch hose, connecting one end to the stanchions and the other end to a six-foot piece of three-quarter-inch iron piping, drawn together and sharpened at one end to stick into the ground with a tee and nipple for hose connection eighteen inches from the bottom, the top fitted with a three-quarter-inch brass Magowan Spray, the stanchions when running throw a spray that will cover thirty feet and we move the stanchions from one middle to another, until every middle has been thoroughly wet down.

We usually run twenty stanchions at a time and leave them standing in each middle forty minutes, thus giving each middle or tree 480 gallons of water, which I think is equal to a little over three-quarters of an inch of rain.

We have made it a practice to irrigate the grove whenever the moisture sinks three inches below the surface. summer or winter, during the months of March, April and May we run an Acme Harrow over the grove as soon as it is irrigated. During a drouth we find it necessary to irrigate once every two or three weeks, harrowing the grove once every week; this keeps a good moisture under the sand mulch at all times.

We have under irrigation thirty acres of grove.

The plant, as I have described it, cost us a little over $6,000 and as yet, the plant being new, we have not had to lay out anything for repairs. I run the engine myself and have one man at $1.50 a day to move the stanchions from place to place.

The engine consumes practically twenty-five gallons of gasoline, running from nine to ten hours a day, and it takes practically two days to irrigate ten acres; so I calculate that to irrigate ten acres costs—

My time nothing	$ ...
One man	3.00
Gasoline	10.00
Incidentals, such as oil, washers, waste	.60
Total	$13.60

This does not include wear and tear on machinery.

When irrigating in hot weather we start our engine up as soon as it is light enough to see, and run it five hours; then we start up again in the afternoon at three and run until seven. The first year we irrigated we ran the engine steadily from daylight until dark; but I became convinced that it was not a good plan to throw water into the grove in the heat of the day. Of course, it would be much better to irrigate at night rather than the day, but this is not practical, as I have yet to find men who will drag hose around through the grove in the dark.

Some say it is a question whether or not irrigation pays. All I can say is that our trees look well and we seem to get a pretty fair crop of fruit each year.

By J. W. Hoard.

Mr. President, Ladies and Gentlemen:

To the tourist or winter visitor, Florida presents a most beautiful picture or panoramic view of flowers and sunshine; of magnificent and extensive evergreen forests, dotted here and there by beautiful lakes whose waters are as clear as crystal, and as pure and sparkling as the morning dew. He is delighted with our glorious climate, our orange groves laden with their golden fruit, and our truck farms embracing broad acres of growing vegetables. He is impressed by the scenes of nervous activity and evidences of enterprise and prosperity on every hand, and especially in and around our packing houses during the shipping season. He hears and reads of vast sums of money being made by the fruit and vegetable growers in various parts of the state. He is delighted with all he sees or hears, and, in fact, it seems to him that Nature has almost exhausted her resources in making of Florida a veritable horticulturists' paradise, leaving nothing to be desired which could in any way contribute to his happiness or success. And from his standpoint the tourist is right in his conclusions. Florida is a grand state, possessing many natural advantages and horticultural possibilities for which we hereby express our thanks and gratitude to the One from whom all such blessings must come. We all love our Florida and appreciate her many natural advantages and also those which have been brought about by the efforts of her enterprising citizens; and our hearts are bound to her by invisible and mysterious ties which we cannot possibly understand nor explain and which grow stronger as the years go by.

But, at the same time, those of us

who have spent many years here, and have on several occasions seen the smiling features of our fair state disfigured almost beyond recognition by natural causes, are forced to admit that Florida also has several natural disadvantages, among which may be mentioned the poverty of the soil, unexpected visits from Jack-frost in winter, the insufficiency of rainfall during the growing season, and a pretty good supply of insect pests of all of the leading and up-to-date varieties; and one or two other disadvantages from which nature is not responsible, viz.: the high freight rates and poor services imposed upon us by the railroads.

Some of these adverse conditions have been overcome by artificial means, and most of the others can and must be, or the horticultural industry will be overcome by them; and as I understand it, one of the principal objects of this Society as a body, and of each member as an individual, is to give each other the benefit of whatever knowledge or experience we may have gained in our attempts to meet and overcome any one or all of these difficulties.

The problem of poor soil has been solved to the satisfaction of all concerned by the fertilizer manufacturers of the state, who have placed within our reach, in convenient and available form, all of the necessary elements of plant food so essential to plant life, and in which our Florida sand is so deficient; thereby enabling us to not only make two blades of grass grow where only one grew before, but even making it possible for us to grow good crops of fruits and vegetables where nothing could grow before; thus, in my opinion, placing the fertilizer manufacturer in the front rank of public benefactors. The Florida Experiment Station and also the United States Department of Agriculture have given and are still giving us valuable information along the line of insect extermination, by sending to our assistance specialists of the highest order, men specially trained and fitted for this kind of work, who are industriously devoting their time and talents to scientific investigations and experiments along these lines. It has been my privilege to become acquainted with several of these gentlemen during the past two years and make myself somewhat familiar with the work they are doing, and it gives me pleasure to say to this Society that they are meeting with success and are getting results which could never have been obtained in any other way and which will be of inestimable value to the horticulturists of Florida.

We look to the Railroad Commission, to the Inter-State Commerce Commission, and the Florida Fruit and Vegetable Growers' Protective Association, for reduced freight rates and better transportation facilities.

So with all of the other problems disposed of, we now come to the question of irrigation. This scarcity of rainfall during the growing season, just when rain is most needed, is, in my opinion, the most serious difficulty with which the fruit and vegetable grower has to deal. It causes him more disappointments, more heartaches than all of the others combined; it sours his disposition, causes him to grow old before his time and, in fact, at times it causes him to almost doubt the existence and guidance of an impartial and all-wise Providence.

These conditions have been gradually growing worse for the past two or three seasons, until at the present time irrigation, which is, of course, the only remedy, is regarded as an almost absolute necessity. A good many growers who happened to be favorably situated as to water supply, who were sufficiently informed as to what kind of irrigation they needed and had the means to pay for it, have put in irrigating plants which are working successfully and which have made their owners independent of rainfall. But most of these plants have been installed at an expense which places them out of reach of the orange grower, one of my neighbors having just completed a plant which cost him over $10,000.00. It consists of one mile of six-inch wrought iron pipe, enough smaller pipe to form a complete network under his grove of about 120 acres, and a rotary pump driven by a fifty-horse-power engine. The water is delivered through patent sprinklers which are placed in the centre between each four trees; he can run forty of these sprinklers at once, thus watering forty trees at one time.

This kind of irrigation is all right for those who can afford it, but is beyond the reach of about ninety-nine per cent. of us, and for this reason it is not necessary for me to enter into a detailed description of it at this time. What is needed is a system of irrigation which can be installed at a cost within the reach of the average grower of limited means and yet of sufficient capacity to meet all of his requirements.

For the past eight years I have had charge of the property of Chase & Co. at Waco. This property consists of the famous Isleworth groves and nurseries and, incidentally, an extensive irrigating plant of about the same capacity in gallons of water as the one above mentioned and costing about one-eighth as much. I have visited and made myself familiar with the workings of irrigation plants of nearly every kind or system now being used in our part of the State, but for handling vast quantities of water at the least possible expense, which is, of course, what the grower of limited means wants to do, I have never seen anything to equal our plant.

A description of our pump and method of distributing the water over the grove will be found in the report of last year's meeting, but for the benefit of those who may not have been present at that meeting I will give a brief description here. The pump consists simply of a square box two feet in diameter inside and about eighteen feet high, or about six feet above the highest point in our grove. This box stands one end in the edge of the lake, where water should be two to three feet deep. Through the center of this box, from top to bottom, there is a steel shaft, with a water wheel on the bottom end; another one of the same kind in the middle and a pulley at the top for connecting with the engine. This bottom wheel, by being revolved at a high rate of speed, lifts a column of water two feet square, up to the upper wheel, which catches it in the same way and carries it out at an opening near the top of the box, and just below the belt and pulley. In case of a higher lift being required all that is necessary would be to increase the length of the box and shaft, put in another water wheel about seven or eight feet higher up, put on more power and go ahead. From the top of the pump the water is conducted across the middle of the grove through a ten-inch terra cotta pipe; thence from this ten-inch main to either side of the grove through a five-inch galvanized-iron pipe of about the thickness and weight of small stove pipe and connected up in the same way, but in sections ten feet long.

Our pump will supply about four of these lines of five-inch pipe at one time; sometimes in case we are short on piping we run one or more of these five-inch openings in furrows. This running water in furrows in Florida sand has always been theoretically impossible, but we have proved beyond question, by actual experience, that it works very successfully indeed; and, in fact, I consider it one of the best, if not the very best, method now being used; and I would especially recommend it to vegetable growers. We can fill four or five furrows from each opening in our ten-inch main, and by using the furrow system exclusively we can have about twenty furrows 600 to 700 feet long running at one time. This will give you some idea of the capacity of our pump, and also give you an idea how effective this system would be in irrigating vegetables. The imagination of the trucker could not possibly conceive a more pleasing picture than to go out some evening about sundown and find twenty little rivers of cool, fresh water flowing gently down between twenty rows of his withering vegetables.

I had, as the title of this paper suggests, intended giving quite an extensive collection of facts and figures as to cost of irrigation supplies of different kinds, but as I believe this part of the subject will be more thoroughly and ably covered by Mr. Skinner, I will only give a few points along this line in connection with this particular system of irrigation.

The pump we are using is known as the Menge pump and is manufactured in New Orleans at a cost of about $150 at the factory. The terra cotta piping of various sizes can be had at about the following prices, delivered to different parts of the state:

10-inch	25 cents per foot
8-inch	17 cents per foot
5-inch	10 cents per foot
4-inch	8 cents per foot

The five-inch galvanized pipe comes at about ten cents per foot, delivered. For locations where lake water is available, and the lift not more than fifteen feet, there is nothing better nor cheaper than the Menge rotary pump. For higher lift I would recommend a centrifugal pump, which will not only lift the water but also force it to any height up to about thirty-five feet.

The capacity and cost of these fourteen pumps range about as follows: A pump with a capacity of 100 gallons per minute will cost about $110; 450 gallons per minute, $210; 1,000 gallons per min., $360; and others, large or smaller in proportion. A pump furnishing 600 gallons per minute will cover one and three-tenths acres one inch deep in one hour, or 13 and one-fifth acres one inch deep in ten hours.

1,000 gallons per minute will cover two and one-fifth acres one inch deep in one hour, or about twenty-two acres one inch deep in ten hours. One inch of water over an acre or, in other words, one inch of rainfall, will wet thoroughly six to eight inches of perfectly dry Florida sand.

By L. B. Skinner.

Mr. President, Ladies and Gentlemen:

I received a letter from Prof. Rolfs asking me to give a little talk on irrigation. I am always ready to talk on irrigation, but I was not posted as to what special branch of irrigation I was expected to talk on, until I came into Gainesville.

My experience has been entirely with what is called the sprinkling system. When I first had an idea of taking up irrigation, I felt that I had to take it up if I were going to grow oranges as a business and make a success. Of course, the first question that came into my mind was, where to get the water. There were only two ways: from a pond and from a well. I spent a little time going to see the irrigating plants through the state, and among them was one of Mr. Adams of Thonotosassa. His struck me as being the best I saw. It consisted of large pipes with small mains connected with them, running to different parts of the grove. From these laterals were standpipes to which the hose was attached. By using the hose he was able to get along without using so much iron pipe. To the hose were attached the McGowan sprinklers, which he considered the best in all respects. They throw a large amount of water and throw a very fine spray with plenty of force all over between the trees. It struck me as being the best and most successful system I had seen, and he had a fine crop of fruit from his grove.

At that time, iron pipe was beyond my reach, and I investigated the advisability of using cement pipe. The best iron main will cost thirty-five and forty cents a foot for four-inch pipe. I think a six-acre grove irrigating plant with steam pump and boiler, iron pipe, etc., will cost in the neighborhood of $1,000.00. I had plenty of muscle, time and some labor. I investigated the cement pipe and made up my mind that it would do. I bought a machine and a car of cement and went to work. We turned out lots of pipe; I now have about 35,000 feet of that cement pipe. It has cost from three to six cents a foot; generally about four cents; but there is no time to stand around when you make it at even four cents. I think you can possibly make it at an average of five cents.

You dig your ditch and put your machine right in it, and make the cement pipe as you go along, cleaning out your machine when stopping at noon or night and starting again. I tried to make a solid joint by pressing the cement together with my hands about the core of the machine, but found that it would not do. When I put on my power, every joint burst and there was trouble right away. A gentleman who has made and uses this pipe told me that though the weak places in his cement pipe had broken, he had patched them until the pipe was all right. I began to find that there were weak places and fixed them up by this method. When I stopped making the pipe at any one joint, I set the machine down in the ditch farther along and went on, leaving that gap. Afterwards I put the machine on the ground and made some pipe for filling these gaps and sawed it into the proper lengths (you can pick up five or six or seven feet) and set it in the section. Then I set the right length into the gap and wrapped some wire loosely around the joint; then took some cement well mixed and spread it around and in the wire completely. That joint will never break. Just wind some wire loosely around it and fill it in with cement, spreading it quite liberally, and it will answer every purpose. Any small wire will do; I generally use small, galvanized wire.

We generally put in the hydrants the following morning after the cement pipe is made. Scrape the top of the cement away so as to give a new surface. When you are running your irrigating plant and the hydrants break out, by using this wire plan, winding wire around again and again loosely and filling it up with cement, it will be tight and ready for use on the following day.

I find this cement pipe very satisfactory. I have tried the McGowan nozzle. It has a little small top that screws down to regulate the amount of water. Sometimes it is screwed down too tight and sometimes too loose and you are apt to have trouble if you don't look after it pretty carefully. Cement pipe will stand a good deal of pressure, but not as much as iron pipe. You have all heard the story of the man down at the Tampa Bay Hotel, who had a big head on him the morning after a festive evening. The manager took one of our finest Florida grapefruit and fixed it up with a little ice and sugar and a little French brandy and gave it to him. Pretty soon the man came down and asked for his bill and said, "I am going to New York to tell the boys, 'Eureka, I have found it.'" The Cactus sprinkler affected me very much the same way. When I saw it I felt like exclaiming, "Eureka, I have found it and must tell the boys." From a four-inch pipe I have seen it throw the water in a circle thirty-five feet in diameter, wetting it well in just a few minutes. It puts water on in the finest kind of spray. They are very simple and last a long time. There is only one that is any good for our irrigation, and that is No. 10, one-inch size. It will put on lots of water and in fine shape and at low pressure.

In the above system of iron pipe, the laterals are of two-inch pipe from a four-inch main. It waters about forty acres and costs about $3,000.00. To fix it up with cement pipe it would cost about one-third as much. The Chase & Co. system at Lake Butler, where there is an ample supply of water, is the cheapest plan there is, but you must have unlimited water. If your water supply is unlimited, you can take terra cotta pipe and the Mean's pump and throw a world of water on the ground, but where you have a limited amount of water and the ground is not situated where you can make the water flow, I think the cement system with Cactus sprayers is the best and cheapest system I have even seen.

DISCUSSION.

Dr. Inman—How far under the surface do you lay the cement pipe?

Mr. Skinner—Twelve inches.

Dr. Richardson—What is the name of the sprinkler of which you speak?

Mr. Skinner—Cactus Lawn Sprinkler, No. 10. They are made by the Phrenger and Hanger Company and are for sale by the Baird Hardware Company, Gainesville, who are the state agents.

The most perfect system of irrigation for vegetables that I have ever seen is at Sanford. It is a revelation. Their system of irrigation with artesian wells is really marvelous.

Mr. Rose—I am not well acquainted with the Sanford system. As Mr. Winters has described it, there are varieties of the same system. There are admirable systems where the tile is perfectly laid; where the irrigation where needed is perfect and drainage where wanted is perfect. The greatest trouble is that the fields frequently get more water than they want and their plants take diseases and die.

Mr. Skinner—The place I visited specially, had the tile so arranged that the gardener could draw the water off. I was told by Mr. Chase and some of the men who lived there, that in former years water would stand all over the country, but now the drains are all open, and when the artesian wells are shut off by the gate valve, the water flows off in a few hours.

The men who had the best fields had level fields.

That system has gradually grown up by their needs and their wants, and it certainly has served their purpose. It certainly has proven a great success. I do not believe I have seen so many new homes going up in Florida. Men who used to get two dollars and three dollars a day are now getting thousands a year, easy.

We all agree that with plenty of fertilizer, plenty of water when we want it, and a way provided to carry off water when we do not want it, there is no place on earth that will blossom like Florida.

Shipping and Growing of Vegetables.

By N. O. Penny.

Mr. President, Ladies and Gentlemen:

I am called on at this meeting for a paper treating on the growing and shipping of vegetables,—a large and an important subject, one that not only requires, but deserves a great deal of thought; and unfortunately for me one that I am not as familiar with now as one should be when preparing a paper.

It is now several years since I have had any active experience with the vegetable business, and accordingly I shall only give you some of the conclusions arrived at at that time together with my observations since.

I have no apologies to offer for knowing so little about this subject. I am simply here with this paper because I am called upon, and I feel that it is the duty of every citizen to respond when called upon to the best of his ability, and that is what I am now doing.

The demand of our markets is for strictly fancy produce as well as fruits and it is only by catering to this demand that the grower is able to make money. Poor and inferior stuff seems to be a drug on the market at any price, a thousand crates of fancy goods will sell before one of inferior grade.

Among the most successful practices seems to be that of irrigation and drainage. There does not seem to be any standard for water supply, some are using windmills, others artesian wells, while still others are using gasoline engines and pumps. The locality and source of supply seem to be the determining features. As far as we can learn results are good from all, but probably the least efficient is the windmill, which I think is being gradually superseded by the gas engine, especially so where large quantities of water are required.

Drainage also appears to be one of the fundamental requirements. It appearing to intelligent growers that if we cannot depend on Dame Nature for water when we need it, neither can we depend upon her not to send us more than we need, and growers find that a flood is as bad as a drouth.

Drainage is usually accomplished by means of open ditches and underdrains, I believe that the most approved practice is in having the system so arranged that they can be used for both irrigation and drainage at the will of the operator. The grower can then protect himself in either a wet or a dry time.

More attention is being paid to intensive culture, intelligent growers find that one acre properly cared for will produce more than two indifferently cultivated, and at the same time there will be a larger per cent. of that most important essential fancy quality.

A great deal of attention is also being paid to the use of fertilizers, and it is not uncommon for growers to use two and three thousand pounds per acre where but a few years ago it was only customary to use that many hundreds of pounds. This is not becoming necessary on account of any impoverished condition of the soil, but growers find that it is a paying investment, one that pays very large dividends.

There also seems to be a tendency to specialization at certain points. I will cite Sanford for celery, Hastings for potatoes, etc. There are many advantages derived from this, and where it is possible for him to do so the grower will do well to take advantage of them. I will not undertake to enumerate all the advantages that may be derived from so doing, but will mention a few that occur to me at this particular moment. First we are sure of our land and the crops it will produce; we get the benefit of car lot rates, direct line transportation, cash buyers, and lastly but not least we secure the benefit of all prestige and reputation this particular point has in the markets of our country. That this is a very valuable asset, is best illustrated in this way. It not only amounts to quick sales, but very often in an advance or higher price of at least 25c. on the crate over the same quality of unknown goods. All these things are a handicap to the grower who does not avail himself of these advantages, and quite frequently it amounts to all his profits.

I do not mean to say that a grower or growers cannot build up a reputation for any particular point, or any particular product, but I do say, my friends, that it is uphill work, and a long pull; and if we can arrange to take advantage of a reputation already established it will more than pay to do so.

METHODS OF PACKING.

Growing a crop is scarcely half the battle. The successful grower provides a packing house of ample size, wherein to handle his crops with rapidity, he has also provided all the facilities that are essential for the handling of his crops. He will provide the best of crates. He has also furnished himself with stencils for each and every mark that goes on a crate, and under no circumstances allows a pencil to be used for any mark. He has also provided each year printed wraps if his crops are such as can be wrapped, each wrap being printed with a fac-simile of the brand that is used on each crate. He will gather his crops at the proper time, see that they are very carefully handled to avoid all damage from bruising, etc. See that his crates are all neatly and securely nailed, and made in the best possible manner, the better to withstand transportation, and that they may present a better appearance on the market. He will see that his produce is all properly cleaned, and washed if needed, that it is properly graded to a high standard, that it is carefully sized, and well packed. All crates being uniform, only one grade and size in each crate, and that grade and size plainly and neatly stenciled on one end of each crate.

He also sees that each crate bears his own particular brand either stenciled or printed on one end, and that all stenciling is done in a neat and systematic manner, and presents a good appearance. And when delivery is made to the transportation company each crate is in a condition that barring accidents or delays it will arrive on the market in prime condition.

There is a tendency among the best growers, especially individual shippers to select one good firm in one or two cities that can handle their goods to advantage, and ship to them each year, year after year. It places their goods on sound business basis, and does not bring it into competition with itself, and in a short time they will often build up a trade that is enviable. No sensible grower will change his house without serious cause. He cannot afford to do it for in so doing he throws away all the prestige and reputation he has been years in building up. He would in changing have to begin all over again with a new firm, and the new firm's customers. It is like going into a strange city. It requires a long time to become acquainted with its people, and it is the same way in the produce markets.

GROWING AND SHIPPING CELERY AND PEPPERS.

By W. E. Robinson.

Mr. President, Ladies and Gentlemen:

The first thing necessary is good land, well drained and irrigated; subirrigation is the best. The next important thing is good seed which can be obtained from any good seedsman. The best varieties to grow are "Golden Self Blanching Celery," and "Ruby King Peppers." Another consideration is good fertilizer. This can be obtained from any reliable fertilizer company. Be careful not to use fertilizer that runs high in ammonia, as it will cause heart-rot in celery and black-rot in peppers. Fertilizer should run at least 10 per cent. in potash and not over 3 per cent. in ammonia. Lands should be thoroughly cleared off, well plowed and harrowed thirty days before planting. Fertilizer should be applied broadcast and harrowed in both ways ten days before planting and land thoroughly irrigated. For celery one ton per acre should be applied before planting, and one-half ton five weeks after planting by spreading in the middle of rows, harrowing or plowing in, always plowing shallow after planting. For peppers, one-half ton should be applied before planting, and one-fourth ton in four weeks after planting by drilling in middle of rows. One-fourth ton should be applied in eight weeks after planting for last application. Pepper will grow and continue to bear till frost comes or season closes for shipping. Seed beds are the most important of all in these crops. Celery should be sown about August 20th broadcast and not too thick on seed bed well prepared and raised eight inches above the level of the ground. Seed beds should be partially shaded—the best way is to cover with slats four feet above the seed bed slanting towards the south with cracks two inches wide. All shade should be removed after September the 20th. Seed beds should never get dry, and should be watered twice a day for eight days after sowing and then kept wet. Plants should be sorted so all will run one size as near as possible and set in straight rows three feet wide and eight inches in drill, either single or double rows, single rows are preferred; if double rows in drill, then rows should be four feet wide.

Peppers should be sown the same as cabbage or tomato seed, seed beds are prepared about the same as for other things. Any farmer can raise pepper plants. Peppers should be planted in rows three and one-half feet wide and twenty inches in drill.

Celery and peppers should be sprayed with Bordeaux Mixture, celery every ten days, and pepper as often as black rot appears. Celery should be sprayed in seed beds from the time it comes up to the time of setting out. Celery should be well blanched with boards by standing the boards to the side of the row close to the celery as possible, and all cracks should be stopped to exclude the light. It will take from ten to twenty days to blanch celery, and the boards should remain till celery is white. Twelve-inch boards are the best. Gather the celery by cutting around the root with a knife and leave a part of the roots on the celery, but be certain to keep the celery clear from dirt, especially do not get dirt in bud or plume. All dead leaves should be removed and it should be packed in large crates with roots all one way and as many stalks in crate as possible. Crates are always packed from the side. Be certain to use plenty of nails and ship by express or by refrigerator cars.

Peppers should not be packed till thoroughly matured when it looks slick and feels firm, it should be allowed to grow as long as it will before turning red and it should be packed in tomato carriers or in lettuce baskets, as you prefer. Always use the largest package for the same freight. Select your commission merchant before you get ready to ship and get in touch with him. All markets are about the same on celery and pepper, supply and demand governing the price.

"Shall Rudimentary Agriculture and Kindred Sciences be Taught in the Common Schools?"

By Capt. R. E. Rose.

Mr. President, Ladies and Gentlemen:

I find myself on this occasion in rather a peculiar situation. On coming in last night and listening to what Dr. Sledd had to say in regard to the relation of the University to the Horticultural Society I found that he had, to a very large extent, anticipated the remarks I expected to make this afternoon. It reminds me very much of an anecdote which has gone the rounds of the Florida political campaign for many years. Some years ago, a prominent candidate for Governor and Congressman Davis were canvassing the State for different political offices. The rule was that the gentleman running for governor should make the first speech, followed by Davis. At one point, the candidate for Governor was invited by a friend to stay all night with him; consequently they were belated in going to the meeting the next morning. The local committee, not desiring to delay the speaking, asked Mr. Davis to address the audience. Davis had heard his friend speak so often that he got up and gave the candidate for Governor's speech almost verbatim. When the other man came in and found that his speech had been taken thus unceremoniously from him, there was nothing else to do but be taken suddenly ill and not make any speech at all.

I could perhaps have overlooked one speech of this kind, but at the close of the meeting our worthy president had a paper largely along the line of common education in the public schools. That reminded me of the little boy when the minister was taking dinner with his father and mother. The little fellow was very fond of chicken and chicken was scarce with them. His mother said, "Now, Tommy, you must only take one piece of chicken." Tommy said, "Well, but, mamma, I want more than that." She said, "I know, but there must be one piece left for manners." It so happened that the minister took the last piece for his second or third helping and Tommy cried out, "Oh, mamma, there it goes; manners and all!"

That is the way I feel today. I am very glad to see that this session has dealt very largely with the interests of education. I am very glad to see that our college men, literary as well as scientific men are beginning to realize the fact that a slight understanding, at least, of the principles of a man's calling, are absolutely necessary to his success.

The question, Shall we teach rudimentary science in the common schools?—Physics, Chemistry, Biology and kindred sciences, relating to agriculture, and domestic science, better known as nature studies, is now occupying the attention of many thinkers. The question is discussed from many points of view, by persons of divers professions,—the scientist, the editor, the professors of our colleges, both literary colleges, and scientific schools; the political economist, and the layman.

The fact that the discussion is universal among thinkers, shows its importance. No one at this day will deny the value of education; no one would dare suggest the abolishment of the common schools.

The question is therefore, What is the purpose of public education? The reply would certainly be, to improve the man; to make of him an active, useful member of society; to teach him the principles of the calling he is to pursue; to broaden his conception of the laws underlying his chosen profession; to give him the benefit of knowledge accumulated from the experience of others, without the care, toil, research and time necessary to be given in the personal experimenting, and study of the subject, in gaining the information as to the facts, laws, and reasons underlying the work he is to perform; incidentally to improve his reasoning powers, broaden his mind, and develop his intellect.

The common school has greatly broadened its scope, in the last three decades,—much useless matter has been eliminated, and better methods adopted.

The science of teaching has been recognized, teachers are trained. Pedagogy is now recognized as a science, and taught as such. To become a teacher one must study the science and art of teaching. Most of us can remember when the teacher in the common schools, was generally an untrained workman, knowing little of the teacher's profession, having more or less knowledge of the "Three R's" and little if any capacity, or inclination, to impart what little he did know.

The demand for training, or education, has grown wonderfully in the past thirty years—particularly for training along special lines. In all walks of life the specialist is now recognized,—in law, medicine, the sciences, teaching, agriculture, chemistry, physics; in none is the specialist more evident than in the teacher's profession.

Agriculture, "the oldest art, the youngest science," occupies by far the greater number of our people, while the trades, and other productive occupations; manufacture and transportation, the next larger part of the population of this and other countries. The proper fitting, or training, of this vast majority of our citizens, for their future occupations, becomes a question of the utmost importance to the State.

In a recent address delivered in this city, by an eminent authority, Dr. Andrew Sledd, President of the Florida University, he said:

"For some years the public schools of the United States have not been fully meeting their obligation to the general public. According to the census of 1900, of the 29,000,000 persons over 10 years of age engaged in gainful occupations, 10,400,000 were following agricultural pursuits, or 35.7 per cent; 24.4 per cent. were employed in manufacturing and kindred labor, domestic and personal occupations claimed 19.2 per cent., trade 16.4 per cent. and the professions only 4.3 per cent. In Florida the percentage of farmers is even greater, or 44 per cent., and of men engaged in the professions, smaller, or 3.5 per cent.

"A public school system, established for the greater good of the greatest number, would, if free from prejudice and from traditional influences, base its educational policy along the line of bulks of population. The curriculum would be made to prepare the major part of the youth for their life work, instead of those preparing to follow some profession. Until recent times the major part has been ignored.

"The present situation gives promise of what is to be, although the struggle with tradition is still going on. Modern education is for the masses. Practical education is coming to the front. The cultural and humanizing subjects are not to be ignored, yet the practical should assert its rights.

"Washington, in his first message to congress, advocated the fostering of agriculture. The first organization of farmers in the United States was founded in 1785 at Philadelphia. Of this society Washington and Benjamin Franklin were members. Among the committees appointed was one to promote agricultural education. This committee advocated the founding of professorships of agriculture in the colleges already established, and the giving of courses of agriculture in the high schools. The first professorship of agriculture was established at Columbia in 1792. The first State Agricultural College was founded in Michigan in 1855; although private schools, some of college rank, were in existence before this date, and a few of these had State aid.

"The Federal government early manifested its interest, the first action being taken even in the time of Washington. In comparatively recent times this interest in the practical education,—in the education for agriculture and the mechanical arts—has grown greatly. Various acts have passed and several are now pending in congress for the fostering of education in agriculture and the mechanical arts.

"In these acts the Federal government seeks solely to promote instruction in agricultural and mechanical arts. It believes that the masses need instruction where their work lies. There are several acts still pending.

"In its aid the Federal government seeks to throw emphasis where it is most needed to help the masses, to enable the man who toils in the sweat of his brow to do his work more efficiently. It seeks to uplift the mass of working people. Schools founded for this purpose should keep it in mind; they should strive to serve most of the people in the best way."

"I have taken the liberty to quote Dr. Sledd liberally, his position as an educator; his knowledge of the subject, gives his opinion and statement, weight and authority.

"I desire to call your attention, however, to the fact that the effort to teach agriculure, and its kindred sciences, has been to establish colleges, and schools of higher learning,—a very necessary course perhaps in the early days; when trained agriculturists and scientists were few, when the science of agricultre was drabtically unknown; when text-books on the subject were few, and not adapted to the schoolroom; in fact only of value to the trained scientist, and so cumbered with scientific terms, that the ordinary teacher, to say nothing of the school children, failed to grasp their meaning or understand their truths, which were, frequently, simply assumptions, and not yet demonstrated facts,—There were doubtless reasons for beginning the structure at the roof and building down to the foundation. As Secretary of Agriculture Wilson has aptly said, "Place a faculty of agricultural professors in the top story of a building without a stairway, and say to the boys and girls of the country, jump up here and we will teach you scientific agriculture."

When we remember that of the many millions of school children, only one per cent. or less, graduate from the high school, (of which 80 per cent are females), that by far the greatest number never enter the high school, but have to begin their life work, with but a few years (or months) training in the common schools, we realize how few of our boys and girls destined to be the farmers, and farmers' wives, of the country, ever receive in school any practical or scientific knowledge of the subject which will be the principal, if not the only, pursuit of their lives.

I will not indulge in the usual platitudes, "The farm the basis of wealth, the mudsill or foundation of the nation's prosperity." The object of my talk is to stimulate a demand for teaching those things that will be of the most value, to the greatest number of the future men and women of the country, that will elevate their conception of the dignity of their profession, and stimulate them to excel in its pursuit.

Ninety per cent. of our boys and girls, particularly in the rural districts, "quit school" before reaching what is known as the seventh grade of the common schools; very few enter the high schools, and still fewer graduate therefrom.

By far the larger part of our people begin their life's work without finishing the course in the common schools, with a smattering of "Reading, Riting, and Rithmetic," with no effort made to teach them any of the facts, or laws, underlying the profession they are to pursue. It would be folly for me to decry the value of the necessary preliminary studies, arithmetic, spelling, reading and writing, and such fundamental branches. I do contend, however, that the rudimentary principles of Physics, Biology, and other natural sciences, "nature studies," should be substituted for the ordinary "reader,"—with its fables and glittering generalities, elocutionary gymnastics, and singsong poetry. Our reading exercises could be made useful and entertaining, and impart knowledge at the same time, language equally as pure taught, and correct ideas as to natural science imparted at the same time.

Equally as interesting stories, inculcating facts, can be substituted for the fables, and stories, of the present reading lesson.

Many of the text-books on agriculture, —now abundant,—are interesting to a degree to the youthful mind,—always hungry for information. That child once taught the first law of physics, expressed in simple language,—that "force and reaction are the same and in opposite directions," will not in future life spend years in the futile effort to create perpetual motion.

That child taught a few lessons in Physiology, or animal structure, will never be guilty of removing an animal's inner eyelids to cure the "hooks," nor bore a cow's horn for "hollow horn."

When taught a few of the fundamental laws of Agricultural chemistry, he will not buy a ton of "guano" because it is cheaper than another ton; nor will he be persuaded to buy fertilizer, or feeds, on account of a name, or brand, and pay more for an inferior material with a catchy name.

No lesson is more quickly absorbed, nor more easily taken in, by the average child than Physical geography, simply because it deals in facts, as to productions, and conditions of various countries, strange animals, plants, people, and customs.

A boy or girl may not know what the

definition of a continent, peninsula, island, or isthmus is, he knows however, that oranges and alligators are found in Florida, that "Uncle Sam" is cutting a big ditch at Panama; that monkeys, coffee, jaguars and India rubber come from South America.

We do not appreciate the capacity of our children for facts,—they care little for the reasons, but want facts,—these should be given as fully as possible. Rules mean but little to children, facts much.

How many of you remember the old "Murray's Grammar?" with its pages of rules,—which we "learned by heart" and did not understand, (and don't yet). The old "Davies" or "Todd's" arithmetic, with its rules and terms,—all Greek to us then, and to most of us now.

We did know (when the teacher, or our parents told us) that certain construction of sentences, or certain words were not correct. We learned good language from hearing it spoken.

We now teach grammar and arithmetic almost unconsciously, by absorption we might say.

The same may be said of science, or "applied common sense,"—the facts which experience, and experiment have proved to be facts, governed by natural laws.

How many of us members of the Horticultural Society, would have avoided serious mistakes, expensive in time and money, had we as children been taught a few facts, as to the composition and use of fertilizers,—why they were necessary, and for what purpose applied; the functions of nitrogen, phosphates, and potash, in the plant economy?

How many of us have had to learn by experience, more or less expensive, the facts well known to the scientist of the day? though forty years ago he knew little more than the average pupil of the common school does now.

There is little chance to teach agricultural science, (and art), to the adult farmer; barring the Farmers' Institute, there is no efficient method of reaching him. However, teach these facts to the children, furnish them with authentic and trustworthy text-books, and very soon the parent will himself absorb a very considerable part of the sciences.

It has been said, "The education of the child should begin in the cradle," no greater truth was ever spoken.

"The child is father to the man," and on his early training depends the future citizenship of the country,—while teaching the child,—the common school pupil, —the rudimentary truths, facts and laws, of science,—"nature study,"—by simple statements of facts, with little discussion, rules, or reasons,—put before him in an interesting manner in the shape of narratives or stories, illustrating the subject; together with simple experiments and illustrations, we unconsciously, but none the less certainly, teach the parent many truths, and broaden his conception of his calling. For rest assured, that whatever deeply interests the child at school, is discussed at home,—commented on and digested to a degree, not generally understood nor allowed for.

Why have our children's imaginations excited, their faith in the wisdom or truthfulness of their teacher,—and text-books lessened, by such tales as the "Adventures of Sinbad the Sailor," "Gulliver's Travels," "Don Quixote,"—interesting and exciting to the imaginative, and credulous mind of the child,—and other equally useless, in fact, injurious matter; used in the schoolroom? When equally choice and interesting reading matter, describing wonderful occurrences, beautiful processes, and surprising results,—all inculcating truths, that will be of value in succeeding years, can be given them; equally as interesting and exciting to their imaginations, making lasting impressions on their plastic minds. Truths told in simple language, free from scientific jargon, comprehensible to the youthful mind, or to the ordinary adult, who has had no scientific training, of which the mass of our people are composed.

Among scientific literature, written in plain, simple language, that should be found in every schoolroom, and read by every teacher, or pupil of our common schools, is the little monthly publication of our State Board of Health, called *Health Notes.* It deals with common things, common diseases, their cause and effects in such simple, though forceful language, as can be readily understood by any one, child or adult, who can read. As a pattern for a child's or adult's primary, scientific, text-book, it is commendable, and should be found in every household in the State.

I am pleased to say that this subject is now attracting the attention of school officers and educators everywhere.

I note our next summer schools for teachers, will have the benefit of twelve lectures on agricultural subjects, by such men as, Dr. Sledd, Prof. Rolfs, Prof. Floyd and Prof. Fawcett, of the University of Florida, and the Florida Experiment Station. Lectures that will doubtless go far towards instructing the teachers of the State, as to the importance of acquiring a knowledge of the rudimentary principles of agriculture, that they may be better fitted to successfully prepare the children of the State for a broader view and more comprehensive knowledge of their future callings; that they may be able to dignify the farmer's profession, by teaching that it is truly a science, as well as an art, requiring more knowledge of all the sciences, than does that of any of the learned professions, to master its details, and successfully practice it.

I believe the place to begin the teaching of agriculture is in the common school, just where we begin the teaching of literature, and the science of numbers and language. That the farm, the school, the experiment station, and agricultural college, should be linked together, and properly co-ordinated; that we should begin at the foundation,—the child,—and build upward toward the complete edifice, the college, and not from the college downward.

Roselle.

By P. J. Wester.

Mr. President, Ladies and Gentlemen:

Of the smaller fruits that have been introduced into the State for a compartively long time, none, with its seeming commercial possibilities, have been more neglected than roselle (*Hibiscus sabdariffa*), also known under the name of Jamaica sorrel. Even as a household plant, it is not, considering the ease with which it is cultivated, grown as widely as it deserves. At the Subtropical Laboratory we have paid particular attention to the cultivation of this plant for nearly four years, and on receiving an invitation from the President of the Society to deliver an address at this meeting, I selected this as a timely subject, so much the more as during the existence of the Society only once, in 1899, if I am rightly informed, has the attention of the members been called to the roselle. This paper is Farmers' Bulletin No. 307 condensed, where the subject is more fully treated, with such additional data as have been obtained since that bulletin was written.

As those of you who are acquainted with roselle know, the plant is an annual and resembles somewhat the cotton plant in habit, attaining a height of from five to seven feet, with about a like spread, under favorable conditions. Its large, red-eyed yellow flowers indicate its relationship to the okra, the various species of ornamental hibiscus and the cotton plant. It is indigenous to the Old World tropics, but is now probably disseminated to all the tropical and subtropical countries. Some twenty or more years ago the roselle was introduced into Florida, the name Jamaica sorrel being probably an indication that the plant was introduced from Jamaica.

Keeping in mind that lands subjected to flooding and insufficiently drained lands should be avoided, as well as lands infested with the rootknot nematode (*Heterodera radicicola*) to which the plant is very much subject, the roselle seems to thrive on any of our Florida soils that are moderately rich or supplied with the necessary plant food in the form of commercial fertilizer. If stable manure is used it should be supplemented with phosphates and fertilizers that contain potash, as an excess of ammonia in the soil tends to the development of large plants at the expense of their productiveness.

The plants may be started in a seedbed in the spring and planted out in the field similarly to tomatoes, or the seeds may be planted in the hills where they are to remain and thinned out to one plant to a hill. The rows should be from six to ten feet apart and the plants set out four to eight feet apart in the row according to the fertility of the land and the supply of moisture. In our experience a mixture similar to tomato fertilizer has been found to be very satisfactory, applied at the rate of 1,000 to 2,000 pounds per acre. Where a few plants are set out for home use most fertilizers that are available would probably serve the purpose.

The greatest drain on the vitality of the plant is the ripening of the seed and if the calyces are picked as soon as they are full grown instead of allowing them to become more mature, the plant, in the effort to reproduce itself, sends out new flower-buds that set fruit continuously until cut down by frost if it is not injured by diseases or insect enemies.

In a report from the Porto Rico Experiment Station, 1906, the yield per plant is given as four pounds of fruit while some plants were estimated to yield double that amount. At the Subtropical Laboratory during the past few years we have been engaged in the breeding of a variety having larger calyces than the common kind and during the last fall and winter weighed the fruit from eight plants of this variety to ascertain the average yield. The data obtained, which are given in the following table, are quite interesting.

Nos. 1, 2, 3, 4, and 5 represent one plant each and No. 6 represents calyces from three plants weighed together. The yield from No. 1 was so markedly larger than from the rest of the plants that it was thought desirable to save the seed for breeding purposes, which explains the omissions in yield from January 6 to February 8, 1908, at which latter date part of the ripe calyces were saved and the remainder February 18. January 25 the calyces of all the plants except No. 1 (which was tented) were picked for fear that the plants might freeze down in an approaching cold wave. Subsequently all the plants in this experiment died from the attack of rootknot nematodes, except No. 1, which was pruned back, has continued to bloom and is still in active growth and setting fruit. Two plants which were not included in

TABLE

Showing the average yield of Roselle, variety "Victor."

Date of Picking	No. 1, Grams	No. 2, Grams	No. 3, Grams	No. 4, Grams	No. 5, Grams	No. 6, Grams	Total Grams
	Weight of calycs set from first bloom.						
November 15, 1907	1665	695	967	......	......	1818	5145
November 23, 1907	4055	2885	2050	1290	1465	4585	16380
November 30, 1907	1390	1510	1295	785	1940	6555	13475
December 7, 1907	35	170	1485	2835	1190	2800	8515
December 17, 1907	......	......	......	825	280	535	1640
	7145	5260	5797	5735	4875	16293	45105
	Weight of calyces from bloom induced by picking.						
December 23, 1907	115	145	15	......	55	55	375
January 1, 1908......	......	315	205	......	......	700	1220
January 16, 1008.....	....	292	775	450	......	1190	2707
January 23, 1908....	......	......	665	......	545	......	1210
January 25, 1908.....	......	750	495	735	335	2880	5195
February 8, 1908....	430	....	......	......	......	......	430
February 18, 1908...	2110	......	......	......	.....	......	2110
March 6, 1908.........	75	....	......	250	50	335	710
	2730	1492	2155	1435	965	5160	13957

Average yield of calyces per plant from first bloom.. 5638 gr. - 12.4 lbs.
Average yield of calyces plant from bloom induced to set by early and continuous picking.. 1744 gr. - 3.8 lbs.
Total average of calyces per plant............ 7382 gr. - 16.2 lbs.

the above mentioned test yielded together 46 lbs. or 23 lbs. of calyces per plant. It should be stated that we had no frost in Miami during the past winter. You will note the great difference in the yield as given by the report from

Porto Rico as compared with that obtained by the Subtropical Laboratory, due partly to continued breeding and selection, and probably in part to more favorable conditions and perhaps to better cultivation.

In Florida the plant has thus far been grown for home use only and the calyces used in making a sauce similar to that made of the cranberry, or in jelly making. Besides the two products already mentioned, the roselle yields a most excellent fruit syrup that can be used in the home in various ways. It can also be used as a flavoring extract at soda fountains.

When the calyces are used as a sauce the seedpods must of course necessarily be removed but last fall we found that this is not necessary in the making of jelly. In the manufacture of jelly on a commercial scale this is an important consideration, as the removal of the seedpod is at present a slow and tedious process.

Several years ago Mr. W. W. Tracy of the Bureau of Plant Industry, made jelly of the tender twigs and branches, but did not follow up his discovery to ascertain its commercial possibilities. Acting on this suggestion, during the past year the writer experimented with extracting the acid from the whole plant by boiling both the young stems and the leaves. The jelly obtained in this way was perhaps a little more difficult to make than that made from the calyces, but it is possible that some mistake in making it was the cause of this, for I understand that Mrs. P. H. Rolfs has made jelly from the stems and leaves that she considered fully equal to that made from the calyces of the plant. An excellent fruit syrup is also obtained from the same source that may be used in the household or used as a flavoring extract in soda water fountains. Utilized in this way the plant can be grown in a large territory of the United States and the ease with which the plant is cultivated probably renders it a cheaper source for flavoring extract than any other plant.

The only disease that has so far been observed on roselle is a mildew that attacks all parts of the plant above ground and if the disease appears early it is apt to do considerable damage if it is allowed to spread unchecked. An experiment to ascertain the comparative value of dry sulphur, sulphuric acid diluted one part to 500, 1,000 and 2,000 parts of water, respectively, and liver of sulphur as a remedy for the disease was made last fall at the Subtropical Laboratory. Their comparative values as fungicides were found to be as in the order named. The sulphur should be applied early in the morning while the plants are still wet with dew.

In addition to the soft scale (*Coccus hesperidum*) another scale was noted on roselle last fall. Specimens were sent to Dr. L. O. Howard, Chief of the Bureau of Entomology, United States Department of Agriculture, who identified them as *Hemichionaspis aspidistrae*. It appears, however, to do very little damage as, while multiplying itself rapidly, the scale is followed by a parasite (*Aspidiotiphagus citrinus*) that seems to keep it well in check.

In Queensland the cultivation of the roselle has assumed a commercial aspect during the past few years and considerable quantities of roselle jam are yearly exported to Europe. In the United States, aside from the home use as a sauce, the most popular products would probably be jelly, a fruit syrup for the table use, or diluted with water as a cooling drink and as a flavoring extract for cool drink stands. The writer ventures to express the opinion that when the manufactured products of roselle become known to the public the roselle will furnish the basis for a considerable industry along these lines in the United States at no distant date, in which Florida, due to her geographical position, should have a large share.

Efforts to Secure Better Shipping Facilities and Rates.

By F. D. Warner.

Mr. President, Ladies and Gentlemen:

For as far back as most of us can remember we have been complaining of high freight rates on our fruit and vegetables, but it is only within the past year that any concentrated effort on our part has been taken to remedy the evil. Many cases of individual efforts have been made, but to no avail. But today we have a strong organization to fight for our rights, and if we can have the co-operation of all shippers we can accomplish much, we believe.

As most of you will recall, the Gainesville Melon Growers' Association called a meeting in Jacksonville in February, 1907, for the purpose of securing a car-lot rate on our fruits and vegetables to the eastern markets and to form an association for that purpose. At that meeting there were some sixty members who joined and now we number over five hundred, with only one resignation during the year.

Shortly after this meeting we had a conference with the representatives of the various railways leading out of the state, at the office of our secretary, J. C. Chase, Jacksonville, at which time they promised to take the matter up and give us some relief, but failed to do so; but instead asked us to meet them in Washington on November 6th, which we did, our attorney also being present at this conference. We made them a compromise proposition, as follows: 5 cents reduction on standard crates and 10 cents on bbls. oranges and pineapples, with a refrigeration of 15 cents a package instead of 20 cents, with a minimum of 20,000 pounds to all eastern points. This they refused, but came back to us with a proposition granting about one-half of our compromise; which we in turn refused and took the matter before the Inter-State Commission in its original form, which amounts to much more than we were willing to compromise for. The first hearing before the Commission was held at Washington on February 4th, at which time we had eight witnesses from Florida and several from the commission merchants at the north. This meeting, as you know, was adjourned to Jacksonville on March 18th for the want of time, and as you all know we had a large representation. The final hearing takes place tomorrow at Washington, and we can look for some decision some time in June.

There was a called meeting at Lakeland on April 21st, which meeting took the place of the annual meeting which should have been held in February. At this meeting the old officers were re-elected and several added to the board of directors. The matter of adopting a standard size box for both the celery and orange was gone into to considerable extent, but no action was taken to make the Florida orange box to conform to the California size, i. e., 11½x11½x26.

The matter was laid over until the next meeting, which will be held in Jacksonville some time in July, when we will have heard from the Commission.

It was decided at Lakeland to continue the Association and to take up the many matters which we are discriminated against both by express and freight. Some of our best markets are south of the Ohio and Potomac rivers and yet the rate is often higher than points beyond.

There is no salaried office in this Association and the officers have been faithful and loyal to the cause and have sacrificed much time and money, and we want the help of every person who ships a package of fruits or vegetables. We would also like to have the endorsement of this Society in good, strong terms.

DISCUSSION.

Mr. Warner—This report is simply to show what has been done to secure better rates, especially car-lot rates for eastern points, than we now have. They have given us a promise that they will make a decision before they adjourn about the first of July. We would also like to have the endorsement of the Society. The railroads have tried to belittle our efforts, but we contend that we represent about seventy-five per cent. of all fruits and vegetables shipped. If all you people will come with us and stick to us and all of us hold together, we can get pretty nearly what we ask for, which, of course, is only our rights. I believe I have given you an outline of what has been done. We have here a copy of our attorney's brief, but the testimony in our case amounts to volumes and volumes. I will be glad to answer any questions that any of you care to ask.

Mr.——Have your efforts been confined to oranges and pineapples?

Mr. Warner—No, sir; we have been working for better rates on everything that is raised in the state.

Mr. Frink—I would like to ask Mr. Warner if the object of this Fruit Growers' Association is to make a permanent organization of it and continue the fight for better rates and better facilities of all classes of fruit and vegetables, not only now but in the future.

Mr. Warner—Yes, sir; that is the object of this Association, and in the meeting at Lakeland it was moved that the Association be continued. The final hearing that comes up tomorrow is for a carload rate to the East, which we do not now enjoy. We want to enjoy the same blanket rate that California has now on oranges, both East and West.

Mr. Frink—I am in favor of Mr. Warner's work, and think the members will all be in favor of it if they understand it. It is a great work and needs to be looked into more carefully in the future than it has been in the past.

Mr. Hart—It has a membership of about five hundred, hasn't it?

Mr. Warner—Yes, sir.

Mr. Hart—Why didn't they call on us?

Mr. Warner—They did. We have written letter after letter, and asked everybody to help us that we possibly could. But we have not had funds enough to foot the bills, and have had to go down in our pockets, because we thought we were doing the right thing.

Mr. Skinner—The penalty of being a Director is about $500.00.

Mr. Warner—We have hired the best attorneys we could hire. We have hired attorneys to get up briefs and have had all kinds of expenses to contend with and nothing to meet them with, unless we paid them ourselves. The next meeting will be held in Jacksonville some time in July.

Mr.——I would like to ask if any reduction was asked for anything less than carload lots.

Mr. Warner—No, sir. We thought we had a fight big enough for us to handle when we asked for a reduction on carload lots. There is a great deal of shipping done in less than car lots. They made a proposition to us saying that they would give us a carload rate provided we would accept their terms on less than carload lots. We refused to do this. However, the fight was taken up originally to get a carload rate on fruits and vegetables.

Mr. Skinner—The Clyde Steamship Line pays the Atlantic Coast Line Company ten cents for every package they deliver to them at Jacksonville, as a sort of compromise for not carrying it to Savannah and delivering it to the Ocean Steamship Line. The rate to Jacksonville is from 17 cents to 20 cents on oranges. The rate to New York is 35 cents, 10 cents of that goes to the A. C. L. We contend, and I think we are supported in our belief, that they are transgressing the law, and that they should carry it to New York for 25 cents. The grower should have the benfit of the 10 cents that is paid to the A. C. L.

Mr. Warner—In other words, the Clyde Line pays the Coast Line 10 cents for not hauling it to Savannah. Now, gentlemen, if we will join together and stick together, there is no doubt but that we can get our just deserts and I think it is the duty of every one of us to uphold this Association in its fight.

Mr. Skinner—It means about $200,000 to the state if we win out. This is worth fighting for.

Prof. Rolfs—I think we ought to hold up the hands of the Association, like holding up Aaron's hands of old. I understood, Mr. Skinner, that a committee was appointed this morning to prepare resolutions of some kind commendatory of the work this organization has been doing. If you have them ready, we would be glad to act upon them at this time.

Mr. Skinner—"Whereas, The fruit and vegetable shippers of Florida have for years been discriminated against by the railroads and have been obliged to pay a much higher rate of freight than our competitors for a less haul; therefore be it

"Resolved, that, The thanks of the Horticultural Society of Florida be tendered the Florida Fruit and Vegetable Shippers' Protective Association for their work so far, and that they most heartily approve of their efforts to obtain some relief to the Florida grower and shipper."

Motion made, seconded and carried unanimously.

Wednesday Afternoon, May 13, 1908.

Mr. Skinner—We have prepared the telegram to Mr. Glasgow and I will read it to the Society before it is sent:

Wm. A. Glasgow, Jr.,
c. o. Interstate Commerce Commission,
Washington, D. C.

The members of the Florida Horticultural Society, in its 21st annual session, unanimously endorse complaint and brief presented by you before the Interstate Commerce Commission, and extend to you its hearty support.

(Signed) E. O. Painter, Sec'y.

Telegram received from Wm. A. Glasgow, Jr.:

Washington, D. C., May 14, 1908.
E. O. Painter,
Secretary Horticultural Society.

I thank you. Case submitted, and I am hopeful.

Wm. A. Glasgow, Jr.

Orange and Grape Fruit Statistics.

By P. Phillips, M.D.

Mr. President, Ladies and Gentlemen:

Enclosed please find letters from the different railroad companies, in the state of Florida, with the exception of the East Coast Railroad, which I explain here below.

The crop for the year of 1906-07, three million seven hundred seventy-six thousand naught eighteen (3,766,-018). I estimated the crop for the year of 1907-08 to be sixty per cent. of the above amount. This will make it 2,265,610. I will gladly get up the statistics again from the different railroad companies of Florida, the number of boxes shipped the past season and compare it with my estimate, provided the Society desires me to do so.

The East Coast Railway Company, I estimated, had five hundred thousand boxes, and after correspondence with them, I found that my estimate was not far wrong. I, therefore, think I have it as near as possible to the correct amount that was shipped out of the state during the year of 1906-07.

Hoping the State Horticultural Society will continue to prosper, and with you—its president—I know they will succeed, I beg to remain,

Yours truly,
P. Phillips.

Dr. P. Phillips, Orlando, Fla.

Dear Sir—In reply to your letter of September 28th, I beg to advise that the Atlantic Coast Line handled during the season of 1906-07, 2,375,898 boxes of oranges.

Yours truly,
James Menzies,
General Freight Agent.

Dr. P. Phillips, Orlando, Fla.

Dear Sir—Replying to your favor of the 30th ultimo, would advise that during the year 1906 the Southern Express Company handled 250,120 boxes of oranges. Respectfully,

J. B. Hockaday,
Superintendent.

SEABOARD AIR LINE RAILWAY.

Jacksonville, Fla., Sept. 23, 1907-leb.
File 26-1 A.

Mr. P. Phillips, Orlando, Fla.

Dear Sir—Yours of the 20th. We handled out of Florida, season 1906-7, approximately 650,000 boxes of citrus fruit. We have not made an estimate at the present time, for the coming season. Yours truly,

S. C. Boylston,
Assistant General Freight Agent.

Nursery Inspection From the Inspector's Side.

By E. W. Berger.

Mr. President, Ladies and Gentlemen:

The essential parts of this paper were written nearly a year ago, and were then intended to be a contribution toward supplementing Nursery Inspection (1) and (2), published by Prof. H. A. Gossard as Press Bulletins Nos. 6 and 7 of the Florida Agricultural Experiment Station, and republished in the Florida Agriculturist for June 19 and 26, 1907, pp. 5 and 7, respectively. The purpose of the paper was to set forth more fully the practices of inspectors as understood by the writer, based upon his own experience, and the experience of other inspectors obtained verbally and from their writings. The writer realizes that, considered from the standpoint of the ideal, the inspection of nurseries, as practiced in the United States, is frequently open to criticism; but the subject has been treated here as modified by the conditions which exist, rather than from an ideal point of view. In other words, we have to deal with a practical question and not a theory.

THE RIGHTS OF THE INTERESTED PARTIES.

These naturally come under three heads: those of the buyer, the nurseryman, and the inspector.

THE BUYER.—The buyer, or grower, is perhaps the most vitally interested of all, and generally has the least to say in regard to the inspection of the goods he desires to buy. That the buyer might have much to say will be brought out later. The buyer has the right to be protected; but at its very best, a certificate from an inspector cannot be a perfect guarantee of freedom from insects and diseases; a fact noted in Nursery Inspection (2), and generally recognized by experienced inspectors. The point is, that it is physically impossible to examine every tree in a nursery, to say nothing of examining all parts of a tree. Nevertheless, a certificate signifies much. After the inspector has examined, say, the four sides of a large block of stock and has passed through it in several directions, carefully scrutinizing abnormal appearances as well as making a close inspection of an occasional tree, he feels reasonably certain whether the block is clean or not. Besides signifying that a diligent search has been made, a certificate implies that moral obligations have been assumed by the nurseryman. It thus becomes especially obligatory upon him to send out nothing but clean stock. Then there is a further deterring influence, namely the fear of exposure and forfeiture of the certificate if he sends out infested or diseased stock.

In view of the fact that a certificate cannot be an absolute guarantee, it has been suggested that a written guarantee from the nurseryman should be substituted for a certificate. But why should a written guarantee from the nurseryman not be required to accompany the inspector's certificate? Every buyer has the power to demand such a guarantee. Again, it has been suggested, that fumigation should be substituted for a certificate, or that a certificate of fumigation from the nurseryman should be required to accompany each shipment of certified stock. The requirement of a certificate of fumigation from the nurseryman, together with an inspector's certificate, is the law in Georgia and some other states. Again, defoliation together with the cutting back of the tender growth should be required in all shipments, and several nurserymen now make this practice. In fact, one should practice not only defoliation and cutting back, but fumigation as well. There remains only the addition of the written guarantee, and I hope soon to see some nurserymen take this forward step. A nurseryman could give a guarantee which the inspector cannot give, because every tree sold ought to come under his or some competent person's scrutiny at the time of digging and packing.

It has been objected that fumigation, defoliation, and cutting back are injurious to trees. In regard to defoliation, the preponderance of evidence, so far as the writer can judge, indicates that, at least under certain climatic conditions, it is not injurious; and some even state instances where defoliated trees started off better than others not defoliated. Should fumigation cause the death of some trees and retard the growth of others—a doubtful contingency—yet the loss of a few trees should not be deprecated when it may involve the saving of a whole grove from becoming overrun by insects. It is the writer's opinion that defoliation, together with cutting back and fumigation, should be practiced by all nurserymen, in fact insisted upon by the buyer, whether any noxious insects are suspected to be upon the stock or not; for there are other pests, such as rust mite, red spider, orange weevil, and perhaps still others, living on the leaves and roots [the grubs of the orange weevil live on the roots], which would probably be completely eradicated by this means.

No stock should be shipped partially exposed [leafy tops left uncovered], but it should be so covered and wrapped as to make it secure against becoming infested in transit. We need only to bear in mind the possibility that a package of citrus trees may come in contact, either in the express car or at the railway station, with a crate of scale-infested citrus fruit, or a package of peach, plum, or other similar trees, or with some San Jose scale-infested fruit; when the infestation may spread to the previously clean stock, if it was not completely and properly covered. All these requirements, I believe, are quite within the reach of the buyer, and need simply to be insisted upon when he contracts for his trees.

Further, in regard to a written guarantee from the nurseryman, it will be evident that the nurseryman could not give a guarantee of freedom from insects and diseases extending ahead over any long period of time. The best form of written guarantee would probably be one to the effect that the stock was guaranteed to be free from all living insects (mites included), insect larvae, insect eggs, or other diseases, at the time of its delivery. If newly-set stock is found to be free from infestation when it has matured a new crop of foliage, this would be fairly clear evidence that it was clean when received. If infestation with insects, or infection with disease, was discovered by the time a new crop of foliage had matured, expert evidence [inspection of the neighboring premises, and of the nursery from which the stock was obtained] would have to decide the case. Such a guarantee would also be in the nature of a challenge to the buyer or grower to find insects and disease if he could; and no nurseryman would make such a challenge if the stock he shipped was not clean.

In conclusion, the writer believes that the grower can best protect himself by making the following requirements the conditions of buying a nurseryman's stock:

1. A written guarantee that the stock is free from noxious insects and diseases at the time of its delivery.

2. A written guarantee that the contents of each package have been properly fumigated prior to shipment [ornamentals and other stock which would be killed by fumigation alone not to be fumigated, or fumigated with a smaller dose].

3. The complete defoliation and cutting back of all stock (especially citrus) prior to shipment [ornamentals and other stock which would be killed by such treatment alone excepted].

4. Complete protection of the stock from outside contamination through insects and diseases during transportation, by a properly constructed box or other covering.

The writer also desires to direct the growers' attention to the following law:

Ch. 4814, Acts 1899, Sects. 1 and 2.

3701. The Sale or giving away of Diseased Nursery Stock or Seeds.—It shall be unlawful for any person to knowingly sell or give away any diseased nursery stock or seeds in the State of Florida. Any person violating this section shall be fined not more than five hundred dollars or imprisoned not more than six months.—Gen. Statutes of the State of Florida, 1906.

From the foregoing it will be seen that the grower has these matters wholly under his control, and all that is necessary is for him to take advantage of his rights.

The Nurseryman.—That the nurseryman also has some rights must be conceded. When nursery inspection has become definitely established under well-defined laws and regulations within a State; and when a larger number of nurserymen have learned to realize that a knowledge of insect pests and plant diseases is quite as important to their business as the ability to grow plants; and when by the bringing of gradually increasing pressure by inspectors from year to year, greater vigilance will be exercised and thoroughly up-to-date methods be employed in all nurseries; we may assume it proper to refuse a nurseryman a certificate in whose stock but one specimen even of a species of noxious insect is found. But where, as in Florida, nursery inspection has not become systematized; and where, furthermore, citrus nursery stock has not before been certified [the writer did this for the first time last fall, when several states and foreign countries required citrus stock to be admitted under certificate only]; it appears no more than fair that conditions of fumigation, defoliation, etc., should sometimes be required in giving a certificate in lieu of absolute freedom from insects. I admit that to the buyer one insect is as bad as a thousand, and the case merits careful thought and consideration. But the nurseryman having spent thousands of dollars to grow his trees, feels that to be refused a certificate means bankruptcy. The grower hardly desires to see the nurseryman bankrupted, neither does he wish to see his own property jeopardized. In such an instance the inspector almost invariably steps into the breach, so to speak. His knowledge of a certain pest, for instance, convinces him that the stock should be absolutely safe when cut back, defoliated and fumigated. He requires this as a condition of giving the certificate. The nurseryman assumes the moral obligation of good faith and the other conditions previously referred to, and the case is generally settled; unless the nurseryman, to his discredit and to the detriment of the inspector, breaks faith. Besides the above stipulations the inspector may require the destruction of all infested trees, and the exclusion of certain blocks of stock from the market; or the entire nursery may be placed under quarantine pending a period of cleaning up. All of these practices are in the nature of a compromise; but they are practiced by all inspectors in some form or other, as will be evident from a perusal of the literature available on the subject.

In connection with this same point we may imagine the case of two nurserymen, one of whom succeeds in concealing any disease in his stock; while the other one does not attempt this, and even points out the doubtful trees to the inspector. Under a cast-iron rule of "one insect—no certificate," the honest man would fail to get a certificate, while his less honest neighbor would get one. Again, of two neighboring small nurseries, the one is perhaps found infested or diseased; the other one is not, and gets a certificate. The whole of a large nursery is as large as two small ones; one portion is perhaps infested, the other part not. In view of the fact that the inspector can hardly, under ordinary conditions, refuse a certificate to the small clean nursery; then ought not the large nursery to be certified, with proper restrictions, to the extent of its clean portions, leaving the infested portion without any certificate? Besides, if the man with the clean, small nursery is dishonest, he may buy infested stock from his neighbor and sell it under his certificate.

The Inspector.—The rights of the inspector—what are they? He is entitled to a hearing if anything is supposed to be going wrong. He should be the first one to be notified. Thus, last fall, the entomologist of a certain southern state wrote to me stating that there were rumors of unclean stock having been shipped into that state from Florida. I asked him to send me particulars at once. He answered that he would as soon as he had seen th stock in question; but as he was never heard from again in regard to this matter, it is to be presumed that the rumor was without foundation.

The inspector must insist upon the right to use his judgment. It is not unfair to assume that his knowledge of insects qualifies him for this beyond all others, few excepted. In the facts already discussed, the writer has implied that, under certain restrictions and preliminary operations, certificates are sometimes issued where adherence to a fixed rule would prohibit this. Inspection in Florida is not for Florida itself, but for other states and countries which admit stock only under certificate. The inspection requirements of these states and countries will therefore naturally be made the chief guide in the inspection of Florida nurseries. Furthermore, when the writer was in doubt he wrote to the entomologist of a certain southern state into which he knew that large quantities of citrus would be shipped from Florida, and received the following answer: "Our plan in Louisiana is to give a certificate of inspection to nurseries, even when whitefly is present; provided, of course, that we have no reason to believe the nurseries in question will not thoroughly defoliate the stock." With this statement in mind, I acted so as to meet the exigencies of the case, and I believe that the interests of the grower have been safeguarded; for no one has yet claimed to have found whitefly on citrus stock sold under the writer's certificate. I did more than the previous statement exacted, for I required the stock to be fumigated besides; which to the best of my knowledge, together with cutting back and complete defoliation, makes citrus trees safe from whitefly. The following circular was sent to nurserymen on November 12, 1907, and a revised form will be issued during this summer or fall.

PRELIMINARY CIRCULAR TO NURSERYMEN.

Following are several simple requirements, compliance with which is expected from every nurseryman receiving a certificate:

1. To fumigate all nursery stock prior to shipment: excepting shipments to states and countries that fumigate all stock at the port of entry; excepting to parties desiring to do their own fumigation; and excepting a few ornamentals, such as roses, that do not stand fumigation, and conifers.

2. To defoliate all stock, if not already defoliated, at the time of shipment. A few ornamentals that do not stand defoliation are alone excepted; and shipments of citrus stock may be excepted during November and December if the buyer so requests, provided the same are fumigated and completely enclosed in a box or in burlap.

3. Since it is impossible for the inspector to examine every tree in the nursery, it is imperative for the nurseryman to see to it that no diseased stock is sent out. This should be a simple matter, since each tree must be handled several times in preparing it for shipment.

4. The inspector reserves the right to re-inspect, at the expense of the nurseryman, any nursery previously

certified, for the purpose of verifying that all conditions have been, or are being, fulfilled; and to annul the certificate if the conditions in the nursery prove unsatisfactory, or if any requirements upon which the certificate is conditioned are violated.

N. B.—The purpose of Rule I is not to encourage nurserymen to be less careful in keeping out whitefly, scales, etc.; for a badly infested nursery will not be certified under any conditions.

E. W. BERGER.
Entomologist to Florida Agricultural Experiment Station, Gainesville.

In conclusion, the present inspector can in no sense be considered a state official, and inspections have been carried on by the Experiment Station solely to meet the exigencies of nurserymen doing business with other states and with foreign countries.

THE GROWER'S SIDE.

C. B. Thornton.

Mr. President, Ladies and Gentlemen:

As a member of the Committee on Nursery Inspection would say: In my opinion, the only measure to insure justice to all, is a State law, so framed that all nurserymen in Florida large or small, selling trees in the State, especially citrus trees, are compelled to have a certificate duly attested, from a State officer, competent to judge, stating the absolute condition of the trees offered for sale and this done often enough to give security to the buyer. This is a drastic remedy but in no other way can positive security be given the buyer nor an impartiality hindered between the different nurserymen.

As a prominent nurseryman writes me: "How much good will it do you if I sell a lot of nursery trees to you, duly inspected, passed, and finally to make sure, fumigated and your neighbor "J"—, going to a little out of the way nursery, buys a lot of trees infested with scale, mealy bug, white fly and all other ills? How long will your trees stand in their neighborhood without becoming infested? At present nursery inspection is simply of no value to Florida and with the exception of out of the State and West Indian business, it does not amount to a row of pins." This is from an experienced, successful nurseryman. Unless a severe State measure is passed, all that should be required of a Florida nurseryman is, that he has his stock free from white fly and mealy bug. These two are the most dreaded and justly so. Unless radical measures are taken at once, the white fly will be prevalent in all citrus growing parts of the State as the common purple or long scale is at present and this in spite of all sprays, fumigations, fungus or other preventatives.

Cultivating and Fertilizing Citrus Trees.

J. D. Bell.

Mr. President, Ladies and Gentlemen:

It is not to be expected, since horticultural science has become a lifetime study in what may be called the producers colleges, established by our government all over our country, that much that is new can be brought you by a lay member of our brotherhood. I shall endeavor to remind you anew of well known facts. upon the principle that line upon line and precept upon precept is needed in our business as in all others. Cultivation is a word having a vast range, applying not only to the every day business of the horticulturist but to every department of human activity. In the limited sense in which we are to consider it today let us call to mind why we cultivate. First, to conserve moisture; second, to put the soil in good tilth; third, to kill grass and weeds which are taking tree food from the soil; fourth to decrease evaporation.

During the months of March, April and May in Florida the orange grove should be cultivated every ten days. In the fall the grove should be plowed shallow, this being the best method of putting it in a clean condition for winter and thus reducing danger from cold. As to the tools and minor particulars of cultivation every grower should judge by his own experience what is best for himself or follow the example of his most successful neighbor. In the dry weather of spring and early summer cultivate shallow, cultivate often. During the rainy season cease cultivation.

Prof. Hume says "the horse and cultivator are often a most excellent substitute for an irrigation plant." Some one has said "cultivation is fertilization." Theory and practice strongly enforce the necessity of frequent and thorough cultivation during our dry season. An equally important duty of the orange grower is a liberal use of fertilizers. Citrus trees amply repay good care and attention. Not less than one ton of the best quality of fertilizer should be applied to each acre of bearing grove. A good way of guaging the quantity of fertilizer for a bearing tree is to increase your applications until your tree has a good crop of oranges and is at the same time making a good growth. Look over your grove and endeavor to make every tree in it as good as the best one. Scatter fertilizer broadcast through the grove, except for young trees, then scatter upon the feeding roots. Some successful growers fertilize in January, May and October. Others in February, June and November. Three applications are better than a less number, having the same amount of fertilizer. Work in fertilizer soon after it is applied. Always be liberal with your trees, a stingy man cannot make a great success in orange growing.

Join the Horticultural Society and

Orange Growers' Associations, get acquainted with the professors of our experiment stations, draw upon their supplies of knowledge of fruit growing early and often. Plan your work, work your plan. Start with an unlimited supply of faith and courage, for we contend not with principalities and powers, but with ten thousand times ten thousand and thousands of thousands of creeping and crawling things.

Reports from Local and Horticultural Societies.

By Lawrence C. Moore.

Mr. President, Ladies and Gentlemen:

At the time I received President Rolf's circular letter (which was doubtless mailed to every member), naming certain subjects which should have the attention of our Society, and then mentally examined my stock of knowledge upon said subjects I threw the letter in with my answered mail, satisfying my conscience with the thought that he would find more fully equipped men to discuss and entertainingly present all the leading facts; so, donning my hat, I wandered forth to my orange trees, drying up for want of water and cultivation, with work enough in sight to keep three men busy for a year! But—two topics kept persistent hold of my mind and I found myself repeating the old adage, "What is everybody's business is nobody's business," and, in my egotism, I applied it to the letter of our President, and persuaded myself that it was my duty to do the little I might, to hold up his hands—send him some response and leave it to him to present the best thought offered on any given subject, or to dissect each paper, and combine the best ideas, to the end that individual knowledge might be increased and some progress be the result. I therefore throw upon him the whole responsibility should this paper reach other eyes—or ears—than his own!

Having determined my duty, next came the selection of the subject. This was not difficult; it was suggested on every hand by the wilting trees, the encrusted ground, the hot, dry winds and eight or ten neighbors sitting around whittling, smoking and discussing everything but the improvement of surrounding conditions. Perhaps it was the strong contrast to all this which caused my mind to revert to my boyhood's days, when I had the good fortune to spend several happy vacations in that wonderfully thrifty Quaker settlement, Sandy Spring, Montgomery county, Maryland, where both my grandmother and my honored father first saw the light. Here the local Horticultural Society has cemented the neighborhood into one homogeneous whole, and no such conditions as those surrounding me could exist under the unity plan. Neglected trees, idle men have no part or place in that community, but persistent labor and the helping hand of neighborly neighbors have converted it into one of the garden spots of this country.

And so I wrote to our President and accepted an assignment on "Local Horticultural Societies." Then came the rub; I was committed; had to work out a given thing in a given time, and that is always a nerve-strain. Suddenly a brilliant inspiration came: why not write for a full account of the organization and life of the Society at Sandy Spring and substitute it, warm from its birthplace, for any colder facts which I should have to cook over?

And so I will give you the reply which came to my letter, with only such alterations as are necessary to elucidate facts otherwise obscure because of lack of familiarity with the surroundings.

"SANDY SPRING, MD.,
2nd month, 11th, 1908.

My dear Cousin—I was glad to have thy letter, for I believe it has been twelve years since we have met. I send thee, as requested, such information as I possess regarding our Horticultural Society. The Horticultural Society of Sandy Spring has been in existence about forty years, and it seems to us to be a fair model of a local organization. It was started with the double object of promoting a desirable social life among country people, and to cause them, by this contact of minds, to learn better ways of living and better methods of producing, thus enabling the community to discover and put into practical use new methods of doing old things, as well as the most modern and economical manner of producing, harvesting and marketing the products best adapted to its locality.

Our Society meets once a month, from March first to November first. but in thy locality this would doubtless be changed, and possibly twelve delightful meetings might be held. About fifteen different households belong to the Society, with an average of three to a house in attendance; guests often bring the numbers up to seventy-five. Meetings are held in rotation at the homes of the members, and each one is expected to bring small samples of his wheat, best fruits and flowers, or specimens of plants to be discussed, looking to improvements in its propagation, or to the extermination of some enemy. We meet at 3:30 p. m., and have the usual officers—President, Vice-President, Secretary and Treasurer—who are elected annually. The latter is a mere complimentary position, as funds are not much in evidence, nor are they needed; hence there is no membership fee. The reading of the minutes of last meeting is disposed of in the usual way, and also the minutes of the last meeting held at the farm of the present hosts, since this takes up the work most interesting and valuable to them. For example: Thee may be devoting thy time to orange growing; another to pineapples; another to grapefruit; and so on; each wants the ideas on his specialty, and it is the aim of the presiding officer to keep this subject uppermost. Then comes the report of the "Forethought Committee," which is always bright. Then each member is asked a question, or may read a brief, suitable selection. Generally two readers are appointed, with the understanding that they will not be called on if business prevents. An early collation is served in any informal manner selected by the hostess. The collations are purposely kept very simple and consist of tea, coffee, hot rolls or biscuit, ham, chicken, or better still, a salad; or else coffee and sandwiches, with a simple dessert of cake or melons, in season. This is served either by handing round with paper napkins or is placed on a table on the lawn, each guest helping himself.

I have gone into particulars to show how easy it is to serve seventy-five or a hundred guests when it is done simply. It seems unnecessary to say that neither politics, religion, nor any subject calculated to provoke heated discussion, is permissible.

Our Society always has a waiting list. There are two similar ones in the same country neighborhood, of forty members each; this speaks volumes for its usefulness. Your cousin,

M. B. Thomas.

Mr. President, this article is sufficiently lengthy to stop here, but I ask your indulgence for a single moment, to say that no place in our country offers a better field for local organizations than Florida. We boast of the most cosmopolitan citizenship of any State in the Union. Local jealousies and petty personal differences are sapping the life of many communities; men antagonize progressive local measures because others advocate them, and I have yet to see the neighborhood unanimous even for good roads. One neighbor withholds the price obtained for a shipment, and makes a secret of the name of the house to which he consigns it. Another will write your customer, whose name he has obtained at depot from your shipment, underselling you. These and similar local unpleasantnesses are rendered void by local associations, and the old but true statement is exemplified, that "There is a giving that does not empoverish and a withholding that doth not enrich." If this be true, then go home and organize, and let the first Society render us a synopsis of its year's work, through its secretary, at our next annual meeting.

ORGANIZATION OF LOCAL SOCIETIES.

By H. B. Stevens.

Mr. President, Ladies and Gentlemen:

I said I did not have any paper; I might have said also that I did not have any speech. If you want to organize a Society, go ahead and do it. If you succeed, you succeed; and if you fail, you fail. We organized a Society in DeLand to fight against insects, and the people, through that organization, have become more interested in horticulture. If you organize a local society, you will find it is an easy way to get members into this Horticultural Society. The Fruit Growers' Protective Association will be a great help to us, and our society saw at once the advantage of taking hold of it and the great need of carrying on its work. When they made an appeal for money, $300.00 was raised with us in about fifteen minutes. If you have an organization like this, it is an easy and quick way to bring matters of vital interest to you all, before them, and it is an advantage to have as many organizations as you have neighborhoods.

I think it well to get together locally and form other organizations and all join together against the things that are working against our interests; the railroad transportation, etc., and to work with the Horticultural Society. There is everything for us in co-operation, and failure for a good many if we insist on standing as individuals.

Agricultural Organization.

By C. K. McQuarrie.

Mr. President, Ladies and Gentlemen:

It gives me the greatest of pleasure to present to you for consideration and discussion a subject that every member of this Society is interested in, viz., *Agricultural Organization.*

In dealing with this subject I want to say at the start that the word Agricultural in this case means Horticulture as well as Agriculture.

There is no doubt whatever of the benefit to be derived individually and collectively where there is a wide-awake, up-to-date organization of farmers and fruitgrowers in existence, and it would be to the advantage of the country at large if their numbers were largely increased. One can easily understand how uniformity of prices can be maintained and the proper distribution of products controlled by an organization, where the individual would be hopelessly lost. We have had ample proof of this in West Florida during the last twenty years and if it would not seem to be out of order, I would like to give a little history of a couple of these organizations of which I happen to be a member.

Eighteen years ago there was a rush of new settlers around DeFuniak and every last one of them going in for peach, pear and plum growing. We found that collectively we could buy nursery stock to greater advantage in car-load lots; so we organized "The West Florida Highland Fruit Growers Association." We had a membership of more than one hundred. For three or four years everything went along smoothly; bought nursery stock and fertilizer in car-load lots and saved considerable money in so doing. G. W. Mellish was our energetic and capable secretary, and A. G. Hollowell was president, and under this management things did very well. We held meetings once a month and in the summer time, or when weather permitted these meetings were held at members' residences in rotation. At those meetings was laid the foundation of the greater interest that West Florida takes in farmers' meetings than any other portion of the state. And here let me digress a little from my subject to say that the attendance at Farmers' Institutes in West Florida is far beyond any other section of the State both in attendance and interest in the subject on hand.

When our orchards began bearing, we tried to ship in the same way that we bought, but it somehow would not work. The varied individuality of the membership caused considerable friction. Poor packing, packing unripe fruit, and packing fruit that was too ripe were some of the causes and we found that, generally speaking, the man that did the worst packing and was not particular as to uniformity in size and coloring was the one who did the most kicking and loudest grumbling.

The L. & N. (the only road in this

section) would not give us the rates to which we were entitled. They had us by the neck, and they knew it. So when our Association came to the marketing side of its usefulness it did not prove as successful as the purchasing side of it, and, to add to our calamities, our enemy, the San Jose Scale, came in among us to stay for good, and in a very few years we were as busy grubbing up dead trees as we had been planting, and the grubbing was the more laborious job of the two.

For a few years after that our Association drifted along with a very small membership waiting to see how affairs would turn out. Brown-rot and crown-gall, and other enemies made themselves at home among the few remains of our orchards. We knew we had one of the best fruit sections in the country and our faith was strong that we could devise ways and means to overcome most of our difficulties.

On July 4th, 1899, was formed the "West Florida Agricultural Society," whose formation was the outcome of a general farmers' picnic at Grand Ridge. This picnic was gotten up by Judge Porter so as to get West Florida farmers together in a social way and discuss matters relating to their calling.

The Society was launched at that meeting, but at a later one, at DeFuniak, the officers were appointed and a constitution and by-laws adopted. The Society has been very successful along purely agricultural lines. The president at that time, Judge Porter, called on the president of the L. & N. R. R. (Mr. Smith) and was successful in getting a one-cent rate for members to attend meetings. The territory covered by the Society extends from River Junction to Pensacola, 160 miles. In its earlier history meetings were held once a month in the summer and every two weeks in the winter. At these meetings all subjects relative to farming interests were discussed. In fact, they were equal to Farmers' Institutes; but as we had no funds at our disposal to pay expenses of state lecturers, were confined to members for speakers. At each meeting the place for holding the next one was decided. The favorite places were Grand Ridge, Chipley and DeFuniak.

Members attending from a distance had to deposit a certificate of membership with the ticket agent to get the one-cent rate for distance traveled. The condition to be observed in getting this reduced rate was to notify the division ticket agent a week ahead of any meeting to allow him time to notify the local agent. The membership of this Society at one time numbered nearly three hundred of the most progressive farmers of West Florida.

In 1901 it was decided to try to ship canteloupes and other early farm products in car lots, the railroad agreeing to give us certain facilities by placing pick-up cars at our disposal. This worked fairly well, but we found a great many obstacles in the way; the different soils and different modes of planting causing uncertainty in time of ripening; also the different fertilizers used and the different modes of culture. Every small thing had in the aggregate quite a decided influence on the general success of any one crop, and the studying of results along these lines was a very valuable education to those interested, and as the writer happened to be the secretary, the information he got and the means of observation at his command, were very valuable to him for further work in this connection.

The death of C. P. Atmore, the general ticket agent of the L. & N., gave the Society a severe setback; for Mr. Atmore's successor cancelled the arrangement for the one-cent fare, thus giving us a blow from which we have not yet recovered, for the regular passenger rate on this division of the L. & N. is four cents a mile, and few farmers are going to leave home, lose time, and pay this rate to attend meetings, let the subjects be ever so important.

We are still holding together nominally, waiting for better times to come to us in the shape of the return of the old rate. We may not get it, and we may, but the good the Society has already done in awakening interest among the farmers of our section and in educating them in the meeting-habit is of great value to all concerned, for it is a very difficult matter to get agriculturists to attend meetings. They think they have no time to devote to meetings and yet these are schools of education to them. The very fact of meeting each other and getting interested in each other's doings awakens a livelier interest in all matters pertaining to their good.

We all know that the real prosperity of the country depends on its agriculture. It is the real creator of wealth, and if those engaged in it would only wake up and get more mutual confidence in each other the good they could do is incalculable. To get this ideal state of matters, we have to begin early. We have to start in the district school house. *Education is at the bottom of it.* An ignorant man or woman is always a suspicious one; thinks someone is going to get ahead of him; for this lack of education keeps his mind cramped and his outlook narrow. In all agricultural meetings, the man who knows least thinks that he know most, and this holds true everywhere; and the past history of agricultural societies all over the country will bear out what I have said.

The outlook for this usefulness of agricultural organization is very bright. Their past history is full of achievements, but their future history will be yet fuller. The solving of the present problem of the age, good roads, is in the agriculturists' hands, and they are leading the way in a wonderful manner. About fifteen years ago the farmers of New Jersey proclaimed the fact that the state at large was as much interested in good roads as the farmer; that every individual resident of the state, through the market, was affected for weal or woe by road conditions, and demanded that the state treasury pay at least half the cost of good-road building. This really was the birth of the state aid for good roads in America, and the New Jersey agriculturist was at the bottom of it. This work was not done by leading individuals among agriculturists, but by the combined efforts of the agricultural organizations of the States. Their good work was so evident that others caught on to the New Jersey idea and the good work spread rapidly, until today state aid for good roads obtains in fourteen states. All save two east of the Alleghenies have it. Michigan has a sensible law whereby the state pays a bounty on every mile of good road, ranging from two hundred and fifty dollars to one thousand dollars per mile according to the class of improvements, irrespective of the cost of it.

The State of Pennsylvania is spending over a million dollars yearly for its roads, and New York has a constitutional amendment providing for a bond issue of fifty million dollars available at the rate of five million a year, all for good roads.

The New York farmer, strange to relate, did not share his New Jersey brother's enthusiasm for good roads at first, but now he has fallen into line and goes one better in that the state does more for this purpose than any of the others.

Let us look at our own state and see the paltry efforts the farmers are making for good roads and compare it to those mentioned, and yet we could make good roads at less cost than any of those. The Middle West is setting the pace in this direction. The Indiana agricultural organizations have been the means of getting that state to lead all others, as thirty-five per cent. of the entire roads of the state are hard roads. Ohio comes next with thirty-three per cent.., Wisconsin seventeen, Kentucky sixteen, Michigan ten, Illinois eight, Missouri two, Iowa one and seven-tenths, and Mississippi 0.38. Where is Florida? Too low to be figured out. I hope the day is not far distant when we can also make a showing in this direction.

The Highway Commission of Illinois has been collecting some very valuable data on the benefits of good roads versus mud roads. Travel is uniform all the year round on good roads, while mud roads show a falling off of at least three-fourths during February, March and April, showing fully that the economic benefits of good roads are not fully understood by the ordinary individual.

The need of the hour is the road-builder and our agricultural organization more than any other must be in the lead to get him here as soon as possible.

"The schoolmaster and good roads are the most important agencies to advance civilization," declared a great statesman in the U. S. Senate years ago. The schoolmaster is in evidence and doing good work; but where are our good roads? Now, let us, as an organization of horticulturists representing the best in the state in our particular line, lend our aid to hasten this good movement for the common highways of our country are the veins of commerce and civilization, and the greatest need of our day is good roads. This question outweighs the Panama Canal or the irrigation of the arid West. The world's food supply passes on wagons over our country roads and that tells the story in a sentence. Any interruption of traffic upon our roads affects market conditions. The fact of the matter is that prices of farm products have depended more on road conditions than anything else. In the great grain-producing section, crops must all be hurried to market in about two months' time for later than that the roads will be impassable, thus crowding into a few weeks what should have six and eight months to do it in. The consequences are stringency in the money market, depression of prices, and a good time for those parasites on the so-called Boards of Trade who feed on what they don't produce and gamble with other people's property.

I could give this subject all the time at the disposal of the Society during the whole meeting and then I would be touching only the fringe of it.

And now let me finish by saying that the good that can be done by a live agricultural organization is beyond calculation, if conducted along proper lines. The subject of immigration is one that could be profitably handled by such, for the encouragement of the right class of settlers is one that calls loudly at our doors for solution.

The agitation for uniform rates from our railroad company is another live issue that could be taken up and properly settled, and a score more of abuses that exist to keep the agricultural industry in a backward condition. And not the least of these is the subject of compulsory education, for until we compel careless parents to keep their children at school we cannot expect a first-class citizenship from the rising generation.

In recommending the consideration of these very important questions that confront us as citizens and agriculturists, we must by all means steer clear of giving any of them a political aspect, for the history of the past goes to show that politics has been the rock on which the most of agricultural organizations have been wrecked in the past. So by all means let us keep away from giving any question under consideration a political coloring.

And now, ladies and gentlemen, I leave the subject with you for your criticism and discussion. My remarks have been made with a view of bringing out the best point in the subject under consideration by the after-discussion which I hope it will bring on in a lively manner.

Pasadena Farmers' Club.

By H. Roberts.

Mr. President, Ladies and Gentlemen:

The Pasadena Farmers' Club continues in a prosperous condition, with meetings well attended and interest in the discussions increasing.

This is primarily a social club, designed to promote friendly intercourse among all the people in our rural communities, both natives or old residents and those who have come in later from other states. We realize the fact that, especially in sparsely settled districts, farmers and fruit growers are apt to live too much to themselves. They fail to take advantage of the opportunities afforded them to enjoy and develop the social side of life, thus unwillingly imposing upon themselves and families privations that could well be avoided, and failing to obtain the full benefits to be derived from the freedom and healthfulness of a life among the trees.

In this effort to amend social conditions we have succeeded even beyond our expectations. Our people are united and in hearty sympathy with each other. New-comers are introduced at once into the best society and old neighbors who had not visited each other for years are brought pleasantly together and old friendships renewed.

Our discussions are on some matter of general interest, on some line of our work as home-builders. For that is, after all, our principal aim, to make of our little corner of Florida a land of happy homes, such as can only be found among a prosperous and united people.

We should be more than pleased if this club idea would spread to other districts and that a system of inter-correspondence could be established between the clubs so that the people of one county or section might feel a closer interest in the people of other sections; that all might work together for the better settlement and upbuilding of our beautiful state.

A very interesting feature of our work during the past year was a Farmers' Institute held under the auspices of the Club, at which lectures were delivered by Prof. Rolfs and Prof. Blair, of the Florida Experiment Station, the exercises being interspersed with talks and discussions by local workers, and not neglecting the generous picnic lunch supplied by the ladies who are, after all, the mainstay and support of the Club.

With many thanks to your Society for the invitation to "report progress," we remain, yours for a still better and more prosperous Florida,

The Pasadena Farmers' Club.
Per H. Roberts, President.

Report of Officers.

SECRETARY'S REPORT.

Mr. President, Ladies and Gentlemen:

Since the last meeting I have received for the Horticultural Society:

For 100 copies of 1907 report sold to Mrs. McCarty	$ 50 00
For 6 copies of 1905 report sold	6 00
For 11 copies of 1906 report sold	11 00
For 67 copies of 1907 report sold	67 00
For 5 Life Members	50 00
For 2 1909 members	2 00
For 318 1908 members	318 00
For Registering Reports	16
Donations:	
Mrs. W. E. Cadman doubled her subscription	1 00
Mr. Benj. F. Blount	50
	$505 66
Stamps on hand	40
	$506 06

I have paid out for the Society, since the last meeting, the following:

Expense of stenographer at St. Petersburg	$ 6 35
Freight on books from DeLand	1 70
Printing as per bills audited by Executive Committee	23 50
Telegrams	1 00
Envelopes	4 40
Expense of trip to Gainesville	6 95
Postage	50 30
Expense of record books	75
Secretary's salary	100 00
	$194 95

Balance due Society		$311 11
Check to Treasurer Hart	$309 11	
Currency to Treasurer Hart	2 00	311 11

We now have enrolled 81 life members.
2 honorary members.
323 members for 1908.

406 members in all.

I sent notices to all the papers over the State asking them to make mention of the meeting and have received marked copies containing notice from the following. Citizen-Reporter, Lake City; Punta Gorda Herald, Punta Gorda; Supplement, DeLand; East Coast Advocate, Titusville; St. Lucie Tribune, Ft. Pierce; Times Union and Citizen, Jacksonville; Item, San Mateo; The Southern Cyclone, Live Oak, Southern Ruralist, Atlanta, Georgia.

In my appeal to the members for their dues I also requested them to send in one or more members if possible to the society. A number sent in one and the following sent in two beside their own; E. S. Hubbard, H. S. Pennock, John Kendig, W. S. O'Brien, J. C. Kilgore, G. M. Wakelin, J. S. Wyckoff, N. O. Penny, J. P. Mace, Mrs. G. W. Leonard, E. S. Upham, J. W. Hoard, and J. H. Wylie. The following sent in three beside their own: C. A. Robinson, C. A. Rollins, J. Bumby, Mr. Hume sent in four beside his own, Mr. R. L. Rose six and Mr. W. G. Norsworthy six, Mr. J. H. Compton eight, Mr. H. B. Stevens of DeLand sent in 50.

There have also been two books added to the Horticultural Library this year.

Respectfully submitted,
E. O. Painter,
Secretary.

Later—Following the reading of the

resolutions of the Executive Committee, the members discussed various ways to raise sufficient funds to pay all bills. Those present agreed to supply at least two new names as members and in this way $120.00 was raised. This with sixty three new memberships received during the meeting made $183 to turn over to the treasurer. Since the meeting several members have sent in new names. Mr. E. H. Mote of Ocala has excelled all previous records by sending in a list of one hundred. Wish we had more Motes.

TREASURER'S REPORT FOR YEAR ENDING MAY 14, 1908.

		Dr.				Cr.	
1907				1908			
May	17	To balance from last year.....$	613 18	June	12	By E. O. Painter, Secretary..$	57 60
Nov.	7	To loan from Treasurer......	62 55	June	18	By E. O. Painter. Secretary..	109 50
Nov.	20	To loan from Treasurer......	73 80	Aug.	21	R. D. Alger. on Sec.'s draft.	22 47
1908				Oct.	24	By E. O. Painter Printing Co.	423 61
April	9	To membership fees.........	2 00	Nov.	7	By W. C. Steele	62 55
May	7	To membership fees.........	1 00	Nov.	20	By E. O. Painter Printing Co.	73 80
May	8	To membership fees.........	2 00	1908			
May	13	To Sec. Painter.............	311 11	May	13	By Membership fees sent E. O. Painter.................	5 00
May	14	To Sec. Painter.............	183 00	May	14	By pay loans from treasurer..	136 35
			$1,248 64	May	14	By balance in treasury.......	357 76
							$1,248 64

W. S. Hart,
Treasurer Fla. State Horticultural Soeiety.

REPORTS OF EXECUTIVE COMMITTEE.

Mr. President, Ladies and Gentlemen:

The Executive Committee met at the Secretary's office in Jacksonville on July 1st, and instructed the Secretary to print the report of the meeting held at St. Petersburg last May. This volume was dedicated to the memory of our deceased president, C. L. McCarty. Sundry bills were approved and ordered paid.

On March 19th, your Committee met in Jacksonville and named the date of May 12, 13, 14 and 15 as the time for holding the twenty-first annual session at Gainesville, and instructed the Secretary to secure railroad rates and arrange with the local committee at Gainesville for place of meeting and hotel rates.

The Executive Committee met at the Brown House Thursday morning May 14th; bills as presented by the Secretary were examined and ordered paid. The accounts of the Secretary and treasurer were examined and found correct. The treasurer's report showed a deficit previous to this meeting of $136.85, which amount the treasurer has advanced.

The amount paid in by the Secretary at this meeting amounts to $311.11, which will give only $174.26 towards printing this year's proceedings and other necessary expenses. It is evident that the Society will be over $200.00 short of meeting expenses.

This time seems opportune for an endeavor to secure state aid for the Society.

Adjourned.

(Signed) E. S. Hubbard.
H. B. Stevens.
Executive Committee.

Final Resolutions.

Mr. President, Ladies and Gentlemen:

WHEREAS, The members of the Florida State Horticultural Society in its twenty-first annual session have been so well entertained and so well cared for by the citizens of Gainesville, and in view of the courtesies extended to us by the State University and the officers of the Experiment Station, therefore be it

RESOLVED, That we wish to thank the citizens of Gainesville for our royal entertainment (they have made good), the officers of the University for a very profitable and entertaining afternoon and evening and the best of suppers, and for showing us that we have an interest in so great an institution. We feel gratified to know its size and scope, and pledge it support and good will.

RESOLVED FURTHER, That we wish especially to acknowledge the very efficient work and interest in our entertainment of Dr. C. L. Crow and Messrs. Wilson and Ellis. Their work has been thoroughly and carefully done, and we appreciate and thank them. We wish further to thank Mr. Jno. Billing, Press Secretary, for the very complete reports of our proceedings, and congratulate the people of Gainesville on possession of so bright a Sun. This paper has given us the use of several columns daily.

RESOLVED FURTHER, That we feel under especially heavy obligations to President Rolfs for the wonderfully interesting and instructive program he has been able to prepare for us, and extend to him our hearty thanks.

RESOLVED FURTHER, That we thank the gentlemen in Uncle Sam's most efficient ranks of workers, who are engaged in solving for us the difficult problems that confront us, and wish them speedy success. We also wish to thank the Transportation Companies for the courtesy of giving us good service and in reducing the railroad fare, thus enabling more of us to come to the meetings, and hope that they may some day see the wisdom of inaugurating a lower rate in the movement of our produce to the markets of the country. We hope that they may see that our interests and theirs are identical and that they prosper as we prosper.

It is also desired to extend thanks to the two ladies who added so much to our pleasure and entertainment—Mrs. Prange and Miss Hubbard.

L. B. Skinner
(Signed) A. H. Brown
E. S. Williams
Committee on Final Resolutions.

Necrology.

EULOGY OF REV. LYMAN PHELPS.

E. S. Hubbard.

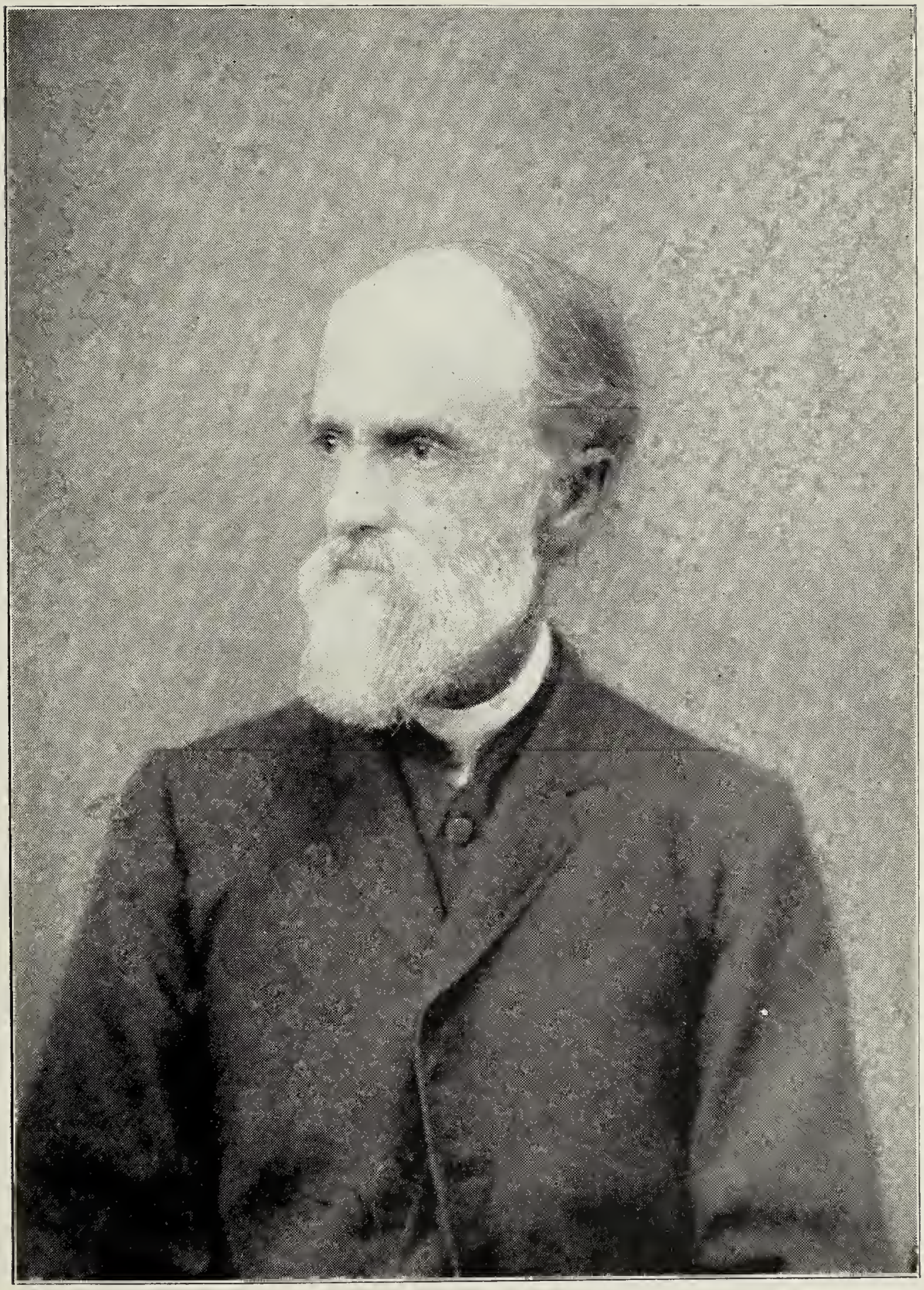
Mr. President, Ladies and Gentlemen:

On April 26th our friend and fellow worker, Rev. Lyman Phelps, embarked on his last journey to "the undiscovered country, that bourn from which no traveler returns," and I would render a tribute to his memory. The lofty brow, the piercing eyes, the Dantean nose, the grim yet tender mouth, the prognathous jaw, the countenance that was index to his character will be seen among us never again. The distinguished presence that graced our gatherings is a memory of the past. The subtle intellect that counseled and guided in our deliberations is a shade with the host of departed spirits, and the place that knew him once will know him no more.

Thirty-five years ago, broken in health from overwork in his chosen profession, having buried the wife of his youth, with even life despaired of, he came to Florida. In our balmy climate he gradually gathered strength and courage and began missionary work among the scattered settlements. The long drives through the wild forest country gave him an intimate acquaintance with Orange county and stimulated anew his interest in botany, giving him a knowledge of the species and habits of the Flora of Florida equalled by few. From this he became interested in the horticultural and business advancement of his surroundings. For a time he was postmaster at Sanford, connected with the bank and an encourager of all legitimate enterprises; but what appealed to him most was the growing and improvement of citrus fruits.

For a time superintendent of General Sanford's Bellair orange grove he made an intimate study of the great number of new varieties imported by General Sanford and was the chief factor in selecting the most desirable and introducing them to the public. At that time nearly all the oranges in Florida were grown on sweet seedling trees from seeds of the old Spanish strain of stocks and the groves planted by Zephaniah Kingsley. Mr. Parsons, the nurseryman of Flushing, Long Island, had made quite a list of importations from Rivers of England, including the Excelsior, also known as Hart's and Valencia Late and imported by General Sanford as Brown, but the varieties of Maltas, Jaffas, etc., were mainly brought to public notice by Mr. Phelps.

He was the father of chemical fertilizing for citrus fruits in Florida. When



REV. LYMAN PHELPS.

he began his experiments the old groves were mainly fertilized by cowpenning with cattle; the muck mania was in full blast and the small amounts of commercial fertilizers used were usually either organic nitrogen material or one-sided, ill-balanced chlorine base mixtures that produced when used continuously unfavorable results. The discovery of a well-balanced chemical fertilizer produced from sulphates that can be used safely year after year was a triumph of which any horticulturist might be proud.

The influence of this discovery has been far-reaching not only with citrus, but with deciduous fruits and the principle involved is now generally recognized as the correct method for high-grade results. He also discovered that an excess of sulphate of ammonia or a spray of bi-sulphate soda prematurely sweetens oranges.

Mr. Phelps was also a prime mover in the citrus exhibits and competitions started at Orlando and continued at Sanford and Ocala. He used his full influence for the judging of citrus fruits by scales of points and furthered the improvement of those scales to this present form. Nothing educated public opinion and knowledge as to the standards of excellence of oranges and the merits of different varieties as did these competitions, and there was no greater object lesson on scientific culture and fertilizing than the thin-skinned, high-flavored fruit shown at these exhibitions. I think Mr. Phelps was most proud, however, of his discovery of the cause of bud-sports, variations or so-called mutations of citrus fruits. The origin of new varieties, types or species in plants is a complex subject. The production of new varieties or types by cross-pollination or hybridization and the culling and selection from thousands of seedlings is exemplified by the work of Burbank and others.

To illustrate the small and inconclusive extent of experimental research into the origin of so-called accidental sports I will quote from Prof. H. J. Webber, Bulletin 251, February 1908, Cornell University Agricultural Experiment Station of the College of Agriculture, Plant Breeding: "A second type of variation is that known to gardeners and horticulturists as sports and to scientists as mutations. These are large pattern, striking variations which do not occur very commonly, but which when found are likely to prove useful in the production of new types of value. The recent scientific studies of De Vries, a famous botanist of Holland, have emphasized the great importance of such variations in the production of cultivated varieties and the evolutions of species. As is well known to gardeners, these sports or mutations appear suddenly without warning or reason so far as we know. We cannot produce them and must simply wait until they appear and then be prepared to recognize and propagate them. Mutations usually reproduce their characters without much reversion to the parental type except such as is caused by cross-pollination. Mutations of self-fertilized plants thus usually come true to type, while in cross-fertilized plants the mutations must usually be cultivated in an isolated place and carefully selected to weed out the effect of such crossing as has occurred. Many seedsmen examine their trial grounds regularly for the sports or mutations and many of our best varieties have resulted from the selection of such sports. Livingston, of Ohio, who during his life was famous for the number of new varieties of tomatoes which he produced, made a practice to regularly search the fields of tomatoes which he grew for seed purposes, for such sports, and almost all of his numerous varieties were produced by the discovery of such striking variations."

"Another kind of variation, probably of little value to the breeder of annual plants and about which we as yet know very little, is the so-called bud variations, sports or bud mutations. Chrysanthemum and rose growers know that it is not a very uncommon thing for a plant to produce a branch which will be entirely different from the remaining portions of the plant. Valuable new varieties of roses, chrysanthemums, carnations and some other flowers and fruits have been secured by the selection and propagation of such bud variations. They seem in a large measure to be comparable to mutations except that they originate in a bud change instead of a change occurring in the sexual reproduction. It is probable that they will ultimately be found to be due to similar causes, being produced in the same way.."

Prof. Webber also speaks of the work of an experimenter stimulating plants to produce mutations by injecting chemical salts at certain periods. Mr. Phelps, however, believed that no effect in nature is produced without some active, adequate cause and that the bud changes were effected by the organs of reproduction of the flowers.

The citrus are the most highly organized plants I know of. The discovery that cross-pollination changes citrus fruits on the parent tree to hybrid fruits but not with hybrid seeds, goes back one hundred years to Gallesio.

Mr. Phelps discovered that not only was the fruit affected in these rare instances by cross-pollination, but that the wood immediately below the fruit partook of the cross also and by taking buds below the fruit when small he secured trees that bore the hybrid fruit and remained true to type. He also claimed that by forcing the trees with special combinations of chemical fertilizers they were more susceptible and that he proved these results by artificial cross-pollination. These were lost in 1895.

It is unfortunate no public experimenter has had the courage and patience to work on this line like Burbank on hybrids, as the results when obtained are more immediate and certain. The establishing of a working plan, however, would require considerable experiment compared with growing hybrid seedling plants, as a majority of hybrids show crossing from the start, while with cross-pollinated sports the negative results might possibly be as great as the rejections from seedlings. The occurrence of these bud sports from bud wood used just after the spring bloom has been often observed by citrus nurserymen and fruit growers.

So far as I know they have never been noted from bud wood taken before blooming. I have secured two and probably three varieties of navels in this manner.

The influence of the bud on the stock, is also greater than imagined, as was shown in numerous cases after the 1895 freeze where lemon and sweet orange sprouts sprang from the roots of sour stocks on which lemons and oranges had been previously budded but killed out.

Mr. Phelps was an original member of the Nurserymen's Association that was reorganized into the old Florida Horticultural Society. He was a charter member of the present State Horticultural Society and chairman of its executive committee till failing health rendered him unable to fulfill its duties, and he did as much as any one man to steer the Society through the perils of its infancy and establish those conservative policies which have made it respected and a power in this state and country.

Mr. Phelps was a man of imagination and possessed the subtle outreaching instincts that mark the prophet and the seer. His enthusiasms may sometimes have carried him to temporary erroneous conclusions, but that happens to us all and it is the so-called cranks and visionaries that reach out into the unknown and discover and harness the unseen forces. Let his example be to us an inspiration, a stimulus to high resolve and stern endeavor, for a pioneer in the van of modern progress, a paladin in the crusade against ignorance, superstition and error, a lofty and a knightly soul has passed from the realm of human endeavor into the great beyond.

Rev. Lyman Phelps, who was a native of New York State, was born December 12, 1833.

He early served an apprenticeship to a cabinetmaker, where he learned the art of working, polishing and finishing woods which was to be in later life a source of pleasure to himself and friends.

He attended the Moravian Institute as a student in winter, teaching in various places during the summer months.

Later he attended the Theological Seminary at Nashotah, Wisconsin.

He was ordained to the deaconhood of the Protestant Episcopal church at Nashotah Seminary, St. Sylvanns Parish, Wisconsin, June 15, 1862, and to the priesthood at Zion church, Oconomonoc, Wisconsin, June 28, 1863.

Under Bishop Jackson Kemper he did missionary work part of the time among the Indians; later he became rector of the parish at Mineral Point, Wisconsin and principal of the church school at that place.

While here he was married to Miss Apia Hait, who was a teacher in the school.

During the summer of his last year at Mineral Point, he went for his vacation to a resort near Magdaline Island where he was to hold services. He was accompanied by his wife.

Owing to bad sanitary conditions while here both Rev. and Mrs. Phelps contracted typhoid fever, which resulted in the death of Mrs. Phelps and complete loss of health to Mr. Phelps.

He was obliged to give up his charge at Mineral Point. He went east for medical advice and treatment, stopping for some time at the sanitarium of Dr. Foster at Clifton Springs, N. Y.

In the winter of 1875, accompanied by a devoted sister, he came to Florida.

Here much of his time was spent with gun over his shoulder, in taking long tramps through the woods studying the flowers, trees and birds of the southland.

His health improved and he became deeply interested in the culture of the orange and other tropical and semi-tropical fruits.

On August 15, 1877, he was married to Mrs. Mary Lyman Wells, the widow of the late Philip Wells of Armenia, N. Y., and daughter of Moses Lyman, of Goshen, Conn., who had a winter home on Onoro lake near Ft. Reed, Fla.

Rev. and Mrs. Phelps chose for the site of their future home a lovely spot lying between Silver and Onoro lakes.

At this time Mr. Phelps applied the knowledge acquired in early life to decorating his house with beautiful specimens of Florida mahogany and curly pine; beautifully finished and polished doors, panels, mantels, tables and suites of furniture remain as monuments of his knowledge, skill and handiwork. Mr. Phelps' health continuing to improve, he did considerable missionary work through the county. He was rector of the church of the Holy Cross at Sanford for some time.

He continued the study of the orange and all citrus fruits, was manager of the famous Belair Grove, owned by General Sanford, when in its prime.

It was while manager of this grove, that under his direction were raised some of the first and finest pineapples ever grown in the State.

He was appointed postmaster at Sanford February 26, 1883, serving the public faithfully during the term of his appointment.

He was one of the originators of the Lyman Bank, and director of the First National Bank until failing health caused him to resign.

His grove at Denmere, his home, became one of the finest in the State.

The freeze of 1895 was a severe blow to Mr. Phelps.

The death of his beloved wife in January, 1897, was shortly followed by a severe attack of typhoid fever. Much of his time for the next two years was spent in rebudding his grove.

During the winter seasons he went to Lake Maitland each Sunday to assist his honored and beloved friend, Bishop Benjamin Whipple, in the services at the church of the Good Shepherd. This he continued to do until the death of Bishop Whipple, which was another severe blow to Mr. Phelps.

On January 17, 1900, he was married to Miss Mary Louise Blanie, of Sanford, Fla., whom he had known for many years.

At this time Mr. Phelps became very much interested in the growth of lettuce and celery, which was attracting a great deal of attention in the State. During the two years in which he was engaged in this work he raised successively very fine crops of each vegetable on his lots in Sanford.

During the winter of 1905 and 1906, Mr. Phelps' failing health was a source of great anxiety to his wife and friends. He could take only short walks about his home.

After January, 1906, he was never able to leave the house. His days were spent in his roller chair. Much of the time on the east porch overlooking the beautiful lake Onoro, or on the south porch looking toward Silver lake. His favorite spot in the evening being at the west hall door to watch the sun sink to rest behind the orange trees.

There was little noticeable change in his health until the winter of 1907-8 when he grew gradually weaker, but suffered very little pain.

On Easter Sunday loving hands placed

him in his chair for the last time. By his own wish he remained up all day, and watched the sun set at evening.

Easter Monday he was too weak to get up. Each day he grew weaker, the last three passed in a semi-conscious state, recognizing no one but his sorrowing wife.

His spirit quietly passed away on Sunday morning, April 26, at about ten o'clock.

The funeral services were held at Denmere, Archdeacon Brown officiating.

The remains were laid in the family burying ground near Silver lake, where in their season, the orange trees he loved, may scatter their blossoms over his quiet grave.

WILLIAM H. EARLE.

William H. Earle for many years was a prominent and leading citizen of Tangerine. He was born at Hubbardston, Mass., on the 22nd day of May, 1831. His father was a farmer, and of good New England stock.

The life history, and a detailed account of the work done by the subject of this sketch, would, as those best acquainted with him well know, fill a volume. Being possessed of a mind, more than ordinarily bright and active, and having a natural inclination to literature, he at an early age became, and through all of his active business career remained a valued and constant correspondent of many of the leading papers not only of his native State, but also of the State of his adoption. Nor was it by pen alone that he acquired the respect and esteem of the citizens of his native State; for we find him taking an active and leading part in the granger movement; and as one of the strongest and most aggressive advocates of the cause of temperance, and it was upon the platform and the rostrum that he won his brightest laurels; eventually becoming the gubernatorial candidate on the ticket of the temperance party of his native State. Again we find him actively engaged in mercantile pursuits, he having founded and for many years personally conducted the agricultural implements, feed and seed business, still carried on by Ross Bros. in the city of Worcester, Mass., and which owing in no small measure to his care and forethought has continued to flourish until at the present time it is one of the largest concerns of the kind to be found anywhere within his native State. Mr. Earle continued in the active management of this enterprise until about 1885, when on account of failing health, he was compelled to dispose of the business, and turned his thoughts toward a more congenial climate than that afforded by the old Bay State. His former schoolmate and life long friend, Mr. Dudley Adams, having acquired extensive holdings of real estate near Lake Beauclair, in Orange county, Florida, it was perfectly natural that his thoughts should turn that way, and we soon find him in company with two near and dear friends, Mr. George H. Rice, of Worcester, Mass., and Mr. S. C. Davis of New York, located near the small village of Tangerine; this was about 1883, and the three friends at once commenced the construction of a cottage, for their winter home in the Sunny South. The genial and equable climate of Florida soon brought about a decided improvement in the health of Mr. Earle; and he thereupon determined to make Tangerine his future home. His friend, Mr. Rice, and himself immediately embarked in the orange culture, then in its infancy in their locality.

They established a large nursery, and set out many of the orange groves in and about the village of Tangerine, the subject of this sketch at once entering heart and soul in the enterprise.

Their groves grew, flourished and commenced to bear fine crops of golden fruit; then came that never to be forgotten freeze of 1895. Almost every tree was destroyed; and absolute ruin stared every owner of a grove in the face. The result was that most of the capitalists from the north withdrew from the field, and abandoning everything returned to their northern homes in disgust.

Not so with Mr. Earle, and it is just here that his indomitable will, energy and perseverance most shows itself. He did not give up, but patiently, persistently and industriously went to work to repair so far as lay in his power the damage done to his groves, and by his acts and advice inspired a few of his neighbors to follow his example. The result is that we have the Tangerine of today, surrounded by its tens of thousands of beautiful orange and grapefruit trees; while many another settlement has for the lack of a man of Mr. Earle's sterling worth and character, been absolutely deserted, and literally wiped from the map of Florida.

During all of these years Mr. Earle was also an active member of the Horticultural Society of Florida, and through his association with that society and its officers, he was enabled to secure many choice varieties of fruits, plants and flowering shrubs from other countries, many of which remain as a monument to his good taste and practical forethought. There is still another enterprise in which Mr. Earle was interested. He became the owner of the only hotel in Tangerine, about 1885, naming it The Wachuset House and personally conducted the house for many years.

Here he hospitably entertained many of his friends from the north, during their winter sojourn in this land of sunshine, of fruit and of flowers. Mr. Earle was twice married, his first wife was Sarah R. Greenwood. Two children were born to them; one a son, William, who died at the age of 17 years; the daughter now Mrs. W. S. Morehouse, and her daughter, Reba Earle Morehouse, reside at Seneca Falls, in the State of New York. Mr. Earle's second wife, Addie Greenwood Earle, survives him.

MR. F. LIPP.

Mr. F. Lipp, who died at his home in Cocoa May 8, was born in Bavaria, Germany, 1844; he came to the United States, 1882, New York, and in 1886 moved to City Point, Fla., remaining for one year. After that he came to Cocoa and has lived here since. He was married the second time 33 years ago to the present wife, who survives him. He was buried in the Cocoa cemetery Saturday evening, with only the formal burial ceremony, read by his old time friend Mr. R. N. Andrews, and his remains now rest by the side of his little son who died 21 years ago. A large number of friends were present. Mr. Lipp has been unwell for almost a year, and bore his affliction with great patience. He was kind—a good neighbor, and his closest neighbors for 21 years bear testimony to his genuine worth as a citizen. The old song "kind hearted and true" sums up the life of Mr. Lipp, and many admirers will miss him.

Question Box.

No. 1—To what extent do orange and grapefruit growers practice cutting out the dead wood accumulating on the inside of trees? We would like to hear from some of our best growers on their practice along this line.

Mr. Hart—I think it is desirable to cut it out and I do so when I can possibly find time for the work. The dead wood there does no harm to the tree so far as I know, unless it is very large, but it is very inconvenient to the pickers and it injures and destroys considerable fruit. I think it advisable to prune out all dead wood while the fruit is small.

No. 2—Do we cultivate the soil, during a dry time, to bring the moisture up, or to keep it down?

Mr. Hoard—I do not see how cultivation could have any effect towards bringing the moisture up, but think it would have the tendency to check it and keep it down.

Mr. Von Engelken.—I presume the practice of cultivating during a dry spell is for the same purpose as that accomplished in the Western States, where they raise crops with practically no rainfall whatever. They keep the soil stirred; in other words, keep the moisture down where it will do the most good.

Mr. Hart—The earth cools off at night and sucks in the air that is laden with moisture, and in the morning as it warms up, that air expands and much of it goes out, leaving the moisture behind. Cultivation just helps to retain that moisture that is brought in the night before. It also prevents the escape of moisture that is brought up by capillary action.

No. 3.—Will you kindly tell me of Bermuda Onions? Can they be successfully and profitably grown in the latitude of Gainesville, Fla.?

Mr. (——)—At McIntosh the farmers have been growing onions for shipment on a small scale and have been very successful. They are pretty fair onions, too.

Mr. Taylor—You cannot grow them on very dry land. They must be planted on moist land, but not too moist. It is one of the surest crops we can grow. They stand both cold and reasonably dry weather pretty well, and the man who puts them on the right kind of land is sure to make something of a crop.

Mr. Painter—A crop of Bermuda onions grown so as to reach the early market is sure to be profitable. Late onions will seldom sell for over $1.00 per bushel. They require a rich and moist soil, or the soil made rich with fertilizer. I grew seven successive crops and all were profitable except one, when the seed turned out to be White Californias instead of White Bermudas. The former made a large crop, but would not carry to market. By raising onions on irrigated land they can be pushed during growing season and when they are large enough, withhold the water and let them ripen and dry up. Two weeks can be gained in this way and two weeks often means a difference of $1.00 to $1.50 per crate. The market does not want a large onion. The best size is three inches in diameter.

No. 4—Is it desirable to prune out watersprouts from orange trees?

Mr. Hart—If the sprout is where I can let it grow, I always save it. Their tops can be swung usually to where there is room for them. I do not waste any growth that I can put to use, and you can put almost any watersprout to use. It is very rare indeed that I take one out. I consider that more groves were killed after the freeze of 1894 and 1895 by cutting off the sprouts, than in any other way. It takes away the leaf surface the tree should have, and I think every inch of leaf surface adds to the strength and bearing capacity.

Mr. (———)—Do they not take a great deal of strength from the tree?

Mr. Hart—No, sir; they bear the second year, and properly trained, soon become as profitable as any part of the tree. The fruit bends them down and the next growth starts from the bend. The limb thickens up, the rest of the tree grows out around it and it becomes a valuable part of a symmetrical tree.

Mr. (———)—Do I understand that you would let nature do its own pruning unless you found that the limbs were bending and rubbing against each other?

Mr. Hart—Yes, sir; that is pretty nearly right.

Mr. (———)—After the freeze of 1894, there were a lot of sour sprouts came up, sometimes as many as eight or ten. In most instances I have left all and they have made large limbs. Instead of having a large single trunk, I have a number of large limbs. The trees are about 25 feet from each other and in some cases they almost overlap, but there is a dense growth in the center. I have been in doubt as to whether it would not have been better to thin it out and get more fruit in the interior of the tree, but I have been afraid to do it. I understood that you, Mr. Hart, did not do it, but I am a little in doubt as to whether I am losing fruit by not thinning them out, or not.

Mr. Hart—When the sour sprouts came up, I budded two or three of them and as the buds took, instead of cutting them away, I cut them partly off above the buds and laid them down. I would cut them partly off and then press my foot against them above the cut so that there would be a long break or split. In that way I retained the leaf surface of the sour wood in connection with the root until the sweet buds became larger and could take care of the strength of the roots. After a year or two the sweet buds have gotten good tops, those limbs that I had laid down had served their purpose and I took them away. Do not cut them entirely away and destroy the leaf surface until the sweet stock is large enough to take care of the root system.

Mr. Seymour—After the freeze, I had to saw off my trees level with the ground and when the sprouts came up budded from four to eight, according to the size of the trunk. I have in my grove from one to seven or eight sprouts on the trees. As to the fruit of a single stock bearing as much as one with four stocks, I have proved that not to be so. I have one tree with one stock and some with four, and I get a great many more off the four than off the one. As Brother Hart says, I do not pull all the extra sprouts off. I think the tree needs the leaf surface, and I leave them on in big bunches and after awhile I pull them off I think my grove is as fine a bearing grove as any in my neighborhood.

Mr. (———)—Where you have a cluster of limbs growing up from the ground, do you prune or not?

Mr. Seymour—I let nature do its own pruning. Unless a limb gets across another one and rubs it, I never cut it out. I have a neighbor who is all the time cutting his trees and he never gets more than half a crop any time. I think in pruning too much, you stop the bearing qualities of your tree.

No. 5.—Is Frenching of the citrus family a disease in itself or simply a symptom of a derangement? How can it be treated?

Mr. Painter—Frenching comes from malnutrition. This may be from different causes, therefore the treatment that will cure in one case will not necessarily cure in others. The most prevailing cause is humic acid in the soil. Apply a liberal application of airslacked or hydrated lime to the tree or on the side of the tree affected and harrow or hoe it in. Fertilize with a few pounds of nitrate of soda in addition to the regular application of fertilizer. In some cases three or four pounds of copperas applied to the diseased tree has apparently cured or helped the tree.

No. 6—I especially would like to know why it is set down so positively that we cannot grow apple trees in Florida. With me several varieties are growing quite as well as they do in my New York orchard. I rely on heavy mulching for all trees, but especially for apples, plums, peaches, etc. I slope my mulch inward so as to catch and retain the rains. This mulch is made of any coarse material and covered with a layer of sand. If carefully made it equalizes the temperature around the roots. The hottest days do not affect the fine roots seriously. I am having excellent success so far with King David (one of Stark's new apples), Stayman's Winesap, and a few more of the fruits set down as hardly belonging in Florida. Of course my test has not yet reached the fruiting stage. I am succeeding so far admirably well with Lambert and Bing cherries. I am planting freely of Mr. Munson's hybrid grapes, and they promise exceedingly well. Among my peaches I have several from Stark Bros, in Missouri, that are doing quite as well as our Florida sorts. One of the best of these is Wright. The Early Wheeler, (first received from Mr. Munson), is doing well. I think, however, that this variety has some of the Chinese blood in it.

What I miss in Florida is humus, and this I put forth every effort to create. Fortunately nature offers us abounding material for this purpose. I do not allow a pound of humus material to be burned. In such material I grew an 18 pound sweet potato this last year. Florida is full of problems, and is to me, immensely attractive.

Mr. Painter—It has been set down that apples cannot be grown in Florida.

after repeated experiments by some of our best horticulturists. Many of the varieties growing in the north have been tried with varying success. The first year the trees are planted they apparently do well; the second year they may do fairly well and bear a fruit or two, but the third year generally winds them up. The apple evidently was not intended for this latitude, consequently will not thrive. It may be that some day by hybridizing carried out on the same line that Prof. Weber is following with the citrus, we may get an apple that will do fairly well in Florida. I believe that the Secretary of the Horticultural Society will be able to eat all of your next season's crop of apples grown in Florida, and would not object to trying.

Topical Index.

Transactions

OF THE

FLORIDA STATE

Horticultural Society

FOR

1909

DR WM. C. RICHARDSON
Retiring President

PROCEEDINGS

OF THE

Twenty-Second Annual Meeting

OF THE

Florida State Horticultural Society

HELD AT

Daytona, May 18, 19, 20 and 21, 1909

COMPILED BY THE SECRETARY

Published by the Society

DeLand, Fla.
E. O. PAINTER PRINTING COMPANY.
1909.

CONSTITUTION.

ARTICLE 1. This organization shall be known as The Florida State Horticultural Society, and its object shall be the advancement of horticulture.

ARTICLE 2. Any person may become a member of the Society by subscribing to the Constitution and paying one dollar. Any person may become a Life Member of the Society by subscribing to the Constitution and paying ten dollars.

ARTICLE 3. Its Officers shall consist of a President, three Vice-Presidents, Secretary, Treasurer, and Executive Committee of three, who shall be elected by ballot at each annual meeting. After the first election, their term of office shall begin on the first day of January following their election.

ARTICLE 4. The regular annual meeting of this Society shall be held on the second Tuesday in April, except when otherwise ordered by the Executive Committee.

ARTICLE 5. The duties of the President, Vice-Presidents, Secretary and Treasurer shall be such as usually devolve on those officers. The President, Secretary and Treasurer shall be, ex-officio, advisory members of the Executive Committee.

ARTICLE 6. The Executive Committee shall have authority to act for the Society between annual meetings.

ARTICLE 7. The Constitution may be amended by a vote of two-thirds of the members present.

BY-LAWS.

1. The Society year shall be co-extensive with the calendar year, and the annual dues of Members shall be one dollar.

2. All bills authorized by the Society or its Executive Committee, for its legitimate expenses, shall be paid by the Secretary's draft on the Treasurer, O. K.'d by the President.

3. The meetings of the Society shall be devoted only to Horticultural topics from scientific and practical standpoints, and the Presiding Officer shall rule out of order all motions, resolutions and discussions tending to commit the Society to partisan politics or mercantile ventures.

Florida State Horticultural Society.

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Dorr, Mrs Lydia M., Federal Point, Fla.
Dow, Chas. P., Orlando, Fla.
Drake, T. P., Yalaha, Fla.
Durkee, C. K., Fruita, Fla.
Ducchardt, Geo., Geneva, Fla.
Dyer, G. L., Winter Park, Fla.

Earle, Mrs. W. H., Tangerine, Fla.
Edmondson, W. H., Daytona, Fla.
Edwards, Wm., Plymouth, Fla.
Edwards, W. S., Daytona, Fla.
Eddy, J. N., Waukon, Iowa.
Elbert, J. T., Leesburg, Fla.
Ensign, W. S., Winter Haven, Fla.
Esch, Dr. J. P., Daytona Beach, Fla.

Farley, J. F., Malabar, Fla.
Fawcett, H. S., Gainesville, Fla
Fawcett, George L., Mayaguez, Porto Rico.
Finnie, A. A., Coleman, Fla.
Fitzgerald, E. T., Daytona, Fla.
Fleming, H., Kissimmee, Fla.
Floyd, B. F., Gainesville, Fla.
Floyd, W. L., Gainesville, Fla.
Frey, John, Bonaventure, Fla.
Froscher, Andrew, Titusville, Fla.
Fugazzi & Co., Cincinnati, O.
Futch, F. E., Gainesville, Fla.

Gaines, J. B., Leesburg, Fla.
Gaitskill, Mrs. S. H., McIntosh, Fla.
Galloway, Miss Laura, Okahumpka, Fla.
Galloway, J. R., Okahumpka, Fla.
Gardiner, C. E., Daytona, Fla.
Garrett, L., Orlando, Fla., R. F. D. No. 1.
Gaston, M. M, Punta Gorda, Fla.
Geddes, Mrs. Kate R., 2105 Putman St., Toledo, Ohio.
Geiger, Louis, Miami, Fla.
Gibbs, Oliver, Melbourne Beach, Fla.
Gille, W. F., Jr., Daytona, Fla.
Gillett, M. E., Tampa, Fla., 313 American National Bank Building.
Gist, W. M., McIntosh, Fla.
Gladney, J. A., Hastings, Fla.
Gore, Mahlon, Orlando, Fla.
Gove, S. H., Daytona, Fla.
Grant, A. J., Dunedin, Fla.
Graves, H. S., Gainesville, Fla.
Greene, E. W., Daytona, Fla.
Green, Mrs. H. E., Lotus, Fla.
Green. S. B., Daytona, Fla
Green, V. M., Daytona, Fla.
Green, Samuel Ward, East Greenwich, R. I.
Greiner, J. C., Citra, Fla.
Griffing, C. M., Jacksonville, Fla.
Grisham, Dr. J. K., Thonotosassa, Fla.
Guild, F. A., Boynton, Fla.
Gurney, L. H., Merritt, Fla.

Hall, F. W., Eastlake, Fla.
Hamm, H. O., Palatka, Fla.
Hammond, Benjamin, Fishkill-on-Hudson, N. Y.
Hampton, B. M., Winter Haven, Fla.

Hardman, A. S., Leesburg, Fla.
Hardy, Chas. R., Jacksonville, Fla.
Hardee, W. R., Jensen, Fla.
Harner, J. N., Fruitland, Park, Fla.
Harper, John R., Santa Fe, Isle of Pines, Cuba.
Harrington, A. B., Winter Haven, Fla.
Harrington, Mrs. A. B., Winter Haven, Fla.
Harris, C. S., Daytona, Fla.
Hartshorn, Harry, Daytona, Fla.
Hawley, P. J., Daytona, Fla.
Hawkins, W. M., Daytona, Fla.
Hawks, J. W., Hawks Park, Fla.
Haynes, A. C., DeLand, Fla.
Hazen, D. E., Thonotosassa, Fla.
Heathcote, W. E., St. Petersburg, Fla.
Hendricksen, H. C., Empedrado 30, Havana, Cuba.
Hepburn, H. S., Davenport, Iowa.
Herman, J. B., 38 South Union St., Rochester, N. Y.
Hess, Wm. E., Mayaguez, Porto Rico.
Hibbard, E. C., Daytona Beach, Fla.
Hicks, C. W., Sutherland, Fla.
Higgins, P. M., Astor, Fla.
Hildrup, Mrs. Emma J., Welaka, Fla.
Hill, W. J., Sanford, Fla.
Hilyard, W. W., Daytona, Fla.
Hinkley, B., Avon Park, Fla.
Hinskey, J. B. Daytona, Fla.
Hemmingways, London Purple Co., 133 Front St., N. Y.
Hoard, J. W., Gotha, Fla.
Hoard, Mrs. J. W., Gotha, Fla.
Hobbs, W. A. H. Cocoanut Grove, Fla.
Holbrook, T. F., Lakeland, Fla.
Hole, H. F., Fulton, Fla
Holland, B. F., Bartow, Fla.
Hollingsworth, G. S., Arcadia, Fla.
Holmes, Miss Winifred, Daytona, Fla.
Holmes, W. F., Daytona, Fla.
Hon, E. L., DeLand, Fla.
Hood, Samuel C., Orange City, Fla.
Hough, B. F., Daytona, Fla.
Houghton, Dr. F. H., Daytona, Fla.
Howard, Alfred, DeLand, Fla.
Howell, J. L., Dunedin, Fla.
Hoyt, R. D., Clearwater, Fla.
Hubbard, Mrs. E. S., Federal Point, Fla.
Hubbard, Miss Edith L., Federal Point, Fla.
Huber, Jos, 603 Race St., Cincinnati, Ohio.
Huddleston, J. H., Geneva, Fla.
Hume, Mrs. H. Harold, Glen St. Mary, Fla.
Hume, Edward G., Glen St. Mary, Fla.
Humphreys, A. S., Indianola, Fla.

Inman, S. C., Florence Villa, Fla.

Jernigan, W. P., Glen St. Mary, Fla.
Johnson, J. H., Daytona, Fla.
Johnson, L. S., Largo, Fla.
Johnson, M. A., 914 James St., Syracuse, N. Y.
Johnson, M. E., 254 Ocean St., Lynn, Mass.
Jones, Cyrus, Bowling Green, Fla.
Jones, W. H., Orange Bend, Fla.
Jordan, Samuel D., DeLand, Fla.

Keck, Irving, Bowling Green, Fla.
Kendig, John, 1220 Market St., Philadelphia, Pa.
Kennedy, L., Pt. Orange, Fla.
Kilgore, B., Largo, Fla.
Kilgore, J. E., Largo, Fla.
Kilgore, S. H., Largo, Fla.
Kilkoff, Mrs. Eva T., DeLand, Fla.
King, Wm., Avon Park, Fla.
Kingsbury, J. C., St. Leo, Fla.
Kirkpatrick, S. F., Chairman Bondholders Exchange Company, Lynchburg, Va.
Klemm, Richard, Winter Haven, Fla.
Klemm, Mrs. Annie Marie, Winter Haven, Fla.
Klock, M. D., G. A., Daytona, Fla.
Knox, Donald, Bulow, Fla.
Knox, L. B., Bulow, Fla.
Kreese, Chas. S., Grand-view-on-Hudson, N. Y.
Krome, W. H., Edwardsville, Ill.

Lainhart, G. W., W. Palm Beach, Fla.
Lasier, F. G., Birmingham, Mich.
Leatherman, J. R., Delray, Fla.
Lee, J. A., Leesburg, Fla.
Leech, D., Winter Haven, Fla.
Leonard, George V., Hastings, Fla.
Leonard, W. B., Hastings, Fla.
Lewis, W. J., Limona, Fla.
Lindsay, J. E., Davenport, Iowa.
Littlefield, S. C., Little River, Fla.
Long, A. L., Gainesville, Fla.
Longley, N. H., St. Petersburg, Fla.
Ludwig, R. E., St. Petersburg, Fla.
Luffman, W., Sparr, Fla.
Luttichau, H. von, Earlton, Fla.
Lyman, A. E., Melbourne, Fla.
Lynch, J. L., Daytona, Fla.

McClees, Mrs. H. A., Ormond, Fla.
McClelland, W. S., Eustis, Fla.
McClung, J. M., Dunedin, Fla.
McClure, George S., Miami, Fla.
McComb, Jas. Jr., Pompano, Fla.
McDaniel, H. G., Orlando, Fla.
McDonald, D. F., Eustis, Fla.
McDougal, Robt., 319 Postal Telegraph Bldg., Chicago, Ill.
McIntyre, Jas., 316 Boulevard, Miami, Fla.
McKay, Arthur, Okahumpka, Fla.
McKinney, J. Y., Candler, Fla.
McLean, E. L., Winter Haven, Fla.
McLean, Wm. C., Grenada, Miss
McLeod, M. M., Fulford Fla.

Mace, J. P., Lake Helen, Fla.
Mace, L. P., Lake Helen, Fla.
Mallary, E. Y., Macon, Ga.
Manz, Adolf, Eustis, Fla.
March, W. E., Miami, Fla.,
Maris, George L., Sanford, Fla., R. F. D. No. 1.
Maris, Mrs. G. L., Sanford, Fla., R. F. D. No. 1.

Mason, A. E., Daytona, Fla.
Mason, F. C., Santa Fe, Isle of Pines., Cuba.
Mason, Benjamin, Daytona, Fla.
Matheny, C. Woodburn, Sarasota, Fla., care G. H. Matheny & Son.
Matthews, George H., Daytona, Fla.
Matthews, W. R., Leesburg, Fla.
Meade, Theo. L., Oviedo, Fla.
Meislahn, H., Clarcona, Fla.
Merrell, Herman, St. Petersburg, Fla.
Merrell, Mrs. H., St. Petersburg, Fla.
Metcalf, H. W., Orlando, Fla.
Mickler, W. N., Leesburg, Fla.
Middleton, W. C., St. Augustine, Fla.
Miller, H. S., Daytona, Fla.
Miller, J. W., Leesburg, Fla.
Mills, E. J., Daytona, Fla.
Mobley, Pa., Leesburg, Fla.
Montie, E., Jacksonvillle, Fla.
Montgomery, Chas., Buena Vista, Fla.
Moore, Chas, E., Kissimmee, Fla.
Moore, Daniel D. T., Eldred, Fla.
Moore, G. D., Dunedin, Fla.
Moore, Lawrence C., Roseland, Fla.
Moore, Nathan, L. C., Venice, Fla.
Moore, Wm. M., Daytona, Fla.
Moore, Capt. Walter R., Geneva, Fla.
Morris, J. D. C., Daytona, Fla.
Morrison, H. L., Barberville, Fla.
Morse, Fred S., Miami, Fla.
Moses, Wallace R., W. Palm Beach, Fla.
Moses, Mrs. Clara N., W. Palm Beach, Fla.
Mote, F. B., Newark, Del.
Mote, Mrs. E. H., Leesburg, Fla.
Murphy, T. W., Largo, Fla.

Nevins, Thos. F., 350 Clinton St., Brooklyn, N. Y.
Neylands, J. J., Thonotosassa, Fla.
Nickerson, H. Guy, Florence Villa, Fla.
Niles, L. D., Dupont, Fla.
Nixon, L. K., Homestead, Fla.
Nordman, Fred, New Smyrna, Fla.
Norsworthy, W. G., McIntosh, Fla.
Nugent, P. H., Candler, Fla.

O'Brien, W. S., Thonotosassa, Fla.
Oliver, Elmer, Daytona Beach, Fla
Osborne, F. B., Sutherland, Fla.

Palen, Peter E., Haines City, Fla.
Palmer, R. A., Bradentown, Fla.
Pead, J. W., Wilton, N. H.
Pelton, C. B., Lake Helen, Fla.
Pennock, H. S., Neptune, Fla.
Pennock, Mrs. H. S., Neptune, Fla.
Penny, N. O., Vero, Fla.
Penny, Mrs. N. O., Vero, Fla.
Perkins, H. T., Punta Gorda, Fla.
Perry, H. A., Pomona, Fla.
Peters, George T., Geneva, Fla.
Peterson, Miss U. C., Pierson, Fla.
Pfyffer, Jno., Pulaski, Ind.
Phillips, Samuel K., Matteawan, N. Y.
Phinney, Jas. P., South Boston, Mass.
Pierson, J. H., Daytona, Fla.
Pierson, N. L., Pierson, Fla.
Pink, Chas., Orlando, Fla. P. O. Box 163.
Player, Harry, Tampa, Fla.
Porcher, E. P., Jacksonville, Fla.
Porcher, Mrs. E. P., Jacksonville, Fla.
Porter, A. McF., Daytona, Fla.
Postethwaite, H., San Jose, California.
Price, Mrs. J. D., Ormond, Fla.
Prange, Mrs. F. C., Jacksonville, Fla.
Prather, G. C., St. Petersburg, Fla.
Prevatt, A. B., Seville, Fla.
Pugsley, Chas., Winter Haven, Fla.

Radcliffe-Cadman Bros., Narcoossee, Fla.
Rast, J. G., Daytona, Fla.
Reasoner, E. N., Oneco, Fla.
Rhoades, J. Beach, Los Esteros, Tamaulipas, Mexico.

Quinby, Thos. B., Jasksonville, Fla.

Ramsdell, Jos, Miami, Fla.
Rice, M. A., Citra, Fla.
Richardson, E. L., Avon Park, Fla.
Richardson, J. P. Leesburg, Fla.
Richardson, W. C., Tampa, Fla.
Richtmann, W. O., Satsuma Heights, Fla.
Ricker,Mrs. Elizabeth A., South Lake Weir, Fla.
Rix, James, Daytona, Fla.
Robb, S. L., Gainesville, Fla.
Robinson, C. A., Eden, Fla.
Robinson, Mrs. C. A., Eden, Fla.
Robinson, J. E., Gotha, Fla.
Robinson, W. E., Palmetto, Fla.
Rogers, D. D., Daytona, Fla.
Rollins, C. A., Thonotosassa, Fla.
Rose, R. E., Tallahassee, Fla.
Rose, Mrs. R. E., Tallahassee, Fla.
Ross, J. H., Winter Haven, Fla.
Rou, S. F., Lowell, Fla.
Rowe, F. M., Daytona, Fla.
Rumble, Alfred, Winter Haven, Fla.
Rutherford, J. P., Steelton, Penn., care B & C. Department, Penn. Steel Co.

Sadler, O. W., 115 Market St., Johnstown, Pa.
Sample, J. W., Bartow, Fla.
Sampson, Mrs. F. G., Quincy, Fla.
Sampson, Mrs. F. G., Quincy, Fla.
Sartorius, L. G., Clearwater, Fla.
Sartorius, Mrs. L. G., Clearwater, Fla.
Schabinger, J. J., Delray, Fla.
Schmidt, Henry, Daytona, Fla.
Schmidt, A. H., Daytona, Fla.
Schnarr, John, Orlando, Fla.
Scott, David, Arcadia, Fla.
Scott, John M., Gainesville, Fla.
Scott, Mrs. John M., Gainesville, Fla.
Seaman, G. B., Daytona, Fla.

Sellards, E. H., Tallahassee, Fla.
Sellmer, Chas., Zellwood, Fla.
Shaw, Mrs H. W., Ormond, Fla.
Shepherd, S. P., Winter Park, Fla.
Shryock, W. P., New Smyrna, Fla.
Skinner Irrigating Co., Troy, O.
Skinner, L. B., Dunedin, Fla.
Sly, E. R., Bay Shore, Mich.
Sly, Mrs. Emma J., Bay Shore, Mich.
Smith, Clark G., Daytona Beach, Fla.
Smith, George, F., Daytona, Fla.
Smith, G. R., Fruitland Park, Fla.
Smith, Lew, Daytona, Fla.
Smith, R. L., Daytona, Fla.
Smith, Wm., Orlando, Fla.
Smith, W. J., Winter Haven, Fla
Snow, George E., East Lake, Fla.
Snyder, A. S., St. Petersburg, Fla., Box 193.
Spizey, Mrs. T. A., Jacksonvillle, Fla.
Spring, F. D., Daytona, Fla.
Spring, O. L., Daytona, Fla.
Stanley, George L., Ashtabula, Ohio.
Stanton, W. E., Miami, Fla.
Stanton, Wm. E., Miami, Fla.
Stevens, B. N., Daytona, Fla.
Stevens, H. B., DeLand, Fla.
Stevens, Mrs. H. B. DeLand, Fla.
Stewart, Dr. E. L., Daytona, Fla.
Stillman, F. A., Daytona, Fla.
Stillman, Howard, Y., Daytona, Fla.
Stirling, Frank, DeLand, Fla. P. O. Box 303.
Stockbridge, H. E., Atlanta, Ga.
Stoeckel, Gustave J., DeLand, Fla.
Stouder, H. G., Eldred, Fla.
Street, A. W., Ormond, Fla.
Strout, H. T., Fruitland Park, Fla.
Sundell, Rev. John F., Lake Mary, Fla.
Swingle, Walter T., Washington, D. C., care Department of Agriculture.
Switzer, W. A., Port Tampa City, Fla.

Taber, Mrs. G. L., Glen St. Mary, Fla.
Talton, E. H., DeLand, Fla.
Tatem & Co., C. P., Baltimore, Md.
Tatum, B B., Miami, Fla.
Tenney, J. F., Federal Point, Fla.
Tenney, Mrs. J. F., Federal Point, Fla.
Thompson, C. H., Winter Haven, Fla.
Thompson, G. L., Sarasota, Fla.
Tenny, Lloyd S., Washington, D. C.
Tillinghast, B. F., Davenport, Iowa.
Tischler, P. Jacksonville, Fla.
Townsend, C. M., 500 N. Broad St., Philadelphia, Pa.
Townsend, C. W., Pittsburg, Pa.
Tucker, R. M., Orange City, Fla.
Turner, A. L., Wauchula, Fla.
Turner, J. P., New Smyrna, Fla.
Tussey, H. H., Wayne, Pa.
Troxler, T. W., Ocala, Fla.

Underwood, R. R., Pierson, Fla.
Upham, E. S., South Lake Weir, Fla.
Upham, Mrs. E. S., South Lake Weir, Fla.

Vernon, J. J., Gainesville, Fla.
Vick, J. H., Orlando, Fla.
Vuillaume, Victor, Herradura, Cuba.

Waggoner, M. L., Seabreeze, Fla.
Wakelin, G. M., Lanepark, Fla.
Wakelin, Mrs. G. M., Lanepark, Fla.
Warner, H. G., Palatka, Fla.
Warner, S. C., Palatka, Fla.
Warner, S. C., Jr., Palatka, Fla.
Watts, B. F., Leesburg, Fla.
Wear, Dr. R. A., Ozona, Fla.
Wells, F. B., Arcadia, Fla.
Westlake, J. Willis, Lake Helen, Fla.
Wey, Jake, Arcadia, Fla.
White, Arthur, Gotha, Fla.
White, F. A., Daytona, Fla.
White, Miss L. M., Dupont, Fla.
Whitehurst, E. E., Dunedin, Fla.
Wichtendahl, Alfred, Gotha, Fla.
Wightman, L., Tampa, Fla. Box 576.
Wilcox & Tracy, Neuva Gerona, Isle of Pines
Williams, H. S., Rockledge, Fla.
Wills, Francis L., Sutherland, Fla.
Wilmshurst, H. J., DeLand, Fla.
Wilson, C. H., Slermont, Fla.
Wilson, W. N., Gainesville, Fla.
Withers, I. N., Lady Lake, Fla.
Wolfe, R. L., Glen St. Mary, Fla.
Wolfe, J. B., 2812 Caroline St., Houston, Tex.
W. W. Wright, Orlando, Fla.
Wyckoff, Jno. S., Citra, Fla.

Yocum, W. F., Gainesville, Fla.
Yothers, W. W., Orlando, Fla.

Zimmerman, M., Ormond, Fla.

PROCEEDINGS

OF THE

Twenty-Second Annual Meeting

OF THE

Florida State Horticultural Society

The Florida State Horticultural Society held its twenty-second annual meeting in the historic city of Daytona, Volusia county. Quite a number of parties gathered at Daytona the day before the opening of the meeting as they wanted to be sure of good accommodations and enjoy the beach at Seabreeze and take in some of the attractions of Daytona before the meeting began.

The place of meeting was in the Armory and all of the sessions were well attended. The evening sessions were especially well attended by the citizens of Daytona. In fact, the number of citizens turning out to the meetings was probably as large if not larger than at any place where a meeting has been held for years. The program was carried through with but little variation and all the time was taken up. For the lack of sufficient time some of the papers were simply accepted and ordered printed with the balance of the proceedings.

The good ladies of Daytona entertained the lady members of the society at the Palmetto Club and all pronounced it a most enjoyable affair. The whole membership of the Horticultural Society was treated to a boat ride to New Smyrna and an automobile ride from New Smyrna to Daytona. It was hard to say which was the most enjoyable, and to cap the climax of good things the people of Daytona assisted by the New Smyrna citizens gave a clam chowder lunch at the Ocean House. This House is noted for its clam chowder and on this occasion it nobly held up its reputation and those present had nothing but words of praise to utter. The members all expressed themselves as having a most enjoyable time and will remember their short stay with the good people of Daytona and New Smyrna with a great deal of pleasure.

When the time for the next place of meeting was brought up, Orlando, Palatka, and Jacksonville were the only places offering invitations and Orlando won, so that the next annual association meeting will be held in Orlando. Two previous meetings have been held in Orlando and they were most enjoyable affairs and the next meeting is looked forward to with a great deal of pleasure.

All of the members present enjoyed the lectures and addresses given by the Government attaches, and hope that they will be with us each succeeding year.

Minutes.

FIRST DAY.

Evening Session.

1. Called to order by the President, Wm. C. Richardson.
2. Opening Prayer.
3. Address of Welcome, on behalf of the city, by the Mayor of Daytona, Hon. E. W. Greene.
4. Response, Prof H. Harold Hume.
5. President's Annual Address.
6. Introduction of Question Box.
7. Social Hour.

SECOND DAY.

Morning Session.

1. "What the Experiment Station Is Doing for the Fruit and Vegetable Growers." Prof P. H. Rolfs, Gainesville.
2. Methods of Handling Citrus Groves. B. F. Chilton, New Smyrna; J. E. Kilgore, Largo; Dr. J. F. Corrigan, St. Leo; Hermann Lubrecht, Island Grove.
3. Discussion.
4. Irrigation. A. H. Bourlay, Leesburg; W. F. Holmes, Daytona; H. B. Stevens, DeLand.
5. Irrigation in Florida. Prof. Milo E. Williams, Washington, D. C.
6. Discussion.
7. Tropical Fruits, E. N. Reasoner, Oneco; R. D. Hoyt, Seven Oaks; E. V. Blackman, Miami.

Afternoon Session.

1. Appointment of Legislative Committee—Messrs. Gaitskill, Hart and Gillette.
2. Appointment of Committee on Final Resolutions—Messrs. H. B. Stevens, Temple and Brown.
3. Appointment of Committee on Necrology—Messrs. Geo. L. Tabor and J. A. Stevens.
4. Methods of Packing and Shipping Citrus Fruits. E. P. Porcher, Cocoa; E. H. Mote, Ocala; Dr. F. W. Inman, Winter Haven; J. D. Bell, St. Petersburg; S. C. Warner, Palatka.

5. Report from Committee Visiting California. W. S. Hart, Hawks' Park; Thos. B. Quinby, Jacksonville.

6. Discussion.

EVENING SESSION.

1. Economic Value of Birds to the Farmer and Fruit Grower. Prof. M. F. Blackman, Winter Park.

2. Modern Methods of Packing Oranges. Mr. Lloyd S. Tenney, Washington, D. C.

3. Yellow Spotting of Citrus Leaves. Prof. B. F. Floyd, Gainesville.

4. Insects and Diseases. E. S. Hubbard, Federal Point; G. M. Wakelin, Tavares; E. S. Williams, Ft. Pierce; Dr. Ernst Bessey, Miami; Prof. H. S. Fawcett, Gainesville.

THIRD DAY.

MORNING SESSION.

Excursion to New Smyrna and Clam Chowder Dinner.

AFTERNOON SESSION.

1. Report of Legislative Committee.

2. Election of Officers.

President—Prof. H. Harold Hume, Glen Saint Mary.

First Vice President—Wm. C. Temple, Winter Park.

Second Vice President—H. B. Stevens, DeLand.

Third Vice President—B. F. Chilton, New Smyrna.

Secretary—E. O. Painter, Jacksonville.

Treasurer—W. S. Hart, Hawks' Park.

Election of Executive Committee.

Prof. P. H. Rolfs, Gainesville.

E. S. Hubbard, Federal Point.

George L. Tabor, Glen Saint Mary.

3. Selection of Place of Meeting for 1910—Orlando.

4. Report of Executive Committee.

5. Ornamentals. B. H. Alden, DeLand; H. S. Pennock, Neptune; H. Nehrling, Gotha; Miss T. H. Hart, Federal Point.

EVENING SESSION.

1. Adoption of Resolution by E. H. Mote, Leesburg; in reference to Blight.

2. Hardy Citrus Fruits. Prof. Walter T. Swingle, Washington, D. C.

3. Native and other trees for shade purposes. H. Harold Hume, Glen Saint Mary.

4. Report of Committee on Final Resolutions.

FOURTH DAY.

MORNING SESSION.

1. Appointment of Committee to attend American Pomological Society at St. Catherine's, Canada; Messrs. W. S. Hart, Hawks' Park; E. O. Painter, Jacksonville; Geo. L. Tabor, Glen St. Mary; H. Harold Hume, Glen St. Mary.

2. Resolution by H. Harold Hume in reference to asking for an appropriation to have an explorer go to the home of the whitefly and ascertain what natural enemy is holding it in check.

3. Peaches and Deciduous Fruits. J. Y. McKinney, Candler; W. E. Pabor, Jacksonville; A. C. Haynes, DeLand; Maj. W. L. Floyd, Gainesville.

4. Fertilizers. S. H. Gaitskill, McIntosh; B. H. Bridges, Tallahassee; Mrs. F. C. Prange, Vero.

5. Adjournment.

Address of Welcome.

By Mayor E. W. Greene.

Mr. President, Ladies and Gentlemen:

It must be gratifying to the members of The Florida State Horticultural Society to see so many gathered in attendance at this the opening meeting of the Twenty-second Annual gathering of this Society. It shows a marked and growing interest in Horticulture throughout the State.

I do not intend to occupy much of your time in a lengthy address of welcome for I know your time can be better spent in listening to addresses from more able speakers bearing on the subject more directly connected with the work of this association, but I want, on behalf of the citizens of Daytona to extend to the visiting members and friends a cordial welcome and perfect freedom of the city during these meetings and after seeing the beauty and advantages which this section can offer, some of you, may wish to cast in your lot with us. To such I would say our welcome extends indefinitely. I hope the committee who have been intrusted with your comfort have faithfully performed their duty and that your stay in our midst may be one of pleasure as well as profit to us all.

Again I repeat, you are welcome and the freedom of the city is yours.

RESPONSE TO THE ADDRESS OF WELCOME.

By H. Harold Hume.

Mr. President, Ladies and Gentlemen:

It has fallen to my lot to reply in brief to the kind words of welcome extended to us by the Mayor on behalf of Daytona.

Your Honor, in replying, I beg to say to you that we appreciate your cordial words and if your words did not amply assure us, there is abundant proof that we are indeed welcome. We were met and taken charge of by a committee of your representative citizens when we alighted from the train and made to feel that we were at home. When a few of us sat down to a belated dinner today, we were promptly informed that we were subject to a fine of increased rates, if we did not partake amply of the food before us. The idea of being fed by compulsion was entirely new. In fact, in the many and varied experiences which all of us have had, the rule has always been to put a premium upon eating sparingly. It must be the Daytona way. And this afternoon, I made note of a pair of horticulturists trespassing perhaps, upon the property of one of your citizens. They had, judging from their actions, found something interesting and made themselves at home. They were not molested. Now, your Honor, I beg of you, should any of this body be brought before you for trespassing, deal leniently with them, they are harmless.

We have seen many things worthy of note in your city. It is a city marked, and out of the ordinary, a city built in the woods, a city where the touch of nature in all its beauty has been left unspoiled. Your Honor, you have here a city unique, a city with well paved and shady streets, restful in its simple naturalness, a city of which you may well feel proud.

And you may feel assured, your Honor, that you will find this society not at all backward in accepting of your kind hospitality. This body stands for the progress of horticulture in this state, if it stands for anything. It is interesting to note the way along which the way of progress has led. The parent horticultural industry of this state—orange growing—had its origin in hammocks on the banks of rivers, lakes and streams. The first problem confronting the grower of those earlier days was that of propagation—the task of bringing those wild sour groves into profitable producers of sweet, edible fruit. Then came an enormous amount of work with varieties, accompanied by much costly introduction work. The problem of fertilizers became prominent and looking over the older volumes of our proceedings, you will find lengthy dissertations on muck and other harmless substances. Scale insects and fungous diseases claimed attention and the strife between sprayers and non-sprayers. The cold came and with it there came into being numerous other horticultural industries. Latent possibilities were developed and as a result our horticulture became more diversified. More recently irrigation has become a question of importance, for we have learned, whether it rains or not, we must have water. The problems connected with the marketing of our products are now being agitated and out of the discussion good will come. And in all these years no old question has been or can be laid down for no problem connected with the growing plant can ever be permanently settled. Difficulties have been met as they arose, mastered in part and relegated to a place of secondary importance as some new one claimed attention. The path has not been an easy one, but it has been cheerfully traveled upward. You can feel certain, your Honor, that an association, with a history such as this, will not be backward in accepting your hospitality, for the way has not always fallen in such pleasant places.

And when we leave, we trust that it will be with a feeling on your part that you are glad we came and we shall, I speak for the society, carry away with us pleasant remembrances of our brief sojourn with you.

Address of the President.

By Dr. Wm. C. Richardson.

Ladies and Gentlemen:

In accordance with the requirements of precedent and duty it devolves upon me as your president on this occasion to deliver an address.

A year ago when you unexpectedly elected me to the office of president, I was reposing in a pool of ambitionless lethargy. I told you at that time that I was unfitted for the place both by inclination and equipment, and that I did not feel qualified to discharge its onerous duties, however your call was unanimous and in accepting the office I did it fully aware of its responsibilities and with a high appreciation of its honors.

I am very much of an optimist, not because optimism is pleasant or fashionable, but because it is a prerequisite to all success and achievement. Optimism and hope nerve the weary toiler's arm and inspire the sinking heart to renewed effort and ultimate victory.

As Horticulturalists we are so beset with difficulties, disappointments and temporary failures that I confess it requires a large and vigorous supply of optimism to keep us from falling into despair and despondency.

There are those who look to the past for their models; whatever has the haze of antiquity has for them peculiar charms. They think and speak a great deal of "the good old times." And, when they look forward, it is with forebodings of evil and prophecies of disaster.

The world in general, is making progress, and is better to-day than in any century of the past. As an illustration, permit me to refer to the "labor question," now agitating this great country from center to circumference. There is much of fallacy in argument, and ignorance of fact, apparent in the discussions of this subject by leading agitators and demagogs in the various political parties of our land. It is asserted that the condition of the laborer is becoming worse from generation to generation; that the rich are getting richer, and the poor are getting poorer. The falsity of these statements will appear from even a slight acquaintance with history. The circumstances of the poor are vastly better now than they were during the Middle Ages, or at any other period of the world. The laborer of our time wears finer clothes, sits down to a more sumptuous table, sleeps in a better ventilated and regulated house than the former king and noble enjoyed. A faithful picture of the rags, the filth, the wretchedness, the stolid indifference to manly aspirations, the ignoble contentment with their very poverty and ignorance in which multitudes of poor people were once brought up, or rather allowed to struggle down to the grave, would doubtless astound many a grumbler, who is fond of exaggerating his own hard lot in comparison with that of his ancestors. "Say not thou, what is the cause that the former days were better than these? for thou dost not inquire wisely concerning this."

In the irrepressible and seemingly never ending conflict between capital and labor, we the independent producers always and invariably get the worst of it.

In point of numbers, including all those who are not affiliated with either class, we are largely in the majority, yet by our supineness we see our rights ignored and ruthlessly trampled upon by both sides of these contending forces.

We are crushed and ground between the upper and nether millstones of aggressive dictatorial labor and tyrannous, oppressive capital. It is not merely a Kilkenny cat affair in which the combatants injure only themselves, but it is a deplorable and disastrous wrangle that involves the entire public.

The solution and termination of this vexatious problem and cruelly ruinous struggle can not be left to the demagog and walking delegate, but the injured and long suffering, unbiased people themselves will finally be compelled to rise up in their strength and put an equitable and fair finish to this cruelly pitiful combat. The question naturally arises how do these people who are relatively only a small part of our population get such a powerful influence: the answer is simple, it is because both capital and labor have their strong combinations and perfect organizations. We too must organize and combine before we can ever hope to wield much influence.

It may be said that this is not a horticulturalist's question, but it seems to me that as horticulturalists and members of the body politic we are vitally interested in all questions of political economy and social welfare. The horticultural and agricultural population of our country is the leaven that converts the whole mass of the populace into a beneficient and glorious nationality.

I believe in Evolution and Development, though not altogether as expounded by Darwin, Huxley, Tyndall and others. The element of progress runs like a golden chain through all the Universe of God and nowhere does it sparkle with more refulgency than in the physical and material world—a realm to which the whole school of speculative philosophers have not lifted their eyes. The pessimistic unbeliever in men, natural law and natural selection, has seen only half the truth, or rather he has not seen half the truth. Like an insect, which must be examined microscopically, he has seen only the smallest objects.

The epoch in which we live is essentially and emphatically a utilitarian age. The study of abstract science and speculative philosophy as a part of man's education have like many other kinds of mental gymnastics been relegated to the rear and the demands of modern requirements insist on that kind of science and philosophy which can be put to immediate practical and beneficial uses.

Throughout all the past ages natural selection has played an important part in the evolution and development of all those horticultural products requisite to the sustenance of human life. At first these variations and survivals of the best and most useful fruits, grains, etc., were the result of sectional environment and climatic influences but later as man increased in intelligence and experience, he took a hand in the matter and has so assisted nature that results most prodigous and startling have been attained.

Man's first efforts were along the lines of careful selection of the best seeds, unscientific fertilization and indifferent cultivation, later, grafting, budding, cross-pollenization, etc., were practiced and at the present day some of the results of man's experiments along these lines are so marvelous and rapid as to be quite incredible.

The modern horticulturalist has by a judicious selection of variations, otherwise known as "sports and freaks," given us the luscious peach as a development from the scanty, bitter husk and large seed of the wild almond; wheat and other valuable grains by a selection of variations in wild grasses.

The strawberry has by careful selection been developed from an insignificant bunch of leaves into one of our most delicious fruits, and now we learn that among the latest things in this kind of evolution is the production of a large, luscious, edible cactus, as much ahead of the kind that the Mexicans have for generations been harvesting for their markets as the present magnificent tomatoes of our gardens are superior to those thought to be unfit to eat if not poisonous only some fifty or sixty years ago. We might go on with examples of this character, but enough has been said to show that the possibilities of this kind of evolution are almost absolutely limitless.

It sometimes seems that the forces of nature combine with man in a determined assault on our welfare. No sooner have we met and vanquished the ill effects of cold, drouth, lack of fertility, insect and other pests than we are beset by human or rather inhuman enemies who seek to rob us of our well earned success, through fraudulent markets, swindling buyers, robber transportation companies, trusts and combines.

There are evils so vast in their proportions and so fortified by position and wealth, that to assail them seems to the eye of sense to be madness and folly. These combinations belong to this class of evils. The longer one studies their nature and all permeating extent, the more conversant he becomes with their results, the more he is persuaded that no tongue, however eloquent, can describe, and no pen, however graphic, can portray a tithe of their evils. To exaggerate is impossible. As John Wesley said of slavery, I would say of this: "It is the sum of all villainies."

The discussion of their oppression is hindered by the difficulty—in a sense, the hopelessness—of the undertaking. They are defiant and laugh our puny efforts to scorn. Their conquests and despotisms have continued over a period of lo these many years, and we almost despair.

Let us remember, however, that while the storms of adversity, the fierce struggles for rights, the crushing of worthy ambitions, the bitterness of disappointment, the gloom of despair, all affect the mental as well as the physical life; and that in some cases disaster is complete; nevertheless to the cheerful, optimistic mind there comes reaction, relief and final victory through determined, persistent and well directed work.

In our successful efforts to extract from the soil its richest and best products, we have through selfish, individual effort fenced ourselves in with a wall of almost seclusive isolation, shutting out our neighbors and fellow workers. While we have been doing this all those others with whom we are compelled to deal, have combined among themselves and with each other for aggressive mutual benefit. The fertilizer industries, the transportation lines, the commission concerns and the buyers; all and each have their well organized systems of doing business without encountering ruinous competition, and are reaping golden harvests of profit. With us lack of any and all organized methods of mutual co-operation in making our requisite purchases of materials and commodities necessary to our operations, and in the ruinous, foolish competitive manner of marketing our crops, have led to a point where our labors are not only unremunerative but destructive of all gains. We have met and vanquished the evil influences of earth and air and it now behooves us to buckle on our armor and meet these last foes. The result can not be uncertain, our forces are now gathering and when we make a united and concerted effort, we must and shall come out victorious.

"Let us then be up and doing with a heart for any fate."

We are altogether to blame ourselves for the deplorable conditions now existent which bear down on us with such oppressive weight. If we would only give a little part of the time to the cultivation of mutual interests that we do to the cultivation of the soil we would soon get such results that our gains might be commensurate with our desires.

Man is a gregarious creature and whenever he attempts to flock by himself, he invariably makes a dismal failure. What we need and must have is mutual combinations of our entire producing interests, so that we can go unitedly into the markets and demand fair prices for products and transportation. Our neighbors in California have in a most signal way succeeded in combining their mutual interests so that they are realizing splendid returns for their products, and this too, without curtailing or interfering with individual rights. What they have done, we can do with such modifications of their system as may be requisite to our situation.

Co-operative efforts have frequently failed, but usually this has come about through a too strong communistic tendency in the details. Co-operative movements and organizations where individual rights have been fundamental and respected have nearly always succeeded.

Let us at once combine together in a final herculean effort to get redress and justice. If we do this intelligently we can not fail.

Upon occasions like the present, active, conscientious thinkers and workers naturally fall into a line of thought and meditation, having reference to the flight of time and opportunity; the dead past, the living present, the unborn future. The dead past with all its memories, whether prosperous or adverse, can give us only the unalterable lessons of example and experience; the living present we seize with avidity, in an eager strife to make it as a past an improvement upon that which may have preceded it; the unborn future we ardently hope may prove a vast improvement upon both the present and the past. It is probably a wise provision of our mental and moral constitution, that—

"Hope springs eternal in the human breast;
Man never is, but always to be blessed."

Today, while standing upon the narrow niche of ever fleeing time we peer back into the sepulchral portals of the buried past; and while ardently wishing it had been better, we, as it were, simultaneously hope, work and pray that the womb of the future, with all its unborn progeny, may have something better in store for us.

Results in life are largely, very largely, what we make them in the exercise of industry, wisdom and sagacity. Accident and chance as factor in results, are but flimsy excuses or pretexts to cloak our ignorance, stupidity and failures.

In the preparation of this address matters purely and essentially horticultural have not had that prominence which has usually been customary, but as an offset to this, those who are in charge of the several committees and the authors of the various papers will give us a feast of knowledge and detail along horticultural highways, and byways that will make up for the deficiency.

If I have touched questions of public interest in certain directions it has been because I feel that these questions are live wires charged with dangers that menace our welfare and I trust that the voicing of my personal sentiments may not be misunderstood or misconstrued.

In conclusion, let us all work earnestly and faithfully to make this gathering one long to be remembered as one fruitful in good things, beneficial alike to every member of the Society, and to the cause of Horticulture. Let us in our discussions, give up freely the treasures of personal experience; let each bring forth his little or much, to strengthen his brother and give him will, force and self-reliance in his daily struggles.

Finally may each and everyone of us live to a ripe old age in harmony with the last words of the great Victor Hugo, "Winter is on my head and eternal spring is in my heart. The nearer I approach the end, the plainer I hear around me the immortal symphonies of the worlds which invite me. For half a century I have been writing my thoughts in prose, verse, history, philosophy, drama, romance, tradition, satire, ode, song; I have tried all. But I feel I have not said the thousandth part of what is in me. My work is only a beginning. The thirst for infinity proves infinity."

What the Experiment Station is Doing for the Fruit and Vegetable Grower.

By P. H. Rolfs.

Mr. President, Ladies and Gentlemen:

I wish to give a somewhat general talk, similar to the one I delivered to the Society at the Tampa meeting. All know more or less about the experiment station; yet I suppose those of us who are at the experiment station think we know less about it than many people in the State appear to know about it. That is quite in keeping with the general order of things; the nearer one gets to the real thing, the less he finds he knows about it. I believe our worthy secretary said, a couple of years ago, that at one time he knew all about fertilizers, but now he found that he was just beyond the beginning point. In fact, his knowledge had increased until he was in the position of knowing just how little he did know.

We have published from the experiment station 98 bulletins, 117 press bulletins, and 20 annual reports. Of the bulletins it will be found that over 50 per cent. deal directly or indirectly with horticultural subjects. During the past fiscal year the experiment station has distributed over 73,000 copies of bulletins, press bulletins and reports. In addition to this a very large amount of time is devoted to answering special inquiries made by various people in the State.

FERTILIZER EXPERIMENTS.

In the matter of making field experiments it is a recognized impossibility to grow all crops of the State at the central station, consequently the workers must proceed to the fields where these crops are grown. And to make these experiments of general value it is necessary to carry them on under conditions which exist in the field.

PINEAPPLES.

We have conducted for the past eight years experiments in fertilizing certain plots continuously with certain definitely known fertilizers. As the result of this work four bulletins and one separate from the annual report have been published. We have now ready for publication another bulletin on the chemical analyses of the fruits grown on the various plots. This work we believe has been carried on as long as it will be profitable under our present scheme of fertilization.

CITRUS.

About a year ago Professor Blair took up the question of arranging for carrying on a co-operative experiment in citrus fertilization. This is being done in cooperation with Mr. G. M. Wakelin, of

Lanepark, Fla. We have 480 trees that have been planted out and fertilization has begun. It is intended to carry this work forward for at least 10 years. While the funds of the experiment station would not permit the experiment to be enlarged to the extent of making it complete in every detail, it is thought that the present experiment will cover some of the essential points upon which we need a great deal more information. A sufficient number of trees (10) have been set out to each plot; so we feel that the results obtained from each plot will be fairly indicative of what will occur on an entire field. The standard formula, or one that is most commonly used by the citrus growers, has been taken as a basis. In some of the plots the ammonia contents are increased and in others decreased. In others the potash contents are increased and in others decreased. In others the phosphoric acid contents are increased and in others decreased. In still other plots the sources of ammonia are changed, while in others the sources of potash and phosphoric acid are changed. So that while we have not made all the possible combinations, we still have made enough variations to enable us to understand something definite about the results when they occur.

Accurate data regarding the rainfall and also in regard to the temperature of the soil and of the atmosphere will be kept. Chemical analyses will be made of the soil before beginning the work, and repeatedly during the progress of the experiment. Chemical analyses will also be made of the foliage, the twigs, and the roots of the trees, as well as of the fruit when it shall have matured.

DISEASE INVESTIGATIONS.

The investiation of diseases in fruit and vegetable crops has always been an important piece of work; and in this connection we have been able to save to the State many thousands of dollars annually. While the ideal condition would be an orchard or field that is entirely free from diseases, we cannot hope to attain to that state of perfection immediately. As a matter of fact, we have to understand the diseases rather perfectly before we are able to prevent their occurrence. When a tree or plant has become thoroughly diseased, no amount of theorizing as to how it should be treated to be kept well is of any value to us. We need to know the remedy and how to have it applied.

PEACH TWIG BLIGHT.

This disease has been causing considerable difficulty for some years past in the peach orchard. It is now being taken up as a special study by one of our assistants in the experiment station.

CITRUS DISEASES.

The citrus crop is the biggest money crop that we raise in the State, and likewise there is probably no other crop that is so severely beset by diseases of various kinds.

This work of remedial measures against such organisms as are the cause of diseases in citrus trees has been taken up by Professor Fawcett, who will speak to you later in regard to the diseases of citrus.

In addition to the diseases of citrus that are caused by micro-organisms, certain diseases are caused by unfavorable soil or fertilizer conditions. In short, they are the results of improper physiological surroundings. This line of research has been lately taken up by Professor Floyd, who will later tell you about gum disease, melanose, dieback, etc.

WHITEFLY STUDIES.

In combating our enemies we have two methods of proceeding; first, by artificial means; and, second, by enlisting in our service the natural enemies or some other natural condition. In combating scale insects, many of us have conducted an uneven warfare by using insecticides and spraying machinery at a very considerable cost. Later it was discovered that we could enlist the fungi which are natural enemies of the scale insect, and so do this work at much less cost to ourselves.

It will be remembered that Dr. Webber about twelve years ago reported to the Horticultural Society that he had discovered a fungus which grew parasitically upon the whitefly. This was a very great surprise to all of us and was eagerly received. In connection with this work however, a great many difficulties arose which prevented a sufficiently rapid dissemination of the fungi to annihilate the whitefly. Dr. Berger has reported to you from year to year his success in devising means for increasing the efficiency of the fungi and making it it easier to distribute them. We now know at least seven species of fungi that are parasitic upon the whitefly, and the indications are that there are still undiscovered species that will work for us if we will but give them the proper opportunity.

Over 1,200 acres of citrus groves have been treated with whitefly fungi and visited by members of the experiment station staff. In addition to this we have received letters from owners of several times as many acres stating that they are using this method. The whitefly fungi are being used in the following locations:

Winter Park, Boardman, Titusville, McIntosh, St. Petersburg, Candler, Auburndale, Orlando, Bartow, East Palatka, Plymouth, Palmetto, Ybor City, Fort Myers, Gainesville, Jacksonville, Alva, Buckingham, Bradentown, Manatee, DeLand, and Dunedin.

CO-OPERATIVE EXPERIMENTS.

These experiments are carried forward jointly with the citrus or vegetable growers. As a general rule, the Experiment Station bears the expense of its agent, and a part of the expenses of making the experiment; the citrus or vegetable grower bearing the expense of maintaining the field and a part of the expense incident to carrying on the experiment.

Co-operative citrus experiments are being carried on at Lanepark. These are expected to be continued for a period of ten years. Pineapple fertilizer experiments have been carried on at Jensen for a period of eight years. Citrus disease investigations are being carried on at Bayview. Celery fertilizer experiments have been carried on at Sanford, and celery disease experiments at Orlando and Bradentown.

Co-operative whitefly experiments are in progress at Gainesville, St. Petersburg, Leesburg, DeLand and New Smyrna.

The advantages to the Experiment Station can readily be seen from the fact that the groves or fields are certain to be under the normal circumstances, with the exception of the conditions of the experiment. In other words the grove in case of disease experiments will receive the normal and usual cultivation and fertilization just as though the experiments were not being carried on. We are certain, therefore, that if any difference occurs on the experiment plot, it due entirely to the test that is being made. The advantages to the grower are that he comes immediately in contact with the most advanced information that results from the experiments. We find in every case that where these co-operative experiments have been conducted there is established at once a Horticultural Society composed of at least one in the audience and a speaker who discusses all sorts of questions in connection with the work in hand.

FARMERS' INSTITUTES.

This work is not properly experiment station work, but from the nature of the case our experiment station workers are well prepared to discuss most of the problems connected with agricultural and horticultural work. It is quite probable that this is the reason why the Institutes continue to call so frequently for workers from the experiment station. During the biennium from July 1, 1907, to the present time, 91 sessions of Farmers' Institutes have been held. The total attendance on these institutes is 9,301, making the average attendance a little more than 100. In this connection I might be allowed to state that the institutes are being called for more frequently in northern and western Florida, than in eastern, central and southern Florida. As both our time and funds are limited, we have been unable to hold all the institutes requested. Under the circumstances, we are not able to work up institutes in sections where they are not called for.

CONCLUSION.

Those of the Horticultural society who have been earnestly interested in the experiments made by the experiment station will have discovered that our most important work and our most lasting work is such as has required a considerable time for perfecting. We might say in a general way that the surface and easy problems have to a large extent been worked out, and have passed from the experimental stage to the demonstration stage. From time to time as we secure valuable results in our experimental work, publications are issued setting forth our discoveries. We have two lines of publications. First, the regular bulletin which discusses certain problems and gives the information in a full and concise way. These are distributed to the people of the State. The press bulletins are short essays discussing certain phases of problems and announcing discoveries in our research work. These press bulletins, as their name indicates, are sent to all the newspapers of the State with the request that they publish them.

Handling of Citrus Groves.

By B. H. Chilton.

Mr. President, Ladies and Gentlemen:

This to me covers a large field; for I am aware that with so many different conditions that have to be met with in the different qualities of soils, and modes of working, and before this body of wide experienced and practical growers, I hardly know where I ought to commence.

First—I believe in thorough cultivation on all common sandy soils; and commence fertilizing and cultivating as early in February as we can with safety. While many of us no doubt feel that there is some danger yet of a late cold striking us. But if your acreage be small, or run up in the hundreds, you have to take your chances, for there is nothing gained by waiting; for about this time generally, nature herself begins to assert itself and the orange tree is among the first to respond.

With fertilizing we make two applications a year: February and June or July, giving at each application 10 to 15 pounds of the standard brands, Gem mixture or special fruit and vine, according to the conditions and needs. This is on eight to ten-year-old bearing trees. With the younger trees planted in grove shape to allow from two up to six pounds to the tree. I believe in blood, bone and potash, governing the amount according to the condition and size of the tree, and for building up your soil. With our June and July application of fertilizer it differs but little, if the season is favorable; only we use if possible the high grade of special mixture of the highest per cent. in potash, on our bearing grove.

On our hammock grove we use less in ammonia and a higher per cent. in potash. Where the vegetation makes a heavy growth we find also that the die back mixture gives good results. For in our heavy timbered grove or marl hammock land, there is a tendency in a moist season, for the trees to show more or less die back signs.

CULTIVATING OR CULTIVATION.

On all old groves and sandy soil, we use nothing but the Planet Junior and Rolling Cutaway and Acme Harrow, and the hoe around the trees. This is kept up until the first of August; and in a dry season, if possible, I would recommend that the Acme Harrow be brought into active service, and all grove be gone over once a week. After July we let the beggar weed and crab grass take possession, which will give your trees a heavy mulch and shade the ground until the first of November. Then we begin again for winter protection. Using the Morgan Spading Harrow, which can be used both ways, and will cut up the growth which has already begun to die down, and mixing it with the soil. And this also makes a fire protection. For with us we use the open pine fire for frost protection, in every check in our bearing groves. With our young groves we make fire in our margins, and bank high all young stock. And in cultivation in our hammock grove, nearly all the work is done with the hoe and scythe. Hoeing large circles around the trees and mowing the margin, this is done three times a year.

PRUNING.

I believe in the use of the knife with good judgment. And that along the line with Professor Harold Hume, gave us in his able lecture two years ago at St. Petersburg. Cut close and clean and using a dressing on all large cuts, of either grafting wax, or oil, lamp black and white lead. And keeping the center of your tree clean of all dead limbs and water sprouts, unless you want to bring out a new limb or leader to fill out the vacancy.

By Jas. E. Kilgore.

Mr. President, Ladies and Gentlemen:

After thinking this subject over I have decided that it is a very large and difficult one for me. Any method I advance will depend, for its success or failure, on the soil and the season where the test is made. A method that would give good results in a wet year may fail in a dry, without proper irrigation, and the different conditions in warm and cold winters also interfere with our plans.

The soil problem is also very complicated where we have citrus groves on every description of land from rich, damp hammock to spruce scrub. Many small groves extend over so wide a range of soil that one side will not do well with a treatment adapted to the other side. Under such conditions there is no best method; every grower must have a flexible system to suit himself and his groves. However, I think that I gain more useful information at our meetings than I do all the year alone in my grove, and I regret that I can give so little in return.

In setting out citrus trees, I prefer midwinter for moist land but for high, thirsty soil the summer rains often make up for the other conditions, so I take that time for setting out. When the trees begin to grow I watch the tops until they are five or six feet high and if two or more buds show equal strength I take off all but one or nip the buds. This prevents a crooked tree and causes little loss of foliage. I prune out water sprouts and dead branches and take off the lower branches as they come to the ground.

In general fertilizing I use a mixture containing little nitrogen and give all the trees a good share. If they look well they need it to keep them so and if they look badly it will help them. Then I go over the grove with my nitrogen and give such trees as need it, a dose according to their needs. If a tree is pale, with small leaves, or has a heavy crop a good lot is used, if it has large green leaves and few fruit little or none is needed. This is not a task for an ordinary laborer but it gives good results in keeping a grove uniform in condition. For my bearing trees I use from twenty to fifty pounds of land plaster per tree and suppose that it does some good. I use also about twenty pounds of Kanit on the same supposition, where the drainage is good. But if I depended on sulphate of ammonia for my nitrogen, especially in early spring when I apply most of it, I would not use the Kanit on account of the well known fact that a chlorin and a sulphate of ammonia do not act well together.

I had a great deal of trouble with my outside rows of trees. The grove is partly surrounded by heavy timber that I did not care to destroy. I put all kinds of fertilizer on the outside rows and a great deal of it, but the woods looked much better than the orange treees and the application of lime was all that seemed to help the orange trees. Then I decided to dig a good deep ditch between the woods and the grove. Now the outside trees look best and one dollar's worth of ditching did more than ten dollars worth of fertilizer could have done for them. The ditches are also very useful in case of a flood. I am convinced that one wet, sobby season can do a grove more lasting injury than a dozen droughts. Also when high land does get too wet it seems to suffer more than low land. If we can keep our ground from staying too wet and "sobbing" off the deep feeding roots the drought will have much less effect. So a good, deep ditch even on high land may largely relieve the need for irrigation. I use also a lot of muck and lime but as their action is more directly on the soil than as a fertilizer I will mention them under cultivation.

Cultivation or, in a general way, the handling of the soil is the real problem in handling a citrus grove and one of which I know little and confess a great amount of ignorance. But for the sake of discussion I will beg your leniency. When I first became interested in this problem the clean culture method seemed to be generally practiced. We cultivated all the year and hauled in mulch to keep up the humus. This seemed alright especially on very dry land where nothing would grow anyway and the weather was too warm for much summer work. But the trees seemed to show age badly and dieback and disease were too common. Then we began to let the grass grow a little after the summer rain had wet the ground thoroughly, and we could cultivate the fertilizer into the wet soil, so that the trees would get it before the sun evaporated it. When the grass died in the fall or was used for hay we commenced over. The grass took the place of some of the mulch hauling and it seemed to do better. About six years ago my summer fertilizer did not arrive on time, we had early rains, and as I had some beggar weed and a lot of grass the ground was covered with tender stuff. When the fertilizer did come I had to put it on and cultivate it in to save it. It was very easy to see the result and I decided not to try that way again. As I could not see how the sun would destroy my citrus fertilizer I next put it on before the rains began, then let the grove take care of itself till late fall, when it was a mass of tangled and dead vegetation except where I had cut hay. This method seemed to me nearly perfect and I got good results and by moving a few times there was little trouble.

But I tried further to find just when the cultivation should cease. First I left a square of sixteen trees as soon as the bloom had opened, and cultivated all other trees until the first summer rain. Then the soil got dry and I cultivated a few rows again before the heavy rains. The spring drought was not severe enough to kill the weeds and grass in the test plot so it was two or three feet deep in fairly rank growth through the worst weather, but the trees looked as well as the cultivated ones and when the rains commenced they put on a much better growth and were ahead of those cultivated. The rows cultivated last were the last to show new growth and made the least growth and the differences were almost as apparent and in the same order the following season. I next turned loose a large plot about the first of April. We had a good shower which gave the weeds and grass good start and they got about eight inches high when the weather got so bad that they commenced to wither and expose the soil to the sun. Then they dried up until I thought they were all dead and the temptation to cultivate was very strong but I considered the mischief done so I let it go. I did not at that time nor have I since noticed any bad results from the neglect, but there was no apparent advantage except a saving of labor. So I have about decided that the best time to lay by is when the bloom opens if there is sufficient moisture; if not then we must cultivate until the first rains of summer. But on fairly moist land if a good deep growth can be secured by the first of May it will keep the ground cool and grow right through the drought when a small or scattering growth would die and be of no use at all. The only use of this growth in a drought is to keep the ground cool and in good condition, for I think that there is little doubt that the growth takes less moisture than would be lost by the direct heat of the sun on the soil. With irrigation, we can lay by when we choose and I would wish to get a cover before the hot weather any way.

Four years ago about twenty-five trees in the lower corner of my grove, where the soil is rather moist and rich, showed die-back. I had little hope for them and have done nothing more to them except to cut down the weeds and young bushes. This season the trees in that plot are the healthiest I have and had the best crop and the best fruit on the place. So it is quite easy to consider this more perfect, except that the dead trash on the ground all winter is too tempting to fire, but closer mowing with some clean middles would help that. I have thought that it would increase the danger from cold but I am not now sure of that when the more uniform condition of sap is considered. I believe that irrigation will be necessary to adapt this cultivatorless cultivation to high land but irrigation is needed anyway and this sort of cultivation will simplify irrigation and increase its benefits, for the final results of irrigation on the bare, hot sand has seemed doubtful to me. If I were dealing with a fruit like the peach which has reached perfection through strenuous urging, or a short lifed vegetable, the result of intense culture and forcing, I would seach for more artificial means in improving them. While the citrus tree shows great ability to stand forcing and other well intended abuses, I think that it is not wholly domesticated and prefers some of its natural forest conditions, a sweet, moist, rich soil on which the sun cannot shine and where its delicate root system will not be disturbed. To bring the soil to such a state plenty of muck, leaves or trash will be needed and a good application of ground shell or raw ground limestone will be necessary. A number of observations on shell and marl land, besides liming tests, make me sure on that point. And if the requirements of this system are filled its adoption will be almost a necessity. The reverse is also somewhat true of it.

Why do we cultivate so much in our too active sandy citrus soils? I would not use a fertilizer on my grove that would be injured by the sunshine or would not wash into the soil with a few showers. If cultivation really saves much moisture under our grove conditions it is of little consequence under modern irrigation or on low land. If to keep the crust broken, so far as I know the sort of crust we break only forms under cultural conditions, and if we keep the top crust broken one will form just below the cultivator limit that we cannot break without injury to the roots. This also indicates that the soil mulch as we use it is not perfect as a mellowing agent. I think also that the apparently good results from cultivation are deceptive and may finally become destructive, especially when the soil is worked when wet or green stuff is worked into it. And the warmer the weather the greater the resulting injury will be in any case. The action of cultivation on our active sand is as a powerful stimulant to the tree when it is done, afterwards, the reaction.

Many of us have seen groves that for some reason were thrown out. If these trees were properly fertilized, irrigated, mulched, and pruned with the grass mowed to return to the soil instead of clean grazing the quantity of fruit might increase to commercial proportions without destroying the quality. At least, we should not be complaining of bad results from fertilizing, etc., when bad cultural conditions were the cause. If any one should be favorably impressed with this idea I can only ask them to go slowly with it as I did. But on rich, moist land the commercial possibilities of this system are especially good and it might adapt such land to citrus culture where it now fails.

DISCUSSION.

Mr. Mead—I have been trying some experiments in fertilizing trees lately. I came to the conclusion that the effect of fertilizer does not last very long, so a year ago I tried the experiment of fertilizing much more often than I had ever done before, giving a less quantity. Now, the ordinary method is to give from twenty to forty pounds of fertilizer to a tree all at once and several months apart. I experimented by giving a tree ten pounds every month. The yield the very first year, although I began the experiment in January, increased from an average of six, to eighteen boxes of oranges. This year the tree has grown splendidly and has set what seems to be a moderate crop of fruit, but it may turn out to be much better than it now seems. I used a complete orange tree fertilizer (Mape's) the "fruit and vine" variety for all except one application. I tried the same experiment years ago with five pounds a month on a plot of six trees, and the results were very satisfactory. The fertilizer was paid for several times over. I used a brand that contains 12 per cent. potash, 2 per cent. to 3 per cent. ammonia and 8 per cent. phosphoric acid. It is one of the standard brands for fruiting trees.

Mr. Temple—May I ask the gentleman if he made any change in his method during the dormant period of the tree? Do I understand that he fertilized every month, the same quantity, right through the year? I would also like to know if he found this had any effect on the tree; that is whether it bloomed earlier in the spring, or later than trees treated as they are ordinarily.

Mr. Mead—I gave ten pounds each calendar month. As to earliness the difference is so slight as not to merit attention. Possibly it did open up a little earlier but I think that was due to the tree being in more vigorous health, but the difference was but a few days. Some of the trees that I did not fertilize at all last year bloomed more heavily, and some of them bloomed earlier in isolated cases. However, this tree has certainly set a good crop.

Mr. Penny—May I ask the gentleman how the fruit on the trees ripened up; did it ripen up earlier or later, and also how was the texture of the fruit, coarse or fine, and was the skin smooth or rough?

Mr. Mead—There was not very much difference between the trees; they all ripened about the same time. The fruit is not of the very best quality but as the other trees were similar I took it to be due to other conditions than the fertilizer. I could not see any difference in the texture of the fruit. When I was fertilizing the plot of six trees the fruit was exceedingly good and smooth. I was fertilizing then with five pounds a month. I could not see that the fertilizing had very much to do with the quality of the fruit. The tree was affected with the whitefly more or less but that did not seem to make any particular difference.

Mr. Penny—How about the ripening?

Mr. Mead—It ripened a little later than usual this year, but by December it was all right and shipped a little later than the middle of December.

Dr. Richardson—Then you mean to say that you think the only difference was the increased bearing. I have heard it said that an experiment was tried in which a tree was given 300 pounds of fertilizer during the year, but after 125 pounds was given they could not see any difference in the bearing capacity or condition of the tree; that it did not seem capable of assimilating more than 125 pounds.

Mr. Penny—I would like to ask Mr. Kilgore what kind of nitrogen he uses. I understand that he used nitrogen independent of his other fertilizer.

Mr. Kilgore—I use almost any sort of nitrogen I can get, dependent on the season. In the spring I keep my grove just as rich in nitrogen as I dare. I get it easily from the legumes, rich muck beds, etc. In the early spring I generally use nitrate of soda or nitrate potash. Later in the season I would prefer organic nitrogen from the soil but I can only do that by allowing the weeds and grass to grow.

Mr. Penny—Then you consider nitrate of soda a good source of ammonia for the spring application.

Mr. Kilgore—I do, most decidedly. I think it is good just for shoving the trees up a little for a good bloom.

Packing and Shipping Citrus Fruits.

MODERN METHODS OF PACKING ORANGES.

By Lloyd S. Tenny, Pomologist.

Mr. President, Ladies and Gentlemen:

More than ever before in fruit growing, the quality of the product as it arrives on the market is of first importance. No matter how fine the fruit may be in the orchard or packing house if it reaches the market in a decayed or poor condition, the grower ultimately loses money. The methods of growing the fruit are of prime importance for unless it is well grown, of fine quality on the tree, free from disease and insect pests, there is no hopes of it ever being in first-class condition when it reaches the market. But it is not sufficient to have the fruit in perfect condition as it hangs on the trees ready for the harvest. The processes of harvesting and packing are almost equally important with the methods of growing for unless these methods are correct, the handling of the fruit in packing may be the means directly or indirectly of much loss from decay in transit or on the market. The work of the department of agriculture in California and Florida on better methods of packing oranges is sufficiently well known for me not to dwell long on these results. The paper which was read at the last meeting of this society at Gainesville gives the data in full to that time. Suffice to say that the experiments all lead to the belief that the methods of picking and packing the oranges very clearly indicate what the carrying quality will be.

The aim of our work in Florida during the past season has been rather more practical than experimental. We have selected certain picking gangs and packing houses where we have had virtually full control of the different processes to determine if careful methods can be adopted on a commercial scale and to learn how the cost of the different processes under these conditions compare with the rougher methods. Chief, too, in our work, was a desire to know how the fruit handled in this improved way carried to market.

This work is not completed as yet, and I shall reserve until some future time the very encouraging results which we obtained. We want you to know, however, that it has been possible to train a picking gang to do good work. It has been possible to eliminate much, if not all of the rough handling in the packing-house and best of all we found that fruit picked and packed under our own supervision had splendid carrying quality and held for two weeks after reaching the market with surprisingly little decay.

I should like to spend more time on this subject to-night but we want to take a long trip and study some modern methods and modern machines used in packing oranges. The pictures which you will see will not all represent ideas which you as orange growers of Florida can incorporate into your business, but where this is true, you may find some suggestions which under changed conditions will be of service to you.

(Following Prof. Tenny illustrated the different packing houses in California with stereopticon views which were very interesting and we regret we cannot show the pictures here.—Secretary.)

DISCUSSION.

Mr. Tenny—A statement made this afternoon was slightly misleading. At this time of the year you would see nothing but clean culture but lately there has been a tremendous tendency to allow the grove to become covered, and uncultivated the greater part of the year.

Just now, at the beginning of your rainy season it is just finishing the rainy season in California. The land should all be cultivated at the present time. There is thorough cultivation with irrigation possibly once a month during the entire summer period while there is no rain whatever. It would not be surprising if they did not have a drop of rain for the next three or four months. They irrigate very heavily when necessary and as soon as it is possible to harrow they do so and keep this ground for about six or eight weeks, thoroughly pulverized. This is continued until usually about September; possibly October. The rains are beginning then but only slightly, and before the rains really start in they get the ground in proper shape and put on a cover crop, mostly the velvet bean and other things of that kind. They come up and grow rather rapidly during October, November and December. Then it depends largely on the personality of the grower, but usually before the 1st of February the ground is plowed and from that time it is clean cultivated.

The wet season with them happens to be in the winter time; in your case it is the summer time. They plow rather deeply and cultivate deeply; six or eight inches.

Mr. Kilgore—How deep is their soil? Very deep?

Mr. Tenny—Very deep; 200 or 300 feet. It is made from the wash from the mountains, then hard pan and sub-soil in places that are hard.

I agree thoroughly with what Mr. Hart stated this afternoon. From his standpoint and from the standpoint of a few packers in Florida the methods that are pursued in California look rather rough. They handle an immense amount of business, however, and it is impossible to give it the same time and attention that a small packer can give his fruit, if he will. And their orange will stand more than the Florida orange will. But as an average, I think Mr Hart will agree with me, their methods are more careful than the average methods in use in Florida. Of course, Mr. Hart's methods as well as a very few others in Florida, are more careful than many in California.

When we first started out in California, in many places we found the fruit was elevated and allowed to run down by gravity through the various machines. This made a tremendous amount of rough handling. The first thought that presented itself to Mr. Powell and myself was that this probably had something to do with the decay. We took up the dropping experiments and got very excellent results. When we came to Florida, for the moment I did not begin work on dropping oranges. I began to look for clipper cuts and found comparatively few, and long stems, but there were few of those. At the close of the first year we began dropping experiments and the results were startling. Sometimes we had as high as 70 per cent decay where oranges were dropped 18 inches, while oranges not dropped showed only 3 or 4 per cent decay at the end of two weeks.

We find there is a great deal of difference shown in the effects of dropping on oranges. Some oranges will stand a considerable amount of dropping while others are much more susceptible. It may be due to the fertilizer, climatic conditions; I don't know just what it is. They may have a thin skin or a thick skin, but it is a fact that some will go to pieces almost immediately, while others will not show the effects for a much longer time.

By E. H. Mote.

Mr. President, Ladies and Gentlemen:

In discussing this subject, I wish to refer to some of the problems that must be solved before we begin to pack the citrus fruits. I once heard a clergyman, who was debating the subject: "How to Read the Bible," begin his oration by saying: "You must first have a Bible to read." He had bibles to sell. We are fruit growers —and I wish to emphasize the fact that we must first grow the right kind of fruit, before successful packing is possible.

In our discussion of this question at the last meeting of this society, Mr. W. S. Hart began an excellent paper on this subject by saying: "We must begin by proper cultivation, fertilizing, etc."

I would place the beginning further back than that. I would begin with the selection of the proper locality, and the preparation of the soil, before a tree is planted, or cultivation and fertilizing begins. The question of drainage, management of subsoil, to insure the necessary circulation of air among the root system of the tree during the growing season is the surest foundation for successful cultivation that will insure the production of a class of fruit that will have all the excellent qualities of pulp and rind necessary to successful packing of fruit that will carry well, and command a price at destination.

I recall a personal experience, some years ago, when I bought the fruit in two groves, aggregating some eleven thousand boxes, which broke down and began rotting before I could get it out of the packing house. One evening I left the cover off of fifty boxes, and found, next morning, an average of ten to the box that were already showing signs of immediate decay. To all outward appearance, the fruit was perfect—but there was a radical defect in production that made it impossible to get it to market in good shape—even by the most painstaking care in handling.

I also call to mind that a few years ago —in the neighborhood where my own grove is located, that the fruit "creased" so badly that a large percent was lost. The fruit now produced in both the localities referred to, has been improved by proper fertilizing, drainage and cultivation, so that no difficulty is experienced in putting it into market. Of course when a grove is already planted and in bearing, these precautions cannot be taken in advance; but, even then, much can be done to remove the evil, by looking well to the cause; and, as far as possible, remedy the natural defects in the soil; so as to bring the fruit into the packing house in a *possible condition* to be benefited by good packing. In this connection I wish to call your attention to the fact that there is a promising outlook for the successful cultivation of the lemon in Florida. We have all the congenial environments for this valuable citrus fruit, that can be found in any country now producing the lemon commercially.

My own experiments in its growth—while not sufficiently extensive to make a hard-and-fast opinion expedient; yet, I have produced some samples of this fruit that are, to say the least, very encouraging. It will be remembered that in California the early efforts to cultivate the lemon promised to be a total failure—not because the *natural conditions were wanting,* but simply because the growers there did not know how.

The present value of the lemon groves now in that State, shows conclusively that it pays to learn how; to so combine the natural advantages which we have in abundance with the habits of this fruit, in order to make its cultivation here very profitable. I believe it will be as easy for us to succeed with the lemon in the near future, as it has been to succeed with the grapefruit in the recent past. It may, perhaps, be properly said that the keynote to successful packing and shipping may simply be in "knowing how." We certainly have much yet to learn as well as considerable to unlearn. We are fast learning the fundamental principles of cultivation, and are making rapid strides in producing the quality of fruit that can be successfully put into profitable markets; and, it only remains for us to learn the detail of the most perfect method in harvesting and packing. Just in this connection I wish to say that want of proper sanitation in harvesting, is a matter that we are too apt to overlook—especially when we consider the class of labor we are compelled to employ.

Who has not seen the evidence of this in the eggplant, exposed for sale in our own home markets; where the print of every finger that touched the fruit in handling, was marked by a decayed spot, due to the perspiration of the ungloved hand of the employes, in harvesting, for home use. Is it not possible that the same cause contributes to the breaking down of the citrus fruits in transit? Some of our thin rind fruit may be as susceptible to injury from this cause, as the smooth rind of the eggplant.

One of the principal evils of our present system of packing and shipping is the want of uniformity. This is evidenced in every department of our industry.

It is just as important that we should have a uniform system, as it is necessary for the railroads to have a uniform gage for their tracks. Who does not remember the embarrassment and inconvenience that grew out of the "broad gage," "standard gage" and "narrow gage" of former rival railroads. There must be—above all—a uniform standard of shipping boxes, applicable alike to every State in the union producing the citrus friuts.

The size of the California box is 11 1-2x11 1-2x26, slats 26 inches by 3 while the size of the box in general use in Florida is 12x12x26 1-2, making a difference of 12 per cent. in favor of the California box. This is a discrimination against Florida fruit, and the general public are not educated to note the difference.

To them, a box of oranges, is a box of oranges—without a thought of the fact that one contains more than another. There seems now to be a willingness on the part of our Congress to establish a uniform package for many of the fruits entering into interstate commerce. The influence of every member of this association should be exerted to the utmost, to have the packages for marketing the citrus fruits included in this legislation; and every section engaged in the business should be compelled to use a package of the same cubical contents—or if any section persists in using a package below the standard, they should be marked, "short" when used in interstate commerce.

There should be uniformity in the handling and marketing of fruit, which involves central packing houses in different well defined, sections.

These separate, district, packing houses should at least be under a single *advisory head;* so as to maintain, as far as possible, uniformity and co-operation in grading for each district.

Perhaps these may be considered Utopian conditions in the present chaotic conditions of the fruit industry of Florida; but, my experience of one year in California, fully convinced me that it is imperative—that substantially the same system—as used in California—must, sooner or later, be introduced here.

I venture to predict, in advance of the report of the committee lately returned from that State, that their recommendations will be along this line.

Along the line of shipping early fruit I wish to point out the great harm to our industry by unscrupulous buyers and growers shipping our *late varieties* under the brand and name of our *earliest varieties.* This is a palpable fraud and should, if possible, be regulated by the police powers of the State—making it a misdemeanor for any one to ship the immature and unripe *late varieties* under the name of the earliest varieties. It is a fact, well known to all growers, that we have early oranges that will go on the market in a fairly ripe and palatable condition as early as October, but it is unfair to the consumer, as well as very detrimental to the grower, to have the immature, unripe, and *sour fruit,* of the *latest varieties,* hastily colored by artificial means, and offered to the Thanksgiving trade as an average sample of Florida oranges. Of course no reputable grower will do so himself, but do not many of our growers who sell their fruit on the trees, *know* that this will be done?

In the present condition of orange growing it is, perhaps, unavoidable that we should have oranges of several degress of excellence—good, bad and indifferent. The uniform influence of this society ought to be earnestly directed to educate the northern jobber to discriminate between the varieties; and the degree of maturity at the different seasons; so that *equal quality from any section* of the State will command uniform prices. Perhaps, in time, this may be, to some extent, regulated by the shippers being compelled to ship the lowest grades of fruit *in bulk,* as the continued advance of box material will soon make it much cheaper to prepare cars for bulk shipment than to pack them in costlier boxes.

In my opinion the shipping of our fruit can be much facilitated, and more advantageously distributed, by selling F. O. B. Fruit will then move only on demand, and the section that can most quickly and cheaply supply the desired quality; will, most likely, get the order. Consignment to unknown markets ought to be discouraged; as fruit so consigned, always comes in direct competition with purchased fruit; to the injury of bona fide buyers. It is quite certain that the great majority of responsible solicitors would prefer to become F. O. B. buyers, if selling were more general, and the grades made perfectly reliable. In time all the best grades would be sold at the packing house, and only the inferior grades—from poor handling—would go forward on consignment.

In conclusion, I want to urge the importance of *neatness* and scrupulous *sanitation* in every department. Clean hands, clean picking boxes; bright, well seasoned packing boxes—clean, sanitary cars for carrying the fruit to market—for it is a commercial *fact,* that if you *please the eye* you touch the pocket book.

"So mote it be."

By S. C. Warner.

Mr. President, Ladies and Gentlemen:

At the last meeting of this society we had reports from your committee on the subject before us that were extremely valuable and I can add but little to their suggestions. Permit me, however, to quote from a recent article by one who is an authority:

"Harvesting—This is one of the most absorbing subjects of the day and demands the most thorough and careful investigation and thought, followed by the most energetic action upon the part of every one engaged in the fruit industry. Our careless handling is costing the state thousands, yea, hundreds of thousands of dollars every year. I make the assertion that fully 90 per cent of the Florida fruit that arrives in market in bad order is attributed to careless clipping and careless handling.

"All of us flatter ourselves that we are taking extra pains and doing better than our neighbors and if our fruit does not reach its destination sound the fault lies with the transportation companies and not with us; when, if the truth were known fully one-fourth of our oranges were either punctured by the clippers, scratched by the fingernails or bruised by dropping, jamming against ladders, pouring into field boxes, the rough treatment by teamsters and emptying and piling into hoppers and falling from the sizers into the bins." This from Dr. Inman.

It is an inconsistency not easily explained why we expend so much labor and money in the production of a crop which receives such meagre attention in its preparation for market as do our citrus fruits.

We have, no doubt, sometimes questioned the inherent quality of our oranges to "stand up" but are not the causes of decay—at least in great measure—our own lack of careful, intelligent, systematic work.

Weather conditions, when fruit is picked, must be right. This, I regard as one of the important factors in successful shipping. Oranges should not be picked when the fruit hanging on the trees shows decay to any considerable extent, even when split or thorned. It is apt to be very inconvenient to lay off the hands at such a time but if the work is persisted in the results are pretty sure to be very unsatisfactory. Simple wetness, as from dew, is not important but if the degree of humidity is such that the decay of the fruit on the trees is very noticeable, decay of the packed fruit, even where care is otherwise used, is apt to result.

The Somer-Hart clippers I like better than any others that I have used. They cut a clean, short stem and with ordinary care, clipper-cutting and scratching is avoided.

As a receptacle for the picked fruit the sack should be avoided. The basket or can, with a perfectly smooth surface inside is very much safer, avoiding the pressure of the body of the workman, thorning and bruising.

The grove box should be carefully made, every edge which can come into contact with the fruit being rounded and sandpapered. Its capacity should not much exceed three pecks, and the top slat being two inches below the top of the end, which we make in panel. The willow splint baskets, used by grocers, make a very desirable field crate, affording excellent ventilation and being light to handle.

In delivering the fruit to the washer or brushing machine it should not be piled more than two deep in the hopper—better only one layer. In emptying the field crate a canvas cover should be drawn over the top, one edge being fastened to the bottom of the hopper, and the fruit can then be poured out without bumping and bruising.

Cleaning fruit adds to its attractiveness and quite possibly to its keeping quality, if done with proper care. There must be no abrasion of the skin nor rupturing of the cells from pressure. This, of course, would be fatal.

Sorting is one of the most important packing house operations and should have the greatest care. Cull fruit should never pass the sorter. It would be extremely desirable if the different grades could be so standardized that it would not be a matter of mere whim or individual opinion as to what constitutes a "fancy" "choice bright" and so on. This will, perhaps be one of the benefits of the new marketing system which I devoutly hope will materialize.

As the fruit comes into the packing-house, after it has been cleaned and sorted, it is desirable to have room for storage before sizing. If boxes are used they should be so made and used as to give the best possible ventilation to their contents. Rack bins are, however, better. In them the fruit receives unobstructed exposure to the air, the pores are more quickly closed and possible scratches have a better opportunity of drying and healing over. A few hours of this treatment should place the fruit in good condition for packing.

One of our most successful growers dispenses with packing-house curing entirely by letting the fruit remain out in the grove, after picking, for about twenty-four hours before hauling to the packing-house. If the results of a method are a measure of its sucess, this is certainly a good one.

With the excellent machines now in use there should be no trouble in sizing properly. I use the latest Maull production and find it quite satisfactory for oranges, grapefruit and tangerines.

Whether the "bulge" or flat pack be adopted the box should contain all the oranges possible without bruising. There is scant excuse for a slack packed box.

I use a press, also made by Maull. Some sort of press, I deem very important as the jar to the fruit in nailing down the cover should be avoided.

Whether white or manilla paper be used or whether there be trimming is, perhaps, not very important but it is pretty sure to be a matter of satisfaction and profit to make the package as attractive as possible. It should be a matter of pride with us, as it is with the California packers.

Stenciling and stamping should be neat and in good taste and it is well to use some distinctive motto or brand, unless we want our work for our own sufficient reasons, to be anonymous.

Let me add a few "don'ts."

Don't pick your fruit when you notice split fruit decaying rapidly on the trees.

Don't use a grove crate holding more than three pecks.

Don't permit a long or pointed stem on your fruit.

Don't fill your grove crate so that the highest orange will touch the bottom of the crate above when stacked.

Don't pick into a sack.

Don't pour your fruit so that it will fall more than one inch unless it strikes a cushion.

Don't permit a sharp point or edge in crate or bin where it can come into contact with the fruit.

Don't permit long fingernails to be worn by pickers or packing-house men.

Don't permit jolting when the fruit is being hauled.

With regard to artificial means of preventing decay, fumigation in the car has not been found to give good results. In some cases a spray or bath of ammoniacal solution of copper carbonate or bisulphate of soda has been efficient.

There is one point that we cannot too much emphasize, the value of reputation; not only our individual reputation but the reputation of the Florida fruit generally. You are aware how sensitive the market is, how quickly there is depression when fruit is arriving in bad order, how quickly buyers turn to some other source of supply.

We are all, to a considerable extent, dependent on each other for the popularity of our fruit, and in this connection there is one question I would ask you to consider: Whether the reputation of Florida citrus fruits has not suffered from the practice of selling on the tree, leaving the picking and packing as well as marketing to parties who have an interest only in the selling of that particular crop and not in the reputation of the fruit in a general way and which is dependent on careful selection as to maturity and proper handling generally. Is not the manner in which much of our fruit is handled by buyers seriously detrimental to us? Having no further interest than getting results from that one crop, depending on the incident of good weather to delay decay which will ultimately result from careless handling, perhaps deferring it till the fruit has gone into the hands of the retailer, who suffers in consequence and then makes us suffer later.

Is it not a fact that this practice has a very far reaching effect on the reputation and popularity of our citrus fruits?

Efforts to Secure Better Shipping Facilities and Rates.

By B. J. C. Chase.

Mr. President, Ladies and Gentlemen:

It is recognized that we have entered upon an era of economy all over the world. The factor of shipping facilities and freight rates is important in the cost of an article to the consumer. The less value there is in an article the greater the importance of the element of freight cost. We do not undertake to say that the rates in general are too high or too low. All we ask is a square deal and equitable rates compared with other sections. Rates that are given to other similarly situated localities producing commodities that are marketed in competition with ours. This is a very complex question and we do not undertake to pass judgment on whether general freight rates are too low or too high. We merely say that when rates are established, Florida and Florida products are entitled to equitable consideration.

The Florida Fruit and Vegetable Shippers' Protective Association was organized in Jacksonville, Fla., January 30, 1907, by Florida growers and shippers upon a call issued by the Gainesville Melon Growers' Association to co-operate in the establishment of carload rates and carload minimums on Florida vegetables to eastern markets. The purpose of the organization was afterwards changed to secure more equitable rates of transportation to all markets on all Florida fruits and vegetables, material and supplies pertaining thereto and to otherwise protect the interests of the fruit and vegetable growers and shippers of the State of Florida.

Investigation developed the fact that Florida fruits and vegetables were called upon to meet constantly increasing competition from like commodities from Cuba, Jamaica and Porto Rico, California, Mississippi and other states marketing competitive products at the same time. Upon comparing rates it was found that these like commodities grown elsewhere were favored with lower freight rates whether based upon the package or upon the hundred weight and whether transported by water, by rail and water, or by all-rail.

At the time of the formation of this association Florida rates had been in effect between twenty and thirty years and little or no effort had been made during that time to better conditions. While carload rates and carload minimums were in effect to western markets no carload rates or carload minimums (except on cantaloupes) were in effect to eastern markets. In spite of the alleged water competition, rates were and still are higher in proportion to the haul to the east than to the western markets. For instance:

It costs 53½c to ship a crate of tomatoes from Palmetto, Fla., to Chicago, Ill., a distance of 1,384 miles, while the transportation charges on a crate from Palmetto, Fla., to Boston, Mass., are 69c covering a distance of 1,449 miles, although Boston is supposed to receive the benefit of competitive rates by water.

Crystal Springs, Miss., can ship a crate of tomatoes to Chicago (a distance of 763 miles) for 26c and to Boston (a distance of 1,773 miles) for 39¾c or 29¼c per crate less than from Palmetto, Fla., although the Crystal Springs crate travels 323 miles more than the crate from Palmetto to Boston.

Like discrimination was found to exist against practically all Florida fruits and vegetables when compared with freight charges on the same products grown elsewhere and going into the same markets.

Comparative statements were submitted to the Traffic Departments of the Florida transportation companies showing freight rates on Florida perishable products, and similar products grown elsewhere, to the principal markets of the country and efforts were made to arrive at an amicable adjustment of the differences in order to put Florida fruits and vegetables on an equal footing in the markets of the country.

It is to be regretted that those in control of the Florida transportation companies failed to meet the growers and shippers in a spirit of fairness or to show the slightest desire to encourage and promote Florida fruit and vegetable industries. As a last resort, the association was compelled to file a complaint before the Interstate Commerce Commission and the case was heard in Washington, D. C., continued and completed in Jacksonville, Fla. Under the decisions and orders of the Interstate Commerce Commission Florida growers have made the following substantial gains in freight rates:

ORANGES, GRAPEFRUIT AND PINEAPPLES.

On all-rail shipments to Atlantic seacoast and interior eastern markets, in a territory bounded on the west by Pittsburg and Buffalo and east including the New England States, the carriers are requested to establish carload rates with a minimum of 300 boxes or crates and rates have been reduced from 4½c as high as fifteen (15) cents per box and per crate as follows:

Baltimore, reduced from	47½c	to 43c
Philadelphia, reduced from	48½c	to 44c
New York, reduced from	50½c	to 46c
Boston, reduced from	59c	to 51c
Buffalo, reduced from	60.8c	to 53c
Pittsburg, reduced from	60.4c	to 52c
Providence, reduced from	59c	to 51c

VEGETABLES.

The reduction by the commission on shipments of vegetables via rail and water to Philadelphia, Baltimore, New York and Boston is five cents (5c) per crate of fifty pounds, which is a reduction from the old rates of fifteen to twenty-five per cent. On cabbage and potatoes via rail and water the rates have been reduced as follows:

CABBAGE—To Baltimore, Philadelphia and New York reduced from 54c to 44c and to Boston from 63c to 52c per barrel or barrel crate of 120 pounds.

POTATOES—To Baltimore, Philadelphia and New York reduced from 60c to 50c and to Boston from 70c to 60c per barrel or per barrel crate of 185 pounds. The all-rail rate to Boston was reduced from 53c to 49c per crate of 50 pounds, and from $1.06 to 98c per barrel.

STRAWBERRIES—The minimum loading of two hundred crates at the rate of $1.80 per crate from Starke and Lawtey to New York was reduced to a minimum of one hundred and seventy-five crates.

The above rates have been in effect during the past shipping season and will be instrumental in saving hundreds of thousands of dollars to Florida growers.

During the past season, we estimate that 4,429 cars of oranges and grapefruit passed through the Potomac yards to markets supplied through that gateway upon which there was a saving of over $100,-000.

We have every reason to believe that a great saving will be made to the pineapple growers on all-rail shipments into the same territory although the volume of the pineapple shipments will not aggregate as many carloads as the orange shipments. Even if no further concessions are had these reductions mean much to the Florida growers.

In addition to the reductions in rates this association has also been instrumental in securing consideration from the transportation companies in the matter of diverting cars in transit and protecting through carload rates in order to avoid over supplying one market and leaving other markets comparatively bare.

Transportation companies have also withdrawn altogether, and modified, other objectionable clauses that interfered with the proper distribution of Florida products.

At the suggestion of this association, the Florida East Coast Railway has inserted in its tariff a clause providing for the shipment of mixed carloads of fruits and vegetables making the carload rate on each commodity apply and we feel reasonably assured that other transportation companies operating in Florida will follow the lead of this road. This will enable Florida growers and shippers to place mixed cars of Florida products in the small markets of the country that are not in a position to handle to advantage a straight car of the different commodities.

In its report the commission stated that "all-rail rates on vegetables were too high." It suggested that the Florida railroads put into effect to Atlantic sea coasts and interior eastern markets an all-rail minimum carload and all-rail rates from Florida base points approximately as follows:

33c per crate of 50 lbs. to Baltimore ...now 40c
34c per crate of 50 lbs. to Philadelphia .now 41c
36c per crate of 50 lbs. to New York ...now 43c
42c per crate of 50 lbs. to Boston ......now 49c
with corresponding rates to interior points.

The Interstate Commerce Commission also stated that "in their opinion rates on oranges to the west from Florida ought to be less perhaps to the Ohio River points and ought to be less from Ohio River points to destination, and ought not to be higher on the average than rates from California." In event the carriers do not put reduced rates into effect the Commission's attention may be called to the matter later on."

As the transportation companies have failed to act upon the suggestions of the Commission, the Association has filed an amended complaint covering vegetable rates and minimums under ventilation and refrigeration to eastern markets, and rates on oranges, pineapples and vegetables into markets north of the Ohio and west of the Mississippi Rivers.

Please understand that we are not asking for lower rates on Florida products compared with rates from other sections but only want to be permitted to go into the markets of the country on an equal, or the same, basis as competitive products produced elsewhere. We have confidence in the merits of Florida products winning out with a fair profit to the producer, provided they are not badly handicapped and discriminated against in the way of freight and refrigeration charges.

At the present time the Florida pineapple growers are treated to an object lesson in preferred attention and expedited service given to Cuban pineapples at a time when Florida pineapples and Cuban pineapples are moving into the markets of the country in open competition.

Is it fair that a product produced with American labor should have to pay a higher freight rate over the same rails and on a shorter haul to reach the American markets than a product produced by cheap foreign labor? The rate on Cuban pineapples (in crates) from Havana to Chicago, via Knights Key, is 66½c per crate with a minimum of 250 crates per car while the rate on a crate of Florida pineapples from Miami, Fla., to Chicago, with a minimum carload of 300 crates, is 92.6c per crate or a greater charge of 26 cents per crate, or $78 a car more on Florida pineapples for a shorter haul by nearly 250 miles than on Cuban pineapples. The same railroads are giving the Cuban pineapples special attention and running special trains through to Chicago on a schedule of 2½ days whereas it takes a car of Florida pineapples, moving over the same route, from Miami to Chicago anywhere from five (5) to eight (8) days. When you take into consideration the fact that Cuban pineapples cost less to produce and less to ship than Florida pineapples the outlook is not encouraging for the Florida growers. Under the circumstances, it is not surprising that the Florida grower feels that he is not getting a square deal.

While this association was not formed to handle the tariff on Florida products, it was called upon to do so. Members of the association appeared before the Ways and Means Committee and filed briefs on Florida fruits and vegetables. The present duty of one cent (1c) a pound on citrus fruits will undoubtedly be confirmed in the pending tariff bill, but it looks doubtful if the pineapple growers would receive the protection they are entitled to. Strong pressure has been brought to bear from the importers and canners of Cuban pineapples and it does not look hopeful for Florida pineapple growers, who are asking for a duty of ½c per pound on Cuban pineapples.

In closing, let me request closer co-operation amongst the Florida growers in questions pertaining to the general good of all interests. It is not fair that the burden be borne by a few and not shared by all. In California the growers authorize the marketing organizations to deduct a fraction of a cent per package from all products shipped as individual contributions toward a general fund to be used in securing equitable freight rates, proper tariff and correcting abuses and bettering conditions.

Irrigation.

By A. H. Bourlay.

Mr. President, Ladies and Gentlemen:

I have been appointed to give an address on irrigation. My experience in this line is limited to the overhead system on vegetables. This is a more expensive system to install than some others, and has not the advantage of drainage as well as irrigation which the subirrigation system has. I believe the subirrigation is by far the most preferable where it is practical.

Our land being a clay with only a few inches of top soil, we cannot lay tiling deep enough to allow cultivation, and when laid in the clay the water will not spread out through the soil, a few feet on each side only being dampened.

We tried flooding but soon found where there was much fall our ground was washed and in small dips and hollows too much water collected and the crops were damaged more than by drought, where other spots did not get enough.

Overhead or sprinklers would also have to be used where the subsoil of clay or marl is too deep down to hold the water and cause it to spread.

With us no artesian water can be had and where clear water from the lakes is not available wells have to be sunk. I say clear because if the supply contains seeds or floating particles one has to use strainers, and strainers in the pipes cut down pressure and if strained at source of supply, I find the strainers are continually clogged as the current draws everything towards them. With wells this trouble does not occur. We get water at a depth of 90 feet and upward but several wells have been sunk over 200 feet and no water obtained, so it is as well to be sure of water before doing anything. The amount of lift and location of supply being important factors in the amount of power needed to get pressure. When buying an engine it is economy to get one larger than you think you will need; an engine not run to its full capacity will last longer and give better satisfaction, and allow for extensions. With plenty of power so as to get 30 to 40 pounds to the square inch and nozzles two and one-half to three feet apart on the laterals, every forty-eight feet apart thorough wetting can be given in a few hours and followed, in a few days by a working, is better than frequent light wetting for vegetables. Sometimes one soaking is enough to make a crop, whereas without it there would have been a failure.

The lay of the plant depends largely on the shape of the ground to be irrigated; one wants to have the rows or beds run with the fall of the land and the laterals should run the same way that it is the most desirable to run the rows or beds.

We use live oak posts eight feet long which place our lateral lines six feet overhead. The main can be overhead or laid underground with 1 1-2 or 2-inch uprights to connect with laterals. It is possible to use the same lateral lines on both sides of the main by having the main running through the center of the field. One of my neighbors has done this; it only taking himself and one man two days to move and set up two acres, thereby irrigating four acres with little more expense than two. We use centrifugal pumps, as they give a steady pressure, but I know that others give good satisfaction.

We find it best to water late in the afternoon and at night, the water has time to soak in and there is no danger of scalding. It is thought that lake or pond water is preferable to well water, but I have not found this to be the case, there being no difference only with well water there is not the danger of the nozzles being stopped up by vegetable matter, etc.

The cost per acre for pipe, posts, nozzles, etc., is about $75; to this must be added cost of engine, water supply and main, which is governed by the number of acres. The larger the plant the less the cost per acre.

By W. F. Holmes.

Mr. President, Ladies and Gentlemen:

The subject of irrigation in Florida presents a most interesting study. The different varieties of soil, the location and the source of supply form the principal parts of this study. I shall only be able to touch upon this subject from an experience with the flowing wells and a system that while in use in some districts, does not employ the same means of construction. Practical and cheap has it proven to be. The expense of irrigation with any system is no small matter and we are all interested in learning of a cheaper way.

A comparatively small area in Florida furnishes flowing wells.

Quoting from Bulletin No. 1 of the Florida Geological Survey:

There are two principal artesian areas: the East Coast area and the Southern Gulf Coast area. Flowing wells on the East Coast have been obtained as far south as Palm Beach, although the water in the well at this last locality was too salty for use. Flowing wells at or near the sea level have been obtained along the Pinellas Peninsula.

The conditions which exist in central Florida are not favorable for obtaining flowing wells. The crest of the anticline lies not far from the center of the peninsula. The dip from the crest is most rapid to the east. Under these conditions pressure sufficient to cause a flow along the side of the anticline would result from the presence of an overlying relatively impervious stratum acting as a confining agent and preventing the escape of the water.

The springs of Florida are famous for their volume of flow as well as for the clearness and beauty of their water and the beautiful scenery about them. Many of these springs are used as health re-sorts. The United States Geological Survey volume on Mineral Resources reports the sale of mineral waters in Florida for 1907 as 43,430 gallons, valued at $12,378.

So much for supply. Now for the application.

The system known as the Sanford system of subirrigation is the one in use here in Daytona and the one of which I wish to speak. The well or source of supply is turned into a main running across the field and at intervals of 25 feet the main is tapped by a head box furnishing an outlet for the water into a lateral laid with two or three-inch clay or cement tile. This lateral leading to the opposite side of the field to a drain ditch, at which point stop boxes are set and by plugging the tile in the stop box the land could be very quickly wet enough for any purpose. During a wet season the water is turned off and the laterals open, which acts as drainage equally as well as for irrigation. If this does not furnish a perfect system of irrigation I have never seen one. The land should be nearly level, if it is not the rows of tile 25 feet apart should be put in parallel with the slope so that the lower end should be only a few inches to the 100 yards lower than when the water is turned in. The water supply being at the highest point and by gravity running through the entire system and discharging into the drainage ditch at the lowest. The supply of water can be regulated so as to irrigate the entire field at one time or confined to a single row of the tile or as many as desired. This makes it possible to grow in the same field a variety of crops, though some may require a very wet soil and other the opposite.

Where the field is only part level, one part being lighter and dryer soil a set of boxes may be placed between the ditch and the main at the line of demarkation, thus furnishing a supply to the level place without injury to the land and wetter part.

We found it of advantage to run deep furrows in planting to come between and in the center of the 25 feet rows of tiling, making the field into beds, this in case of heavy rains provided another means of draining off the water. The advantage of being able to use the system to water a seed bed very wet and another bed comparatively dry, can be appreciated at a glance and the two dangers to farming, too much or too little water, are under entire control.

We cannot say what the value of this system would be when applicable to other seeds and in other localities where water is scarce and expensive.

One authority claims in addition to points named above that the tile drain carry warmth and air, or rather warm air to the roots of growing crops, and wonderfully quicken their growth, and that more than this, that the same crop has been grown on the same ground for a dozen years and with splendid results.

Now a few words about the *construction* and *material* used: Here in Daytona we have mostly cement. Plow and dig out your ditches. We have a machine placed in the ditch into which we feed our mixture, and the tile is laid in one continuous piece across the field, slightly covered as you go to hold it in place before the tiling hardens. Say 3 or 4 days when the ditch can be covered—before covering openings can be sawed into the tile, say every 3 feet, or as often as needed. If the mixture is just right, no openings need be made, as I have seen an opening made of both cement and clay tile and watched one fill up as rapidly as the other when the water was turned on. With a supply of water, and the cement expense provided for, this system can be put in at a less expense over clay tile of about 1-3 or about $100.00 per acre, everything hired. And with a man furnishing his own labor the cost can be reduced to figures much less scary than the average cost of irrigation.

By H. B. Stevens.

Mr. President, Ladies and Gentlemen:

When the subject of irrigation is mentioned, to our mind at once comes the picture of a large irrigation ditch, and ground, being flooded with water as we see accounts of its being done in the West; where their soil is firm and will permit of water flowing over without soaking in too fast. With a sigh we say to ourselves, but that is not for Florida.

Yes, even that is possible in some parts of Florida. Other parts have sub-irrigation by means of tiling laid under ground, through which the water is turned.

To most orange growers, the question is, can we have irrigation at all, when we cannot use ditches as is done in the West? If we turned to the dictionary we will find that the first definitions given for the word Irrigate, is "to water, to wet, to moisten, to bedew," and surely we can do something along this line. Then the question at once comes, will this kind of irrigating amount to enough to make it pay?

At times, yes, if applied properly and well followed up. When it is dry enough in Florida to make watering necessary, and we begin to water, we must keep it up until sufficient rain falls to wet the ground deeper than we have been doing with our watering, otherwise the water we have been putting on will only serve to draw the fibre roots to the surface, to get the moisture. We stop watering, and not sufficient rain coming, these roots die, and our trees are worse off than if we had not begun the watering, but if the watering is well followed up, the benefit will show in the trees and crop.

If trees are to be planted, then the irrigating plant is very useful in pushing them along, and may be the saving of a good interest on its cost, in lessening the number of trees to be replaced the next year, so making a saving, in time, and cost of trees.

If spraying is to be done the irrigating plant is a great help.

If the whitefly is to be fought with fungus, the irrigating plant can help to hasten its growth by being used to moisten the leaves.

The cost of piping a grove and keeping up a steam plant, deter many a grower from putting in one. To such as do not have to go too deep for water, I would recommend a plan that would lessen the cost.

Instead of piping the entire grove, have a number of wells, at proper distances, and have the power and pump mounted, either on a tram car, or on wheels, so it can be moved from well to well. Pump from each well, and from the pump lay a line of iron pipe coupled together with brass hose couplings, so that it can be coupled and uncoupled quickly without the use of anything but a hose spanner. To the end section, attach one length of good hose to enable the water to be turned in any direction; in this manner a grove can be very rapidly watered and at but little cost.

The writer once fitted up an outfit of this kind that pumped from five wells and one pond, and watered a 125 acre grove; the entire cost of the outfit, did not exceed $1,500 and did the work as well as another plant that was put in to water a 200 acre grove and cost over $12,000.

To sum up, irrigation is not an absolute necessity in Florida as it is in some states, but can be made to serve a very good purpose if properly used.

Washington, D. C., May 8, 1909.

Mr. E. O. Painter,
Sec. State Horticultural Society,
Jacksonville, Florida.

My Dear Sir:

A trip this month to the Southwestern States and Territories will prevent me from accepting your kind invitation to be present at the annual meeting of the Florida Horticultural Society to be held at Daytona May 18 to 21. Our office will be represented by Mr. Milo B. Williams, who is in charge of irrigation in the humid regions and I trust he will be able to convince your members of the necessity of a helpful co-operation between the fruit growers of Florida and the irrigation branch of this Department.

Compared with the arid region the citrus districts of Florida have an abundant annual rainfall but since much of this is waste in run off during heavy downpours, the amount which the roots of trees can obtain is frequently below rather than above what is required. Then, too, long periods occur when little rain falls. The Weather Bureau records show that at Orlando from November 1, 1906, to March 31, 1907, a period of five months, the rainfall was only a trifle more than half an inch. The quantity of water required by the citrus orchards of Riverside, California, including both irrigation and rain water, averages about 3 inches a month. For the past nine years at Tampa, Florida, the average rainfall during October and November has been only 1 1-2 inches per month and for more than half the year it is considerably below three inches per month.

The preliminary investigations made by Mr. Williams in your State during the past winter have convinced him of the need of installing irrigation plants to supplement the natural rainfall and as an insurance against crop failures during dry periods. The lakes, rivers and artesian basins of the Peninsula furnish abundant water supplies at low cost and the only questions that are deserving of careful consideration are the installation of the right kind of a pumping plant that will perform efficient service, the adoption of the best distribution system when both economy and efficiency are the main factors, and the application of water in such a way and by the use of such implements as will best serve the objects sought.

This Office has been studying such questions in the West for the past ten years and if any of the experience thus gained or the data collected will prove of service to your industry, we shall endeavor to place both at your disposal.

Respectfully yours,
Chief of Irrigation Investigations.

By Prof. Milo B. Williams.

Mr. President, Ladies and Gentlemen:

In the advancements that are being made in the science of agriculture at the present day, the farmer is realizing more and more the value of being able to understand and control the factors entering into plant growth.

Among the most important factors entering into plant growth is that of moisture, and therefore throughout the agricultural districts of the world a study is being made of moisture, its supply, and the demands of vegetation for moisture.

Nature transports moisture from place to place on the earth's surface, but her transportation service and supply is more or less imperfect to meet the demands of the up-to-date farmer. These imperfections of nature can be perfected to a great extent by the application of one of the engineering sciences, drainage or irrigation, drainage where there is an excess of moisture for agricultural purposes and irrigation where there is a deficiency of moisture for agricultural purposes.

During the past six months I have had an opportunity of studying the conditions in the state of Florida with regard to irrigation and I have prepared in this study a few charts in an attempt to picture the rain fall representative to Florida, so that I may see with you the imperfections of your moisture supply as given to you by nature.

REFERENCE TO CHARTS.

In referring to the charts the following points were brought out.

Chart No. 1: Showing the average rainfall per month from 1900 to 1908 inclusive at Orlando, Florida. That the average rainfall for the months of November, December, January, February and April fell below three inches; that the average rainfall for the months of March and October was less than four inches, making a period of seven months that the average of precipitation is light. That the extremes of the average monthly rainfall are from 1.14 inches in November to 8.77 inches in June, bringing out the unevenness in distribution of the rainfall throughout the years as an average.

Chart No. 2: Comparing the average monthly rainfall at Milan, Italy. The object in preparing this chart was to place before the people a picture of the precipitation in the district that has irrigated for a century so that the eye can draw a comparison of conditions existing where irrigation has proven to be of value and the conditions existing in Florida. The most prominent difference in the comparison of Florida conditions with those of Milan, Italy is the unevenness of the distribution throughout the year in Florida, Milan showing a minimum of 2 1-2 inches of rainfall in any one month and a maximum of 5 3-4 inches.

Chart No. 3: Showing the distribution of the rainfall in the year of 1908 as the best monthly distribution in any one year since 1900. These guagings were taken at New Smyrna, Florida. The minimum precipitation in any one month was .32 of an inch; the maximum was 21.49 inches with a total rainfall of 63.80 inches for the year.

Chart No. 4: Showing the largest dry spell since 1900, coming in the twelve months between August 1, 1906 and August 1, 1907. Guagings were taken at Orlando, Florida, September, October, November and December, 1906, January, February, March, April and May, 1907, went below three inches of rainfall per month. In November and December, 1906, and in January, February and March, 1907, the total rainfall was only .53 of an inch in these five months. During this period Riverside, California, was using three inches of water per month to mature and set her orange crop. During this extreme dry period fruit was damaged and in some places almost a failure in Florida.

DISCUSSION.

Mr. Temple—You state that in California they supplied three inches by irrigation. Did they put on three inches during July, August, etc., or did they vary the quantity applied to suit the season? The good Lord has varied the rain in Florida to suit the seasons and it is during the dormant period with us that the dry spell comes while in the growing season there is plenty of rain, usually. What I mean to say is, did they supply the same amount of water or did they vary it to suit the requirements of the trees?

Mr. Williams—They do. You may know better than I how their orange crop comes off with yours. Their trees are dormant nearly at the same time yours are. The point I wish to bring out is that during your dry period here they are supplying three inches of water per month to their trees. The condition of your trees runs somewhat parallel to those of Riverside.

Mr. Member—Is it necessary for them to have three inches every month?

Mr. Williams—No, but it is necessary to have three inches of rainfall here when they are supplying the same amount there.

Prof. Rolfs—Our trees are dormant a little later than their trees I think. It is not necessary for us to have three inches every month. It is more necessary that we have more than three inches this month and every month when it is needed.

Mr. Williams—We have not had time to study the conditions of citrus trees here, so we use the California irrigation as a basis.

Dr. Richardson—I think it is a good idea to explain to the Society the difference in the seasons in California and here. Their rainfall comes in the winter, while with us the rain comes in the summer, and the dormant season usually comes in the winter. They get their rain during their dormant season while we get ours during the growing season in the summer. Consequently the conditions are radically different.

Mr. Bunch—Is three inches all that is necessary during any month?

Mr. Williams—Approximately three

inches of water per month is the amount that the records show the Riverside people use. Whether they are using too little or too much is for the horticulturalists to decide.

Mr. Bunch—Those who study irrigation come to a proper understanding and knowledge and know just how much a tree should have for certain climatic and atmospheric conditions. Of course a person has to have a certain discretion about the amount of water to give to a tree and he must learn to judge accordingly whether it has enough water or not. A young tree especially may be killed by using too much water and literally drowning it out, I have seen some persons who were so anxious to make the trees grow that they simply kept the trees soaked and the results were far from satisfactory.

Mr. Williams—The truthfulness of your observation has been brought out in arid districts very forcibly. As a matter of fact we always consider that after a certain area has been opened up by irrigation that a drainage system will necessarily follow. One of the greatest faults of the farmer in the West is that if he can get the water he will over irrigate and under cultivate.

In the question of rainfall, as to whether or not irrigation is needed the total annual rainfall runs from forty to sixty inches, but the bulk of this may come in just a very few months, leaving the balance of the year void of moisture to supply maximum plant growth. This period of deficiency of moisture often comes in and extends over the time of the year when it is of most vital importance that the orchardist have an abundance of moisture to insure a crop of good fruit.

The way in which the rain comes and the character of the soil upon which it falls enter into conserving of the moisture. Florida receives most of her rainfall in torrential storms, making the runoff heavy and beating down the surface of the ground.

The sandy soil in the greater portion of the State is an aid to moisture reception, but unless properly cultivated will prove a hindrance to the best of moisture retention.

The natural resources for irrigation in Florida are very encouraging. Lakes, rivers, surface wells, artesian wells and seepage and drainage waters furnish water supplies fairly well throughout the State. These supplies may be brought to the surface by pumping plants, flowing wells or gravity systems and then distributed to the orchards through piping, flumes or ditches.

The methods of application must vary with the varying conditions from furrows and checks to sprays. Sub-irrigation is not used extensively for orchards.

Prof. Rolf—Is sub-irrigation not practical?

Mr. Williams—It has been tried in California fora number of years. The greatest trouble is that the roots get into the pipes. However, their soil does not respond to lateral percolation as some of your soil will.

In my short investigations in Florida I have noted many difficulties where attempts in irrigation have been made. The feature that strikes me most strongly is the great expense per acre the Florida orchardist has gone to in distributing systems for applying water to his trees. It is probable that the Floridian is paying ten times as much per acre for his irrigation as the orchardist in the West. This is due to several interesting causes. The State of Florida has a soil that will not support water in ditches as Western soils will. Neither will it respond to the cheaper methods of irrigation in all cases because of its natural character.

I have found in many places that poorly designed systems have been placed and sad engineering mistakes made, compelling the farmer to pay for more expensive material than was necessary to obtain the results he wished.

The work the United States Department of Agriculture wishes to do in your State is to make a fair comparison of the methods we find being used in Florida with the methods we find being used in the West and adapt the cheaper methods as far as possible, and modify the expensive methods when practicable.

New implements for laying out and building ditches and cheaper water conduits must be worked out, and laborers taught how to run water. It has been a great disappointment to many people who have made trips through the West and seen water running peacefully and smoothly over the surface to find that they are unable to control water and get an even distribution when trying the same methods in Florida.

We feel that by co-operative work with your State Experimental Station and with individual farmers we can help you solve the irrigation problem in Florida in a more economical way. As time goes on we will have more definite data to give you and hope to meet you with some pleasing results in the future.

Mr. Member—What do you think of the overhead system as used in this State?

Mr. Williams—The system of overhead irrigation for citrus trees seems to us to be impracticable, although we are not prepared to condemn any system now being used in your state. It certainly seems as though there would be opportunity for heavy evaporation losses and that there are better ways of irrigating than by throwing the water into the air and letting it come down in a large area on trees and earth.

Mr. Van Dormer—How about irrigating vegetables?

Mr. Williams—I think the people who are familiar with the growing of vegetables in your State can tell you many advantages in spray irrigation for vegetables. However, I believe there is room for comparison with cheaper methods in many vegetable fields and that more economical and simpler methods of application will be used after the comparison.

Mr. Van Dormer—In our sandy soil there seems to be a hindrance to the application of water by letting it run on the surface. It will run into the soil so fast that it makes very little headway in the trench and one end of the trench will be soaking and the water not yet to the other end.

Mr. Williams—Where the conditions are of that nature and it becomes absolutely impossible to supply water on the surface then you must resort to more expensive methods.

Prof. Rolfs—How far were you able to run water in the ditches that you made in the preliminary experiments?

Mr. Williams—In our experiments we have not been able to obtain the head of water nor the body of water that we desired, but we ran water in furrows 600 feet in length, getting a fairly good distribution where the furrows were laid out on a proper grade. I think, however, it is not advisable to run more than 400 feet unless ideal lay of the land would encourage longer distances.

Mr. Member—How much water were you running into the furrows?

Mr. Williams—We were running about 15,000 gallons per hour and applying it in three furrows.

Mr. Gillett—What is the nature of that soil, and is the ground fairly level or quite hilly?

Mr. Williams—The soil is representative of that large area around Orlando. Just how would you classify it, Prof. Rolfs?

Prof. Rolfs—First-class pine land. Rather close.

Mr. Gillett—It seems to me that in view of the three years drought which we have just passed through, this matter of irrigation is one of the most important matters which will be brought before this Association, and one which should be discussed very thoroughly. It is of interest to every man who is growing citrus fruits as there is no doubt that every grower in the State has suffered more or less every year, but especially in the past two or three years because of lack of moisture.

I have had considerable experience with irrigation and have tried to do what Prof. Williams says he is doing. I, however, failed when I tried to run water in ditches on high pine land, and I do not agree with him that this method will be eventually adopted, as I am strongly in favor of a sprinkling system. When we tried to run water in ditches before the stream got far enough away from its source to do any good it disappeared entirely, and where we put water enough in the ditch to carry it any great distance the force of the stream tore the ground all to pieces and it was simply impossible to maintain a ditch in our loose sand.

I have seen a good deal of irrigation in California but it is impossible to compare their conditions with ours. As Dr. Richardson has said, their rainy season comes in the winter while ours comes in the summer. Their soil is heavy and the water will percolate through it so that with two or three ditches between the rows they can thoroughly soak their land, which in our loose sand is an utter impossibility.

I have a brother in California who had charge for many years of a large grove, and I have visited him on several occasions and watched their irrigation methods. During the growing season they water frequently, but along in October and November they take off the water and do not apply any more as they wish to keep their trees dormant, and the winter rains furnish all the moisture necessary. Their climate being much colder than ours the rain fall does not seem to affect the trees during the winter, and no matter how much it rains they continue dormant. Just the reverse of this obtains in Florida, as if we have plenty of rain and a week or ten days of hot weather, the conditions for growth—heat and moisture, will start our trees into a growth which is easily caught by the cold.

Judging from the methods I have seen employed in California and Arizona, and the experiments I have personally made in Florida, I am convinced that the only possible way to irrigate our groves, at least those located on high pine land, is by overhead distribution. It is, of course, at the start quite expensive, but I have tried it with hose and I know of many others who have done likewise and with very few exceptions it has been a failure. In the first place, hose are expensive, and our experience was that they went to pieces in one or two years. It took a large number of men to operate this system, and it was my experience that just at the time we wanted to irrigate we were very busy with other work and we would look at the sky and make up our minds that it was going to rain in a few days, saying to ourselves if it did not we would irrigate. Perhaps it might rain a little shower which did no good, and thinking that perhaps the drought had broken we would continue putting it off until when we finally decided we had to do it the ground had become so dry it took an immense amount of water to do any good.

In our part of the State around Winter Haven, where my grove and nursery are located, it has been so dry for the past three years that on many occasions it would seem that the trees would burn had you touched a match to the leaves. I have often expected to see the whole crop of leaves drop off and while this did not take place and while the trees managed to pull through, there is no question but what they sustained a terrible shock from want of moisture, and while in this weakened condition insects and disease of all kinds are much more apt to prey upon the trees.

I am figuring on putting in a system of irrigation in a new nursery I am starting, and I am adopting a plan which I think will be thoroughly effective. The trouble with most people when they start to irrigate is that they want lots of water but expect to get it through small pipes, and invariably the pipes are altogether too small. I have seen as high as ten inch openings on a 1 1-4 inch pipe, and of course this was an utter failure.

The idea of irrigation it seems to me is to get water and plenty of it, and unless you do this it is money thrown away. My plan for irrigating a ten acre tract is to run a 6-inch main through the center. My trees will 24 fee apart. I will run a 2 1-2 inch lateral every 48 feet and this will take care of a row of trees on each side of it necessitating but one lateral between every other two rows. I will put a cross in this lateral opposite the trees in each of these two rows and run a 3-4 inch pipe from the lateral to within one foot of the tree, which will allow room for the growth and expansion of the trunk. I will then run a pipe over the top of the tree, putting thereon some first-class spray nozzle. This pipe will be six or seven feet high and I will wire it to a good, solid stake until the tree gets large enough so that it can be fastened to the limbs. As the tree grows this pipe will be extended, always keeping it well above the top of the tree.

There will be a valve on each of these laterals close to the main. As many laterals will be opened as the pump can supply with water, and as fast as the section covered by the opened nozzles is thoroughly wet down these laterals will be closed and others opened. My engineer tells me that I can easily distribute one to one and a half inches on five acres of land in twelve hours, and I will expect to do this at night when there will be practically no evaporation, and when the water on the leaves of the trees will not be liable to scald them from the heat of the sun.

While the first cost of this plant will be considered exceedingly heavy it must be taken into consideration that it is all operated by one man—it is practically automatic. As long as the engine is kept supplied with gasoline and the valves on the laterals are kept open the water is bound to flow.

I have seen groves irrigated with a hydrant in the center of each square but this is objectionable because the pipes are always in the way and are frequently run over or broken off in cultivation, and are badly in the way if you wish to mow the grove.

There is still another advantage in this overhead system. As you all know, we are bothered more or less during dry spells with the red spider. Just as soon as the rains come, however, this pest disappears. Now, with the overhead system you wet the trees thoroughly and at the same time wet the entire ground and it has the same fatal effect on the spider as though you had the rain.

My experience is that it is much better to wet the entire ground rather than a little space around the trees, because the roots which are outside of this little belt you cover must necessarily suffer.

There was a grove at Lake Weir, where I formerly lived, irrigated with a hydrant in the center of each square. The trees were purchased from a relative and this small grove was the same age and size as another one when the irrigation plant was put in. Inside of three years the irrigated grove was bearing from 15 to 18 boxes per tree while the other grove never bore over five, and the irrigated trees were three times as large as the others, and although standing in ordinary pine land the foliage was as dense and as dark green in color as I have ever seen in the richest hammock.

Now, it strikes me that this was a prefect system except, as I have before stated, the hydrants are very much in the way, and it seems to me it is much better to have the pipe directly over the tree where it is entirely out of the way, and where the water while wetting the ground thoroughly at the same time washes the leaves, cleaning them from the dust which accumulates from cultivation, and also getting rid of the red spider.

Mr. Henderson—I want to suggest another advantage of overhead spraying. Besides keeping out the red spider it will be of great benefit to our friendly fungi. We are beginning to depend a great deal in Florida on the fungi for San Jose Scale, whitefly, etc., and the overhead spraying is one of the best things to increase the fungi. Sometimes we have a long dry spell and the whitefly gets ahead of us. If we had the overhead system of spraying we could supply the moisture which is necessary for their best development.

Mr. Temple—May I ask what this plan is going to cost per acre for pipes, power station, etc.?

Mr. Gillett—I have two or three firms figuring on it now and have made a few figures myself, but as in many other cases I find the "doctors disagree." One man tells me I can only run one line of my laterals at a time unless I shut off the supply so that I only get a fine mist. Others claim I can run three or four laterals very satisfactorily.

The cost of a plant of this kind depends very largely on conditions. In the first place, the distance from water must be considered. My land is located about 300 feet from a large lake. I am going to use a 6 inch main and a 50 horse power gasoline engine with the best pump I can get for the purpose. There are 40 acres in this tract. I am starting on ten acres and the best figures I have had make the cost in the neighborhood of $5,000.00. The other 30 acres, however, will cost very much less as the engine and pump with the expensive mains have already been paid for, and I think the cost for the other 30 acres will not exceed the cost of the first five. Roughly speaking, I expect it will cost about $10,000.00 to irrigate the whole tract. When it is done, however, I will be in absolute control of growing conditions. It has happened this year in my nursery work that we had so little rain it is almost impossible to make buds live. The trees would start from some light shower which we had, but before the bud would take the drought would prevail again and most of them would die. With the system I have outlined I can fertilize my ground, cultivate it thoroughly, and every night give it an inch of rain, and within a week it will be getting the benefit of the fertilizer, as I can irrigate the ten acres in two nights at a cost of one man's time and not over $5.00 worth of gasoline, and I can well afford to wet it down thoroughly every fifteen days; and you all know that with a good rain every two weeks our trees could not possibly suffer.

Another great advantage which I would accomplish would be this: Having absolute control of the moisture I believe I can keep the fruit from splitting in the fall of the year It frequently happens that after the rainy season comes to an end we have a dry spell lasting four to six weeks, followed by excessively heavy rains. The trees have become very thirsty and take up this excess of moisture greedily with the result that within three or four days a great many oranges split and fall to the ground. Now, if the trees had been given a moderate amount of water during this dry spell they would not have been in this thirsty condition, and my opinion is that they would only have taken a normal amount of moisture which would not result in loss of fruit.

For these and many other reasons I favor overhead distribution if done thoroughly, and while the first cost is great, when you consider that it will last practically forever and cost very little to operate I believe it is economy to irrigate in this way.

Mr. Temple—You speak of giving an inch of water in a very little time; an hour or so. Do you contemplate giving that inch of water all over your ten acres at one time?

Mr. Gillett—Not at all. The main from which the laterals start, as I have before stated, runs through the center of the ten acres dividing it into two five acre tracts. There will be thirteen lines of pipe on each five acre tract. My engineer tells me I can distribute 350 gallons of water every minute from one of these lines, and that this will give over an inch of water on the land. He says I could open four or five lines but would lose my pressure and could not get more water. I will be entirely satisfied, however, If I can deliver an inch per hour, as in thirteen hours I could cover each of the thirteen lines, and by beginning about five or six in the evening I could finish by seven in the morning, and I would have thoroughly wet down five acres of land, and the next night I would repeat the operation.

Mr. Temple—What is the size of the the uprights?

Mr. Gillett—One engineer said an inch pipe was absolutely necessary, while another told me that 1-2 inch pipe would do the work. I made an experiment myself using a 3-4 inch hose on my line. I then tried the same spray with a 1-2 inch hose and could see no difference in the amount furnished, although I had no way of correctly measuring it. We all understand of course, that with a long stretch of 1-2 inch pipe the friction would be tremendous and a great deal of force or pressure would be exhausted in that way. Several competent authorities who have figured on the matter say that a 3-4 inch pipe will be ample. Before putting in the system I wish to make a series of experiments and these should demonstrate conclusively the size of pipe needed. My personal opinion is that it is just as well to water the 26 trees on one line thoroughly in an hour as it would be to put a fine mist over 100 trees and run it four or five hours.

Prof. Williams—What kind of pipe are you going to use?

Mr. Gillett—This matter of pipe is something on which I would like to have some information. The dealers as a rule, tell you to buy galvanized pipe, telling you that it is cheaper in the end. At the present time pipe is cheaper than it has been for many years, as it is at least 22 per cent. below the ordinary price.

In a former irrigation plant I had some pipe that was under the ground eleven years. It was steel pipe, and before laying it I painted it carefully with hot coal tar and when it was taken up at the end of eleven years it was apparently just as sound as when it was put down. If anyone else has had experience along these lines I would like to hear from you.

Mr. Dade—I think you will find that the cast iron will not rust in the ground.

Mr. Temple—For your information on this pipe question I will say that I was interested in a series of experiments costing a great deal of money, and these experiments showed that for underground work where steel will last as one, wrought iron will last as three, and cast iron will last as five. Wrought iron is practically an impossibility today; you may buy it and pay for it, but you will get steel just the same.

As to galvanized pipe lasting longer than the plain pipe, I have some galvanized on my place that has been down for ten years and is perfectly sound, while I have some, made extra heavy, that in five years was entirely gone. I have seen some black pipe painted with hot coal tar and care taken in its preparation and laying that will out last any galvanized pipe that can be put in. I have seen the black cast iron pipe painted and laid that for certainly nearly thirty years was in nearly as good condition as when put down. The wrought iron blackened pipe will last a long time, but not nearly so long as the cast iron pipe. Cast iron you may say lasts two or three times as long as the wrought iron. Lasting qualities are mainly a question of putting it in place and proper care taken for its preservation. I have seen some common, cheap, spirally-welded pipe that was blackened and that must have been down fifteen or eighteen years, and there would be little patches here and there perfectly good while other portions had ceased even to be rust and had been absorbed by the ground.

As to the size it is not a paying proposition if you get less than three inch cast iron pipe.

Mr. Stevens—I had an experience in laying steel pipe in 1890. We had to lay seven inch mains with three inch laterals. I stood up the pipe, sealing one end and filled it full of hot coal tar so that it touched every part of the interior, and then drained and laid away to cool. It coated that pipe so thoroughly that when the pipes were taken up ten years later they were sold for practically new pipe. The person who bought them made no complaint about paying a good price for them. I paid no attention to the outside whatever; only the inside.

Mr. Temple—If you use the lake water, of course that is high in tannic acid.

Mr. Waite—All your lake waters corrode worse than the artesian waters.

Mr. Temple—I have had no experience with the artesian waters, but I know the lake waters are very hard on pipes.

Prof. Williams—What make of nozzle and what pressure do you have in your mains, Mr. Gillett?

Mr. Gillett—I do not know exactly what pressure my engineer is figuring on. My recollection is that he would have to maintain a pressure of 60 to 70 pounds. They had two or three nozzles there but I have not decided which I will use. The one I fancied most I do not know the name of. Never saw one just like it before.

Prof. Williams—Was it the Fish Tail?

Mr. Gillett—Yes, I think it might be as it looks like that.

Prof. Williams—In measuring the quantity of water that will come from the individual sprinklers, we find there is a great range in them and we are going to have some very interesting experiments. We will have that information out in the next four or five months. We measure the pressure at the sprinkler and measure the quantity of water that goes through at that pressure, and then measure the evenness of the distribution under it.

Mr. Penny—How much above the ground will you run your pipe?

Mr. Gillett—That will depend upon how fast I can make the tree grow.

Mr. Penny—How will you support this pipe?

Mr. Gillett—The first pipe I put in I will support with a strong stake driven down by the side of it and wire the pipe to it. Then as the trees throw out their branches I will fasten it to the tree.

Mr. Temple—I like this plan as I think it is just as essential to put water on the leaves as it is on the ground.

Prof. Williams—How far apart are your trees, Mr. Gillett?

Mr. Gillett—They are 24 feet apart in squares?

Mr. Temple—It has been suggested that I ask Prof. Rolfs if it is not possible, in accordance with Mr. Gillett's idea that he would wash the red spider off, that by putting on strong power it would also wash off the honey dew of the whitefly.

Prof. Rolfs—Yes, I think it would be washed off, but if you get a spray of this kind and get your trees in a thoroughly healthy condition it is going to be very hard on the whitefly. That nice, cool condition with lots of humidity in the atmosphere is very bad on his health.

Dr. Richardson—Poor fellow!

Mr. Gillett—On behalf of the Society, then, I wish to ask the whitefly's pardon.

Mr. Meade—Has Mr. Gillett ever used this irrigation to protect from cold at night?

Mr. Gillett—No, sir The Bourlin Bros. at Citra had a big irrigation system on their place, using a large fire hose with a fire hose nozzle to distribute the water, and they had such power behind this stream that they could wash a tree out of the ground with it. When their trees were threatened in '94 they experimented by spraying them. The result was that they had a beautiful crop of icicles. If I were going to use the water, however, in case of cold I should not care to have it above the trees but would prefer to have it nearer the ground. However, I wish to say in this connection that at Winter Haven we never have any cold.

Mr. Harrington—I am a little familiar with the locality where Mr. Gillett is about to start his plant, and heard the discussion about an inch of water on the ground being too much. I want to say that at one time we had a fall of five inches in one hour and fifteen minutes; ten minutes afterwards there was practically no water in sight.

Mr. Mead—I had an acre of young trees covered in and nozzles that threw water in a circle 40 feet in diameter. I found I could keep the temperature up to 48 or 50 degrees when it was below freezing outside when it was covered up tight. However, the draw bars gave away at one corner where the cold could come in and the result was a crop of ice the next morning. I took a photograph of this and the next week took another showing not a leaf or fruit in the enclosure. I think I am the only man who made anything out of that freeze, for I sent photographs up to an editor and he sent me a check for them.

Mr. Hart—I would like to inquire as to the effect of artesian water on the soil; whether it is injurious or not. At Daytona they have been using artesian water for thirty years. I know about fifteen or twenty years ago Mr. ——— gave up the use of it and quite a number of others along the coast gave up the use and are using fresh water. It is long enough now for them to get results and I would be glad to hear from you.

Miss White—I would say that artesian water is mighty good for crops. My father had a good deal of experience along the East Coast and when we went to Hastings he said "Let's take this little patch of ground and drive artesian wells and when we plant our Irish potatoes in December the first time it comes off cold, we will turn on the water and save our potatoes. Well, the cold wave came and we turned on the water and covered the field entirely with water. We kept it on for two days. The results were that there was a nice crop of potatoes in the adjoining field.

Dr. Van Dormer. I have had no practical experience with artesian water here. Artesian water is usually hard water;

that means it has in solution quite a quantity of mineral matter such as lime, sodium and other salts. However, there is one great danger which I can anticipate in this sulphurated water. The sulphur in the water might become sulphuric acid and have a tendency to sour the land if continuously used. However, this can be found out only by experience. Another thing in connection with artesian water that may be mentioned in comparison with water that comes from lakes and creeks. The surface water contains quite a good amount of ammonia salts or nitrogen; not enough to do any harm to the person who drinks it, but enough to be appreciated by the plants. These are not contained in the artesian water which is practically free from nitrates or nitrites.

Mr. Gillett—We do not have artesian water, but presume a good many people here in this section do. I had some of the water to drink last night and would like to know if the flavor of the fruit is influenced at all by the flavor of the water.

Mr. Christiancy—I think Mr. Gillett's method, as I have tried it, is a failure. Mr. Allen, when he started irrigating three of his groves, tried running the water through furrows after the California method and failed with it, and then he piped it. He put down a three inch main and put down five artesian wells to supply the water and then put a standpipe in every center; the trees were some 20 by 20 and some 25 by 25. He never had any success.

I think it would be a good idea to let the artesian water run to waste and I would have a subirrigated grove. In one of those three groves I have never been able to neutralize the soil by the use of any amount of ashes or fertilizer, and I suspect it is the sulphuric acid. I took up the pipes and we started in last spring and replaced the system intended to use hose. The pipe that had been used was wrought iron pipe and buried about eighteen inches and showed no rust on the outside and on the inside a coating which the plumber said was caused by artesian water. The pipes that were about nine inches of the surface were rusted from the outside but not from the inside. The inside had the same coating caused by the artesian water.

Mr. Mead—Speaking of the two waters; I would be in favor of the pond water because you get more or less organic matter in it.

Mr. Waite—I would like to ask the gentleman who spoke of the continuous pipe what proportion of cement and sand he used in making that pipe where it was used as a drain or sub-irrigation.

Mr. Williams—To make pipe that is entirely water proof so that the water will not seep through, I use three parts of sand to one of cement.

Dr. Richardson—Will that porous pipe permit roots to obstruct it?

Mr. Williams—No sir.

Mr. Waite—How far apart should those pipes be in clay soil and sandy soil?

Mr. Williams—In different soils, of course it would vary. The usual practice here is to put them about twenty-five feet apart. In soil very sandy and porous it would be far better to put them not to exceed fifteen feet apart.

Dr. Berger—I would like to have one question settled. The statement was made that the leaves of the tree absorb moisture. Now, will someone who really knows, answer this if they can. I am of the opinion that the leaves themselves do not absorb moisture.

Mr. Gillett—I think I made that statement. Of course, you know I am a layman and do not pretend to scientific knowledge. Let's hear from the professor.

Dr. Richardson—I take it from the gentlemen who made the remark that the water as applied to the foliage washed off the dust and dirt and permitted the leaves to have healthy action. It simply put the leaves in condition so that they could discharge their proper functions.

Mr. Temple—I cannot give you the book, page or paragraph where the remark was made that the overhead spray would feed the tree so much water, but I turned to Mr. Stevens and said that the scientists agree that the leaves of the tree do not absorb any moisture; that they simply breathe for the tree. I am sure authorities on the subject raise no question about this.

Mr. Member—Well, it seems to me that if the leaves do not absorb moisture that it would be better to supply the water through laterals. It takes power to put water up fifteen feet in the air. It certainly would be cheaper.

Mr. Gibbs—The practical effect of putting water up in the tree is just as good and as great a benefit to the tree whether the leaves absorb the moisture or whether it protects the leaves and enables it to hold its tree moisture from evaporation. The benefit is just the same in either case, so what's the odds?

Dr. Berger—I would like to briefly sum up some advantages in applying the water to the leaves. In the first place, it washes the tree; that has been admitted to be one advantage. It will, no doubt, wash off some of the soot in case white fly is present. It will, no doubt, also destroy the red spider. It will retard the development of fungus diseases, of scale insects and whitefly. So we have four advantages in applying the water to the leaves.

Mr. Gillett—I am the one who made the statement that the trees absorb water through the leaves, and am free to admit that I am ignorant on the subject. At the same time, I still contend that cleaning the leaves off must be of great advantage to the tree. I know I had much rather take a bath all over than to dip only my feet in the water.

Insects and Diseases.

DERANGEMENT OF THE ENZYMES OF PLANTS.

By E. S. Hubbard.

Mr. President, Ladies and Gentlemen:

When blood coagulates, a self generated ferment separates it into two parts:

First, a clot called fibrin caused mainly by the breaking down or sticking together of the coruscles with fibrinogenagers or para globulin, corpuscle products, and second, a watery portion called serum which contains the tissue nutrients elaborated by the red corpuscles, the alexins or anti-toxins of the white corpuscles, and if venous blood, also the waste products of the tissues that have been neutralized by the white corpuscles and are finally split up and excreted as tauric and uric acids from the liver and kidneys and carbonic acid gases from the lungs.

This simple looking, natural reaction is a type of the composition of the vital fluids of all organic cellular life, the serum of blood corresponding to the enzymes of plants. Now fellow members, I approach the subject of this short paper with great diffidence.

The question of nutrition is vast and specialized, with much conflicting evidence caused by the rapid advance of experimental knowledge and the various conclusions drawn by different observers from similar experiments. I have only a superficial and incomplete unprofessional acquaintance with this work. Many conclusions must be drawn from the analogy of animal and bacterial research and the subject, now in its infancy, bears about the same relation to plant feeding with fertilizers that the empirical practice of materia medica did to diseases before the establishing of the germ theory.

However, as many members have doubtless given little attention to the question, I trust the elementary generalizations I present will be of interest to the Society.

Pasteur, the noted French chemist, established his reputation and blazed the way for further similar work by investigating yeasts for the German brewers. The brewers had been troubled with bad tasting, bitter beer, poorly fermented beer and yeast that would not give uniform results. So they finally called in the chemist with his culture tubes and microscope.

Pasteur practically had to begin at the beginning. First, he had to find out why sprouted malt would ferment and unsprouted barley would not. These studies showed that in sprouting the life germs of the barley generated and excreted a nitrogenous fluid, a ferment or enzyme that is called diastase. He next found this enzyme changed the soluble starch stored up in the kernel to a fluid form as maltose, a kind of glucose or grape sugar.

In normal growth the fluid solution of maltose is formed into a sprout, the sprout into a plant, while the plant fulfils its destiny by perfecting seed, and this fixing of the fluid sugars in the sap into woody tissue and starchy grain is performed by another enzyme with an opposite function called invertase. There are a great number of yeasts or saccharomyces, so-called because they thrive best in sugar or starch solutions.

Pasteur studied about a dozen and from some of them got the bad results the brewers complained of. He finally isolated and made pure cultures of two which are called high and low yeasts on account of the temperatures at which they thrive best. The low temperature yeast being easiest to keep pure. The yeast cells during their multiplication and growth split up the sugars into carbondioxide gas and alcohol by excreting ferments that are of a similar nature to the enzymes of plants or diastase of malt but with different functions. Every variety of plants seems to have its own peculiar enzymes. See report of J. Wolff. *(E. S. R. Vol. XIX, page 808.)

From a summary of recent experiments on the phenomena of liquefacation and coagulation of starch the conclusion was reached that the principal factors which come into play are the physical state of starch and the reaction of the salts which accompany it. Experiments are reported on the action of malt diastase at 65 degrees C. on starch of different sorts. The lowest amount of starch inverted. 25.4 per cent. was noted with rice and the highest value 99 per cent., with white Cuzco corn.

"In these experiments 25 cc. of 10 per cent. malt extract were used with 3 grains of the raw starch. The microscopic examination of the various samples shows nothing abnormal morphologically. Thus we see that the physical properties of raw starch may be very different, even for varieties of the same species. This more or less great resistance of raw starches toward diastase does not therefore suffice to class the species in such and such category since they may vary with the climate, but it permits us to explain how in the aerial organs of the same plants, starch may be found in greatly different physical states." This would go to show that the healthy enzymes might be found in the top of a foot rot orange tree, while at the place of gumming near the ground the enzymes have lost their power and cannot change the sweet gummy sap into stored up starch or woody tissue but allow it to accumulate and burst the bark as gum. To show the complexity of this subject I quote from a report of "Fermentation Investigations"—(E. S. R. XV. Jan. '04) L. Matruchot and Mallard. "In addition to the fermentation produced by yeast and similar organisms the authors following investigations by Patens Le Chartier and Bellamy show that there is a fermentation which takes place in fleshy fruits, tubes, etc., that is independent of yeasts or other foreign organisms. The methods of the experiment are described in detail—fruits of pumpkins and apples, onion bulbs, beet roots, etc., being kept under aseptic conditions for a

*Note—E. S. R. and C. refers to Experiment Station Record.

considerable time and the alcoholic fermentation and carbondioxide evolution determined. In this connection I wish to call attention to the probable reason of sulphate of ammonia being a healthful stimulus to the enzymes of oranges that sweeten the fruit by quoting from "the chemical nature of diastase." T. B. Osborne, (E. S. R. No. 3,1895. page 182.)

The method used for preparing the enzyme which differs from the one usually employed was to "first separate the proteids from the carbohydrates and other soluble substances by saturating the extract with ammonium sulphate, thereby precipitating the ferment and proteids together; next to remove this proteid existing as globulin by dialysis; and then if possible to separate the albumin and proteids by fractional precipitation with alcohol. In following this method a measured quantity of malt extract was saturated with ammonium sulphate, the precipitated proteid matter was filtered out, dissolved in water and the clean filtered solution made up to value of the original extract. This solution was found to have the same diastatic power as before precipitation, thus showing that ammonium sulphate had not injured the diastase."

I would further call attention to a fact I have often mentioned by quoting an extract from a report of work by G. Liebscher, (E. S. R., Vol. 7, No. 8,1896, page 665,) "as regards the contents of phosphoric acid it appears that the solubility is of more significance than the total amount present. With a high content of of sesquioxides a soil will show great need of phosphatic fertilizers, although it already contains a high per cent. of phosphoric acid."

As a citrate solution is generally used in analyses to determine the percentage of reverted phosphoric acid it would seem orange trees ought to have greater powers of assimilation of phosphoric acid than other plants.

Experiments by P. Kassovich (E. S. R. XVI, No. 2,1048, July, '05,) show that the amount of carbon dioxide set free by the roots was about twenty times greater than would have been required to render soluble all the phosphoric acid assimilated by the plants if it were supplied in an insoluble form. Still further, A. Quartarali (E. S. R. XVII, No. 5,449, Jan. '06, shows "That the organic acids which usually occur in plants first render insoluble phosphates soluble and then convert them into di-hydrogen phosphates. Any free phosphoric acid which may be produced is converted in the plants into a di-hydrogen salt. This is explained by the lower acidity of organic acids as compared with phosphoric acid and by their greater affinity as compared with acid phosphates.

D. N. Prianishni kov (E. S. R. XVI, No. 6,538) shows "that ammonium salts, especially ammonium sulphate, exert an important influence in rendering the phosphoric acid of mineral phosphates available to higher plants, while sodium nitrate exerts no such influence. For this reason ammonium sulphate is designated "Physiologically acid" and sodium nitrate "physiologically alkaline. A series of sand and water cultures with barley, oats, buckwheat, flax, peas and vetches to determine the status of ammonium nitrate with reference to acidity or alkalinity as thus defined is reported. The results show that this salt is intermediate in its action between ammonium sulphate and sodium nitrate and indicates that it may, under certain conditions, be physiologically acid. It was shown to increase the assimilability of the phosphoric acid of insoluble phosphates even in sterile cultures where nitrification did not occur.

O. Schreiner and H. S. Reed (E. S. R. XIX, No. 9,822) show evidence that roots possess well defined oxidizing powers due principally to enzymes. Certain substances used as fertilizers promote the activity of roots, and root oxidation is more active in fertile than unproductive soils.

O. Schreiner and M. X. Sullivan (E. S. R., same page) found that "water in which seed has germinated and seedlings had grown apparently contained toxic properties which interfered with the growth of a second crop in the same solution. F. Fletcher (same page, E. S. R.) made investigations showing the excretions of toxic substances of an alkaloidal nature by plant roots. Phosphoric acid when assimilated by plants is mainly in the form of di-hydrogen phosphate incorporated in the protoplasm of the living plant cells. I have often called attention to the fact of a suspicion that iron solutions from iron impregnated soils which the plants must transpire in making growths evidently have a depressing effect on the plant protoplasm equivalent to phosphate reversion thereby deranging the enzymes that make growth and delaying or even stopping the maturing of the plants.

Most organic poisons are classed as alkaloids and generally speaking alkaloids are albumens or proteids split up into lower molecular forms and given stability by association with alkaline salts.

The most familiar alkaloids are those used in medicine—quinine, morphine, strychnine, atropine, etc., which are deposited as useless or waste nitrogenous substances in the bark or tissue of certain plants.

In most plants after the protoplasm cells are exhausted from excreting enzymes the broken down or split up remains disappear probably as root excretions. The process is shown in a study of maize and dates by H. S. Reed (E. S. R. XVI, No. 5,443,05.) "It was found that in the resting condition the secreting cells of both maize and dates are crowded with relatively small proteid granules, as secretion begins these granules gradually disappear. In maize the disappearance coincides closely with the consumption of the endosperm. In the date however, the granules disappear long before the endosperm is dissolved.

The chromatin of the nuclei is small in amount at the beginning of secretion and increases as germination progresses. The nucleolus diminishes with the progressing of germination. These changes are more noticeable in the case of maize than in the date. There is no evidence that solid matter is excreted from the nucleus. At the end of secretory activity the protoplasm of the secreting cells breaks down and the products of disintegration disappear from sight." L. Lutz (E. S. R. XVII, No. 2,348, Dec. '05,) believes it is practically demonstrated that many organic nitrogenous substances are directly assimilated by plants, and the common belief that ammoniacal fermentation takes place first followed by nitric fermentation is not in accord with what actually occurs in the plant.

The confirmation of this long suspected fact in the use of organic fertilizers would show there is a possibility of plants absorbing so great a quantity of the poisonous alkaloids of quickly decaying animal or other organic fertilizers as to derange the enzyme-producing functions and healthy growth of plants for it is a fact that the alkaloids or toxins may produce a destructive breaking down of plant protoplasm that is as rapid in its way as the transformation by diastase of starch into glucose. As an analogy witness the study of the effects of the tetanus or lockjaw bacillus toxin by N. Tiberti (E. S. R. XVII, No. 8,804, April, '06.) In the author's experiments it was found that in guinea pigs and rabbits the ischiatic nerve may absorb the tetanus toxin and transport it to the nerve centers when the toxin is applied to the cut end of the nerve. When the tetanus toxin is injected into the muscle it spreads about and comes in contact with the nerve fibres by which it is absorbed. If tetanus anti-toxin is injected into a nerve trunk and toxin injected later into the corresponding muscles, the anti-toxin will prevent the toxin from reaching the central nervous system.

In this disease the germs, in the early stages at least, remain in the wound and the symptoms are caused by the digestive and waste poisons they produce in multiplication and growth. The anti-toxins that are secured from the blood of animals that have been vaccinated or have recovered from infectious diseases do not act directly on the organism of other animals or in a chemical sense, but their chief action is a partial neutralization of toxins. It has been shown that a mixture of a toxin and anti-toxin is not strictly neutral, and portions of both toxin and anti-toxin remain uncombined, while the remainder of the toxin and anti-toxin combines and becomes neutralized in varying degrees.

When it comes to applying the principles of the discoveries in the treatment of animal germ diseases to the diseases of plants we are all at sea for lack of sufficient investigation. That plants are attacked and suffer in a similar way to animals from poison and diseases is a matter of common observation. When a soldier bug sucks a fast growing orange or other plant shoot and it quickly wilts we feel sure it has had the effects of a snake bite on an animal and is damaged by a similar alkaloid poison. I know common salt will defoliate an orange tree and that a handful of arsenic or London purple will kill it. L. Montemartini (E. S. R. XVII, No. 10,891. '06.) Studying the physiology of diseased plants due to fungi and mites deduced the hypothesis that the parasites may secrete some poisonous substances that stimulate the plant chiefly by increased respiration during the early stages before the depressing effects appear.

The soft rot bacteria of vegetables excrete enzymes that break down the plant tissues in advance of the entrance of the germs and the same has been shown of fungi.

S. A. Makrzhetski, (E. S. R. XVII. No. 10,959,) conducted a number of experiments in which he introduced arsenic, copper. sulphate, eosin and other poisonous solutions into trees for the purpose of destroying parasites, but did not obtain any very satisfactory results. He then replaced the poisonous salts by nutritive ones and obtained interesting results in improving the condition of the trees. He had best results from dry fertilizer salts in holes 1-2 inch diameter, 1 inch deep covered with land plaster. The dry salts diffused through the trees in different ways not only along vertical lines but some times in spirals.

I. J. Sheviryev, (E. S. R. XVI, December, '04. 383) reports 10 years experiments in artificial nutrition of diseased trees, protecting from insects without killing the trees. According to the author the investigations are based on the following facts: After the spring movement of the sap when the pressure inside the vessels is greater than that of the atmosphere, there follows in summer and fall a period of negative pressure. If the vessels at this time are brought into communication with the liquid, the latter enters and fills them under the pressure of the outside air. For the successful introduction of liquids into the vessels of the tree it was found necessary to prevent the entrance of air. The author attributes the failure of many experiments in impregnating live trees with solutions to the disregarding of this fact. In order to exclude the air the vessels are opened under a layer of liquid. For this purpose, if the trees do not exceed 3 1-2 inches in diameter their trunks are surrounded by a feeding funnel of aluminum fastened to the tree by means of cement.

For larger trees only portions of funnels are fastened to the trunk. After the funnel is fixed in place the solution is poured in and a cut made below the level of the liquid through the thickness of the bark and part of the sap wood. The liquid at once begins to be sucked in and to diffuse above and below the cut, a mariotte vessel provides for the automatic replenishing of the liquid as it is absorbed. The absorption of the liquid continues at the initial velocity for some time after which it slackens, being influenced by climate, season of the year and state of the weather. The absorption takes place more rapidly in dry air at high temperatures and in strong sunlight.

The absorption continues for about 5 days, and the immediate cause of its cessation seems to be the choking up of the vessels through which the liquid enters the tree. This is shown by the vigorous renewal of absorption through new cuts made in the tree.

In an experiment on an oak tree 7 inches in diameter, 11.37 gallons of liquid was absorbed by the tree in 53 hours.

Experiments with a number of solutions colored with eosin or methyl blue, showed that liquids diffuse both upward and downward, and also horizontally. The diffusion in a horizontal direction seems to be along the rays, as the heartwood does not become colored. The colored liquid has been traced to the smallest branches and also to the leaves, and in the experiment with grapevines into the berries themselves. The diffusion into the roots does not seem as uniform as through the sapwood of the trunk.

The author has not made much progress in finding substances which may be introduced in sufficient quantity to be destructive to parasites without being injurious to the plant but expects interesting results from experiments with certain barium compounds with which he is experimenting. I give the report of these experiments in detail as possibly opening a profitable field for investigation in relation to diseases of oranges and other trees.

Tetanus for instance, among germ diseases has been successfully treated by injections of solutions of carbolic acid and glycerine as well as with anti-toxin. Now if the absorption process described by Sheviryev will work on orange trees will it not be possible to discover and directly administer antidotes or even anti-toxins for such diseases as limb blight, die back, foot rot and wither tip? As I understand the preliminary work of isolating and studying the enzymes of orange trees is only fairly started at our State Experiment Station under the provision of the Adams act for original investigations we cannot look for immediate results in devising remedies but it seems to me the time is coming when the diseases of trees will be as well understood as those of animals and when remedies will be directly introduced into the plant sap circulation.

In conclusion I will say that W. Weichard (E. S. R. XVII. No. 5,486) reports that from the flesh of guinea pigs dead from fatigue he was able to extract a body which injected into guinea pigs and other animals caused all the symptoms of fatigue. This body was isolated and found to be very unstable in character and the author considers it a true toxin. When injected into the circulation of horses an anti-toxin was produced which in vitro or in animals counteracted the toxins. As shown by a number of experiments the anti-toxin can be taken by man without harmful results.

In connection with the report of the experiments the author discusses the characteristic symptoms of fatigue, its effects on the body temperature, the production of the anti-toxin in the body and related questions. Further, I can only say I have made these dry subjects as untechnical as possible and hope they will give an idea of the trend of future investigations, but if anybody has that tired feeling I am sorry to say I have not yet secured and am unable to administer the anti-toxin for fatigue.

SOME DISEASES OF CITRUS TREES.

By H. S. Fawcett.

Mr. President, Ladies and Gentlemen:

You may picture to yourself an ideal orange grove; one in which the trees are perfectly healthy; one provided with all the conditions favorable to growth and the production of the maximum amount of fruit consistent with this growth; one in which there is nothing to induce disease of any kind. This would require just the right amount of plant-food, of moisture, of regulated temperature and of light; a suitable substance in which a tree could fasten itself by a root system; and freedom from all attacks of injurious insects and parasitic organisms. But this is only a mental picture, for, as everyone knows, these conditions are never fully realized in any orange grove. A tree is continually being subjected to conditions tending to directly injure it, or to slowly sap its vitality. It is subjected to improper amounts and kinds of plant-food; too much or too little moisture; too great or too sudden changes of temperature, such as frosts or burning heat; wind storms; improper kinds of soil; and also to a host of visible or invisible enemies that prey upon it from the outside. Many of these conditions are to a large extent under the control of the grower. With proper care and due expenditure, the plant-food and the moisture may be largely controlled; but the changes of temperature, the wind storms, and the nature of the soil, are mostly beyond the limits of man's power to change. Parasitic enemies, as far as they are understood, are also largely under control of the grower; but there are many whose habits are not yet sufficiently known for us to get them under intelligent control.

When, because of unfavorable conditions or attacks of parasites, a tree or any part of it ceases to function properly and begins to weaken, we say it is diseased. If we leave out of account the insect troubles, the diseases of citrus trees may be divided into two classes. (1) The physiological diseases due mainly to malnutrition, and (2) the diseases due to parasitic organisms. In the first class, or those presumably due to mal-nutrition, are dieback, melanose, yellow spotting and frenching. In the second class, or those due to, or probably due to parasitic organisms are withertip, scaly bark, scab, gumming and blight. It is of this latter class that this paper will treat. The causes of some of the diseases here described have not yet been proved, but since their symptoms and mode of action are similar to those undoubtedly due to fungi or bacteria, they are included here.

Most of the parasitic fungi that cause diseases in trees are invisible forms, or at least their seed-like bodies or spores are too small to be detected with the unaided eye. Just as the higher plants have different ways of distributing their seeds, so these lower plants, the invisible fungi, have different means by which their spores are scattered. The seeds of the thistle and dandelion are carried by the wind to great distances; the seeds of the oxalis are shot out violently from the pods; the seeds of the mistletoe are carried by birds, and those of the burs by other animals. If we had microscopical eyes we would find that with these little fungus plants there are also various methods of spore distribution. Some spores are light and powdery, are blown off and float like dust in the air; others are moist and waxy and stick to the bodies of insects, the feet of birds, and the like.

One kind of spore has hygroscopic movements, by which it moves on drying and being moistened again. Some are even shot out into the air as invisible dust particles.

Most of the kinds of fungi, of which there are nearly 80,000 species described, are entirely harmless to a citrus tree, and many are even useful in keeping insects in check; but there are a few evilly inclined individuals that make a great deal of trouble for the orange growers. It is only within comparatively recent times that the nature of these low fungi was known. Much advance has been made in their study and in finding means of controlling them, but there is yet much that is not understood. The advance in this line is slow, because of the extreme smallness of many of these minute forms, and the difficulty of keeping track of any one individual in its infection of a tree. When a new disease occurs, one may possibly find a dozen different microscopic fungi growing upon or into a diseased area. It is necessary to isolate these fungi in the laboratory, and then to prove by inoculation experiments which kind, if any, is the cause of the disease, or whether the fungi are simply present as the result of an injury from some other source. The primary cause of a disease once being known, it is a simpler problem to discover a means of prevention or cure for it. One discovery of this kind may prove of vast value to a whole country, yet it can never be known beforehand how much time it will require to make the discovery.

SCALY BARK.

A disease that is confined almost entirely to one section of the State and has attracted considerable attention there, is that known as Scaly Bark. It is sometimes called by the growers "rust" or "nail-head rust." This disease should arouse interest, not only in the section in which it is prevalent, but in other sections as well, because of the danger of its being introduced into new regions. The advantage to the grower of being able to recognize at a glance a new disease at its earliest start is great. For there are times when by the destruction of a single tree in the corner of a grove, or of one tree near a house or barn, into which a disease has been carried, an entire grove might easily be saved from being diseased. From our study of this disease there is every reason to believe that Scaly Bark is infectious, and that it may spread easily from tree to tree or from one grove to another. A history and description of this disease were given by the writer in the Proceedings of this Society for 1908, page 101. It has also been more recently described, with its remedies, in Bulletin 98 of the Florida Experiment Station. It has been estimated that the yearly loss of fruit from this disease in one citrus-growing section of the State is near 20,000 to 30,000 boxes of oranges, and this is in addition to the constant weakening of the trees. The loss of crop in this region is anywhere from nothing up to 25 per cent. in good years, and in unfavorable years it may be as high as 75 per cent, in badly diseased groves.

Description—Scalv bark is primarily a bark and rind disease of the sweet orange. The wood is only affected secondarily, by poisoning due to the wither-tip fungus. The bark of the trunk and of branches of all sizes may be affected; but the greatest injury is done to the younger branches and twigs up to about one-half inch in diameter, and to the fruit.

On the branches and twigs there develop more or less circular or oval spots one-sixth to one inch across, rusty in color, and with well-defined margins. The bark becomes brittle, begins to crack, and forms small flakes or scales. These spots are at first scattered but may increase in number to such an extent as to become joined together. The branch is rarely killed in the first year. During the second year, additional spots form between the old ones, and this may go on for several years until the branch is finally girdled at some point and killed.

This formation of rough scaly bark is also seen on the trunks of the badly diseased trees. As time goes on, the trunks present an extremely rough and shaggy appearance. Pieces of bark one-half inch or more in size are pushed up, sometimes over areas of several inches in diameter, or a continuous surface of ruptured bark is formed. New bark arises under the old, and only rarely do dead areas on the trunk result from this disease. The exudation of gum is a usual accompaniment.

On the rind of the fruit the spots develop somewhat similarly to those of the small branches. The disease affects only the outer portion of the rind. The spots start either as rings, like those on the small branches, or as round yellowish areas. These usually begin to appear on the fruit in July and August. As the fruit approaches maturity, and while it is still green, the rings become sunken and brown, because of the entrance of the withertip fungus, while their central portions remain green. The fruit then colors rapidly, the portion inside the ring sometimes remaining green for a short time. The center is finally broken down by the withertip fungus, and the whole spot becomes brown. Some spots are formed which are not ringed. Fruits spotted by scaly bark color prematurely, and drop before the picking season. Occasionally gummy exudations occur at the spots on the fruit.

Cause—A careful study has been made to determine just what the cause is. It is now believed that the trouble is due to a minute microscopic fungus that makes its way through the bark from the outside and grows just under the outer cells. The disease is quite slow in its development. It develops so gradually into its destructive form that the grower is scarcely aware of its importance until it has been present for several years.

Remedy—Experiments for the control of the disease have been systematically carried on at Bayview for the past two years. The nature of the disease and its slow development upon the limbs and trunks, make the effect of any line of treatment slow in showing itself. As the development of the disease to its destructive form is slow, so the recovery of the tree after the source of infection is cut off requires a long time. We cannot expect to see the beneficial effect of any treatment on the branches in much less time than eight to ten months. Twenty experiment plots, each receiving different treatment, were laid out. These have been continuously under observation, and from the basis for the remedies which are here suggested.

Top Working—Grapefruit, mandarins and tangerines appear to be nearly immune to scaly bark, even when surrounded by badly affected sweet orange trees. Diseased trees may, therefore, be topworked to one of these varieties. At first sight this would seem to be too severe a remedy; but, as a matter of fact, it can be carried out without serious loss at any one time. This can be done by treating only alternate rows. In this way the untreated trees will be found to produce a much larger crop, and this will in a measure compensate for the loss of crop on the top-worked trees.

Top-working has already been practiced by some growers. As a further precaution, the trunks and branches may be treated with carbolineum as suggested below. When these top-worked trees begin to produce a fair crop, the untouched trees may be treated in the same way.

HEADING BACK—During the dormant period, preferably in December or January, cut out the top, leaving only the trunk and the stubs of the larger branches. Then paint the entire bark and the cut surfaces with one part of carbolineum to one part of water. In our treatment of this disease in this way, which began in February, the bark assumed a dark-red color. In a few weeks, as the growing season came on, the tree put out new shoots, and by the end of summer had grown a vigorous, healthy top. By that time the old scabs had disappeared, and the bark had become smooth and free from flakes. The carbolineum, far from injuring the tree, appeared to stimulate it to increased vigor. Unless the entire grove is treated in this way the young growth should be protected by spraying with one per cent. solution of carbolineum in May or June, when the wood will have hardened.

BORDEAUX MIXTURE—The use of Bordeaux mixture has been attended with beneficial results in diminishing the number of spotted fruits, but with bad results in allowing the increase of scale insects. A thorough test was made as to the effects of this spraying mixture at different times of the year, and with different numbers of sprayings throughout the year. The most marked result has been the diminished number of spotted oranges on the sprayed plots, as compared with the unsprayed plots. This test was repeated the second year on the same plots and in the same way as at first. During the first year some effect was noticed, especially on those plots where the spraying had begun in the early summer, but the results were not pronounced. During the second year a great diminution of spotted fruit was seen in nearly all of the sprayed trees. The amount of fruit however, was considerably diminished on the plots sprayed at or near the blooming season. Our experiments indicate that one thorough spraying at any time between November and February is almost as efficient in diminishing the amount of spotted fruit in the following crop, as three or four sprayings during any other part of the year. It is also attended with a smaller increase in scale insects.

Extreme caution must be taken in using Bordeaux mixture for orange trees, since it kills the fungi that are useful in keeping scale insects in check. If Bordeaux mixture is applied, it should be followed by a good insecticide, or twigs from unsprayed trees bearing the proper fungi should be hung in the tops of the sprayed trees a week or two after the treatment.

WITHERTIP.

Withertip is a disease which is very destructive at times, especially when an orange tree is subjected to unfavorable conditions. The primary cause of this disease was carefuly studied and worked out by Prof. P. H. Rolfs several years ago while holding the position of plant pathologist at the sub-tropical laboratory at

Miami. He proved by experimental methods that by spraying the spores of a certain fungus upon the young orange and lemon trees in the greenhouse he could cause the disease known as Withertip. It was demonstrated in this way that the disease was caused directly by the fungus known as Colletotrichum gloeosporioides. It was further shown that other effects were due to the same cause, such as blossom-blight, leaf-spot, tear-staining of fruit, lemon spot, and other troubles. Dr. Ernst A. Bessey, in carrying this work further, demonstrated that the same fungus which causes withertip of orange in its various manifestations, also causes blossom-blight, leaf-spot and fruit-rot of mangoes and avocadoes, and leaf-spot and fruit-rots of various other plants.

Withertip has so many different appearances and symptoms according to what part of the tree is affected and at what stage of development it is found, that it is almost impossible to give a description of it by which it can be identified at all times. The fungus causing withertip appears to be an ever-present one, and the disease breaks out in its destructive form as the result either of the action of virulent strains of the fungus, or from unfavorable conditions that render the tree less resistant to the growth of the fungus into its tissues, or from both causes. Withertip often accompanies or follows other troubles. It is almost invariably found as a secondary agent in trees suffering from scaly bark. It appears that the scaly bark disease was present for years, and only developed in its present destructive form after the advent of the Withertip in the State. Prof. B. F. Floyd has observed that it nearly always follows the yellow spotting of citrus leaves. The resistance which a strong healthy tree presents to this fungus is probably lessened materially through the influence of yellow spotting and the fungus can then enter the weakened tissue. There are certain effects of fertilizers that appear to increase the liability to this disease. Prof. Floyd in his experiments with the physiological effects of certain kinds and amounts of fertilizers on young trees, found that by increasing the amount of nitrate of soda till a poisoning effect on the wood tissue resulted, a condition was produced suitable to the rapid development of Withertip. In cases where amounts of phosphoric acid or potash were used sufficient to poison trees to the same degree, the Withertip was not observed to develop to the same extent.

What usually puzzles the grower is that often there are individual trees, and even individual limbs of the same tree, that are severely attacked; while other trees of the grove and other limbs of the diseased tree remain uninjured. This difference in the action of the fungus toward different limbs of the same tree is probably due to a difference in the vitality of the individual limbs. Any cause rendering a branch somewhat weak, such as a previous heavy load of fruit, or the adverse conditions mentioned above, would most probably render that branch susceptible to an attack of the fungus. The same would doubtless be true in regard to the susceptibility or immunity to the disease of the different trees in a grove. Cases occur, however, that seem to be accounted for only by considering trees as individuals, each slightly different

Yellow Spotting of Citrus Leaves.

PLATE I.

FIG. 1. Scaly Bark. Orange tree "headed back" and painted with carbolineum one half strength in February for Scaly Bark. Photographed 6 weeks after treatment showing new growth starting.

FIG. 2. Same tree as in Fig. 1. Fourteen months after treatment showing a vigorous top.

FIG. 3. Gumming. Section of a large limb of an orange tree showing gum exuding.

PLATE I. (Continued.)

Fig. 4—Gumming. A later stage of the gumming disease, showing roughened resinous patches and scaly patches. This stage of Gummosis is sometimes mistaken for Scaly Bark which is an entirely different disease.

Fig. 5—Withertip. The bare twigs and rolled up leaves show the presence of Withertip.

PLATE I. (Continued.)

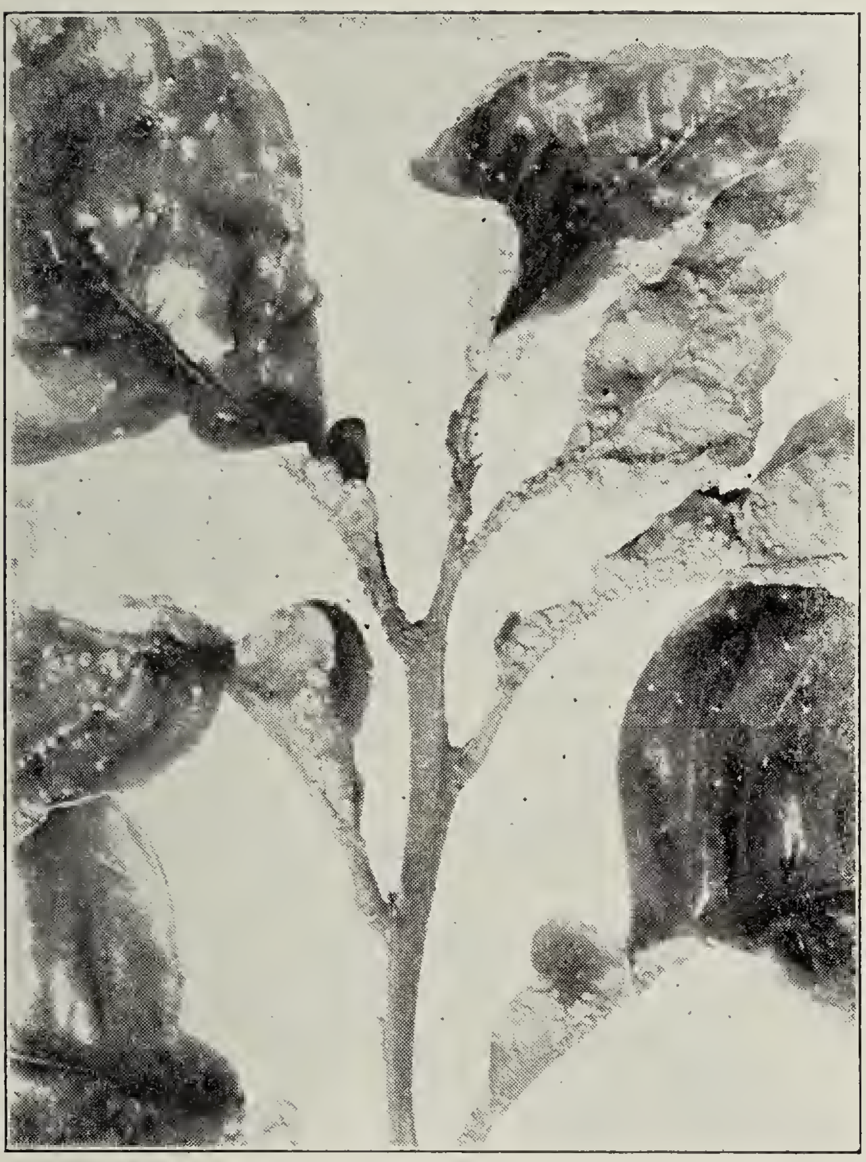


Fig. 6—Scab on leaves and new growth of sour orange. Natural size.

Fig. 9—Scab Fungus, *cladosporium citri*, photographed through the microscope. Magnified 600 diameters or 360,000 times the original area. (a) spore. (b) mycelium grown from a spore.

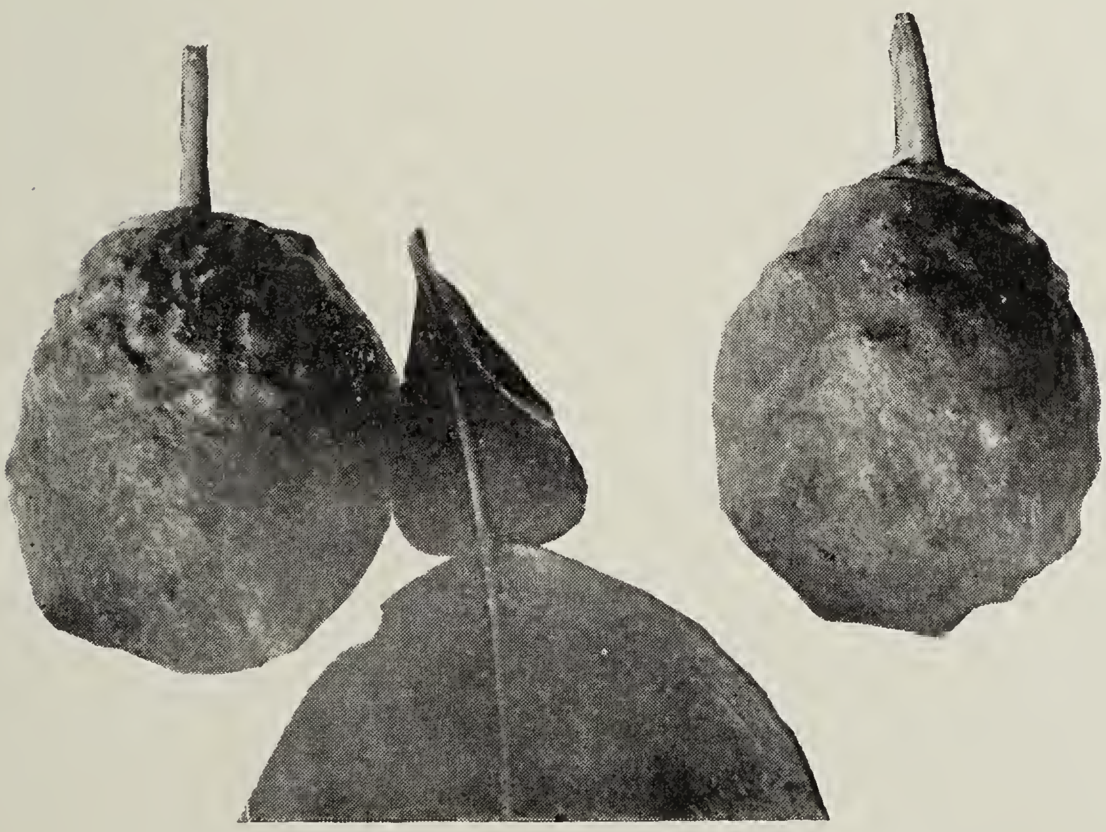


Fig. 7—Scab on young grapefruit. Natural size.

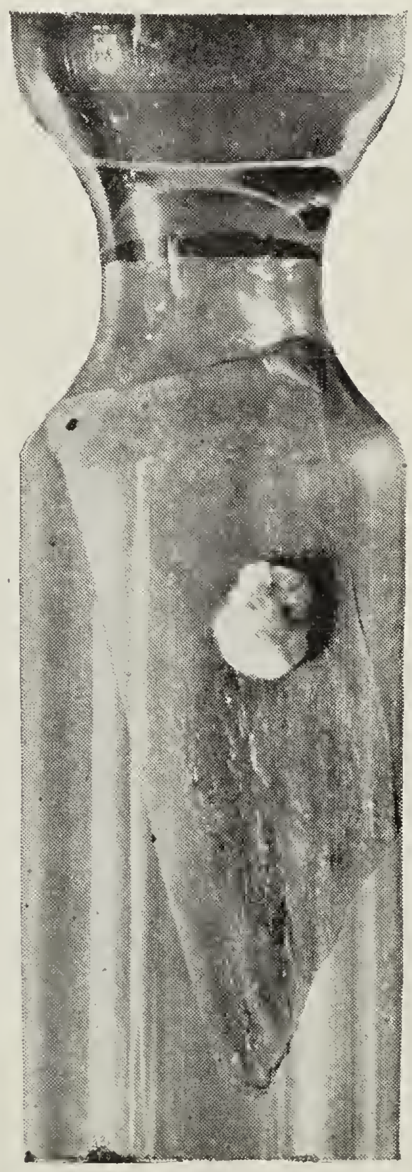


Fig. 8—Scab fungus, *cladosporium citri.* Pure culture growing on a piece of sterilized sweet potato in a test tube.

from the other. One tree, apparently just as healthy as another, is for some cause not yet understood, less resistant to this particular disease, and is therefore attacked; while the tree next to it may remain uninjured.

TREATMENT—The treatment for this disease must vary according to the phase of the disease present. Blossom blight and dropping of young fruit may largely be prevented with Bordeaux mixture properly applied. In case of blossom blight one must spray directly into the bloom. The accepted belief is that Bordeaux mixture will knock off the fruit if sprayed into the bloom, but in case of blossom blight one will do more good than harm by using it. Though it may knock off some fruit it will save more than it will injure. When the disease has gotten thoroughly into the tissues and is beginning to kill back the branches and to poison the wood tissue, more drastic measures must be employed. Prof. Rolfs' experiments showed that the disease could be best controlled at this stage by pruning out. This should be done by cutting out, not only the dead branches, but also the diseased weak branches for some distance back of the apparently affected wood. The poisoning effect of this fungus may extend to a considerable distance beyond the place where the fungus may be found, and it is advisable to get rid as far as possible of the poisoned wood.

This treatment should be accompanied by a process of building up the trees to make them resistant to the further attacks of the fungus. Spotting of the fruit in the fall may also be prevented by spraying. If it be near the season of the ripening of the fruit it is advisable to use the ammoniacal solution of copper carbonate. In using fungicides on orange trees one must bear in mind that one is also killing the fungi that keep down the scale insects. One must be ready to follow with an insecticide, or hang pieces of bark containing the scale fungi in the tops of the sprayed trees. These should be put in several weeks after spraying has been done.

FOOT-ROT.

Nearly every citrus district in the world has been troubled by the foot-rot. It is one of the oldest diseases of citrus trees. In Europe its history extends back as far as 1845. In Florida, according to Prof. Hume, it was first noticed about 1879. The disease is well described, and effective methods of cure are given by Prof. P. H. Rolfs in Press Bulletin 96 of the Florida Experiment Station, as follows:

"The first symptom of the disease that is noticed is the oozing of gum from wounds occurring near the ground. Later on, the gumming ceases and the bark dries, the portion that has become diseased breaking off. These foot-rot wounds, after they begin to heal, are so characteristic, that when once seen they are rarely mistaken. The extent to which the wounds spread depends on a variety of circumstances. Sometimes they are very small, being not more than a fraction of an inch in diameter and more or less circular in outline; while at other times they may extend nearly or quite around the tree at the ground. In such cases the wound is of an irregular shape.

"REMEDY—Since we have known that the disease is infectious and understood the conditions which favor its spread, a remedy can be much more successfully applied. The following brief rules, if followed carefully and conscientiously, will eliminate the disease from a grove, and in many cases save trees that otherwise would be lost.

"1. Remove the soil from about the crown and the crown roots, at least as far back as any disease occurs........ A very small, even an invisible amount, of virus is capable of starting the disease in a new place; consequently, any tools or implements used about a foot-rot tree should be thoroughly disinfected before being used on a healthy one.

2. After the soil has been removed from the crown, cut out the diseased parts......The bark should be cut away as far as the disease occurs, which can be easily told by a yellowish or dark discoloration of the inner bark. As the disease rarely penetrates into the wood, it will be sufficient to remove the bark.

3. After the diseased part has all been cut out, apply an antiseptic wash. One of the most readily obtainable, and also one of the best, is crude carbolic acid—using one part of the acid to one part of water......When the disease makes its appearance early in the year, it may be necessary to repeat this operation a second time, or even more frequently.

4. After the above remedy has been applied, and no new cases of foot-rot have been discovered for a period of two or three months, the following wash may be applied to the trunks of the trees and to such larger roots as are exposed: three parts of slaked lime, mixed with one part of flowers of sulphur. The ingredients may be easily mixed by passing them through a sieve, or by working them on the floor, very much as fertilizers are mixed. After they are evenly mixed, place the powder in a tub or barrel, and add enough water to bring it to a consistency of paint......The trunks of the trees and all of the exposed roots should be given a thorough coating of this material. In groves where foot-rot is just starting and where the wounds are all very small, this wash alone will frequently be found sufficient. In groves where foot-rot occurs on a considerable percentage of the trees, it will be best to apply the wash to the trunks and larger roots of all the trees—those that are not affected as well as the diseased ones."

GUMMING.

A disease known as gumming of citrus trees is becoming a serious trouble in many localities of the State. It has broken out in some groves to an alarming extent.

Description—The gumming areas are usually at considerable distances from the ground on the trunk and larger limbs. This point of difference distinguishes the diseases from the foot-rot. The bark cracks, and gum oozes out in large quantities. When the bark just adjoining the affected area is cut off, it is seen to be yellowish inside, and the bark tissue has a sour odor as if fermentation had set in. The diseased areas as they enlarge may reach one-half to three-quarters of the way around a large limb. In some cases the limb or trunk is girdled. Where the case is not too severe, new bark tissue is formed underneath the old, and the surface of the diseased area becomes characterized by ridges, warts and resinous looking deposits from the hardening of the gummy exudations. The new bark may sometimes heal over; but frequently it dies after a while, and the wood usually decays inward, often destroying the tree.

The cause of the gumming disease is not known. The writer is taking up a study of this trouble, with the view of discovering the cause, if possible, and finding a good remedy. Dr. Ernst Bessey, in his report for 1907, says: "In some cases it seems to be due possibly to the unfavorable effect of the stock on the scion, for it is far more abundant in those trees where the scion is larger than the stock." In California a disease called "Gummosis," which causes a gumming of citrus trees, has been thought to be a physiological trouble.

REMEDY—Gumming has been successfully checked in some cases by scraping the diseased areas, and painting over the wounds with some disinfectant. Carbolineum, one part to one part of water, may be used. Prof. R. E. Smith of the California Experiment Station, recommends the following remedy for the Gummosis found in that State: Peel off the bark without scraping the wood underneath, and cover the wound with a kind of grafting wax prepared by melting four pounds of resin, one pound of beeswax and one pound of raw linseed oil. This is put on with a brush while warm and liquid.

BLIGHT.

This is one of the most dreaded, and probably most destructive diseases of citrus trees in Florida. How many thousands of dollars are annually lost by blight, it is difficult to estimate. In 1895 Profs. Swingle and Webber estimated the loss from this disease at from one hundred to two hundred thousand dollars annually, and it is probably more than that now. Blight is one of those diseases that is extremely hard to diagnose. Even after years of experience a grower will tell you that he cannot tell at once when a tree is struck by blight. It often comes on so gradually, without any definitely marked symptoms, that one can only be sure of a tree having the blight after the disease has progressed for some time. The disease was first fully described by Profs. Swingle and Webber in 1895. It usually appears on trees that have previously seemed healthy and in good bearing condition. It often takes the largest and best trees in a grove. The first indication is usually a wilting of the foliage, as if the trees were suffering from lack of moisture. Most often this occurs in early spring, and at first appears most pronounced on dry, hot days, but later this wilting is seen to persist even through the wet or damp weather. The whole top may show the disease at once, but often a single limb will first show signs of wilting. As the disease progresses and the rainy season comes on, numerous water sprouts are put out from the trunk and large limbs. These look healthy at first, but finally sicken and die.

Much technical study and many experiments have been devoted to this disease in order to discover the cause and to find a remedy. Profs. Swingle and Webber did a large amount of work upon it. Their work was brought to a sudden end by the freezes of 1894-95. Since then, Prof. Rolfs, while at the sub-tropical laboratory at Miami continued the study of this mysterious trouble, but its cause has not yet been determined. Between $30,000 and $40,000 has been expended upon it, and while much information as to the development and nature of the disease has been collected, most of this has been of a negative character as far as practically useful results are concerned. There is need for a more thorough investigation of this trouble carried on regularly and systematically for a number of years. The investigation of a disease of this nature presents unusually great difficulties. The fact that it apparently takes at least seven years for a tree to develop symptoms of the disease, and that blight occurs usually in large bearing trees, makes the investigation difficult. The amount of time needed for working out this problem and the difficulties in the way, make the field a rather uninviting one for the scientist. A sufficient amount of money and a sufficient number of years for the working out of such a problem are things that it is almost impossible to secure under present conditions. We are expected to show results at once. What politician is willing to trust a scientist to work ten years before calling upon him to show them? Yet this time would probably be needed to attain definite results with citrus blight.

In some respects the disease resembles peach yellows, and everyone who has followed the investigation of that disease knows that a great amount of money has been expended and years of study have been given to this trouble, but as yet there is no remedy discovered except the complete destruction of diseased trees. This too, is the only remedy yet known for blight, also called "wilt," of orange trees. The only treatment is to dig up and destroy the trees as soon as they show clearly that they are affected with blight. It is dangerous to dally with this disease; for while one is trying to cure one tree, the disease is likely to spread to others adjoining.

BUCKSKIN.

Grapefruit often develops a peculiar thickened and roughened appearance of the rind which is known by growers as buckskin or sharkskin. The rind becomes abnormally thick and presents a scurfy rough appearance well characterized by the word buckskin. This trouble was quite serious in some places last season. It renders the fruit very inferior, and in many cases almost worthless. This trouble is probably due to some surface-growing fungus that works upon the outer cells and irritates the rind in such a way as to cause abnormal thickening. The real cause of the trouble is, however, yet to be determined definitely. The trouble has not been sufficiently studied for us to be able to give any remedy based on experiments. The fact that the trouble appears to be due to a surface-growing fungus would indicate that Bordeaux mixture would be an efficient preventive. A few years ago a series of spraying experiments for the control of this disease was made by Prof. Rolfs in an orange grove where buckskin fruit had been abundant the year before. After the spraying had been done it was found that the buckskin did not appear that year even on the unsprayed plots, so that it was impossible to get any information from the experiment. This disease appears to be one of those minor troubles that come and go. Some years it is quite bad, while other years it is scarcely at all noticeable. We are now making a study of this disease.

SCAB.

Scab is a disease which is ordinarily of rather minor importance, but which may at times break out upon young leaves and fruits of lemons, grapefruit and satsumas, in a very destructive way. It is sometimes known as "sour scab," because it is so invariably found upon sour oranges and lemons. It is probably found on sour oranges in almost every citrus-growing district in the State.

The earliest infections are on young leaves about one-tenth full size, as minute, light-brown or cork-colored points. Soon the spots become depressed on one side of the leaf and raised on the other. Older spots become dark brown and sometimes pinkish in color. The separate spots coalesce as they enlarge, forming irregular corky scabs. The leaves are contorted, twisted and warped. The fruit, when affected, presents a warty appearance.

The disease is caused by a minute fungus (Cladosporium citri) that grows into the tissue of the leaves. The spores of this fungus are so small that it would take about 8,000 side by side to measure one inch. Pure growths of the scab fungus were obtained in a nutrient jelly by sowing some of these minute spores, and a study was made of the fungus as it grew on this jelly. When the fungus had grown sufficiently to produce a good crop of spores, these were sprayed on to small sour orange trees that were in the greenhouse and were free from scab. In a few days the characteristic scab spots appeared, proving that this fungus was the real cause of scab, and that the infection came from the growth of the spores that had been put upon the surface of the leaves.

Treatment—Sometimes the disease breaks out early in the year, on quite young leaves and fruits, and in a very severe form. The only known preventive of its spread is Bordeaux mixture applied early in the year. The same care should be used in applying the Bordeaux as when spraying to cure withertip, or its application will be followed by an increase of scale insects.

SMOKY FUNGUS.

The smoky appearance of the orange caused by the smoky fungus (Leptothyrium pomi?) is not to be confused with the blackening due to the sooty mold which accompanies the whitefly. The smoky fungus may occur when the whitefly is absent. It causes no noticeable injury to the fruit itself. It does, however, mask the bright color of the fruit by a layer of dark-colored, mycelial threads, which spread over the surface of the rind. It may be rubbed off with the fingers, and so is attributed by some growers to the accumulation of dust from the air. It is most apt to occur in moist groves, late in the fall, and on oranges that have remained on the tree after they are ripe. The selling quality of the fruit is naturally somewhat impaired by the presence of this fungus.

Remedies—(1.) The smokiness may be readily removed from the fruit by putting it through a washer like those used for freeing fruit from the sooty mold fungus. (2.) In the course of our investigations on the scaly bark disease it was noticed incidentally that Bordeaux mixture was effective in preventing the appearance of the smoky fungus, if applied at the proper time of the year. One spraying, about the first of October, kept off the smoky fungus and did not cause sufficient increase in scale insects to injure the appearance of the fruit. Two or three sprayings, however, during the summer, caused such an increase in the number of scale insects as to materially injure the fruit, leaves and small branches. This increase in scale insects was due to the Bordeaux mixture having killed the fungi that were parasitic upon them, thus giving them immunity from their fungus enemies. When spraying to prevent attacks of smoky fungus it may be suggested that the solution should be applied, as far as possible, only to the fruit. The spray should be kept away from the larger limbs and the trunk, where the beneficial fungi are usually located in considerable abundance. A weak mixture, consisting of three pounds of quicklime and three pounds of copper sulphate to 50 gallons of water may be used.

CONCLUSION.

After all has been said in regard to diseases and their treatment, it remains true, as is well known, that a grove properly cared for is not half as liable to disease as one that is neglected or mistreated. Just as good sanitation and more healthful surroundings have been found to cut down the death-rate in a community of people, and prevent to a great extent, the spread of contagious disease; so the proper treatment of a grove will have a similar effect on the health of the community of citrus trees.

The year after a vigorous grove of trees has borne an unusually large crop of fruit, is the time when the trees are quite apt to become diseased. At such a time a grove should receive unusual care because of the strain that was put upon it the previous year. Some diseases attack even the most vigorous trees in a grove; but the rule is, that weakness from any cause predisposes a tree to the attack of parasitic fungi or bacteria. The old saying, "An ounce of prevention is better than a pound of cure," could be re-stated by the citrus grower as "An ounce of brains, scattered through an orange grove is worth more than a pound of bluestone put on as Bordeaux mixture." Yet there are times when the pound of bluestone may be necessary to correct conditions over which the ounce of brains has had no control.

Prof. Fawcett (In reply to questions)—

It is very important to remember, that scaly, bark was with us for forty years, as near as we can find out from the old growers, but did not cause much trouble until the withertip made its appearance.

I think you all recognize the fact that a tree that is well cared for is more resistant than a tree carelessly cared for.

The first year we used Bordeaux Mixture the scale came up by the thousands, but the second year we put on limbs bearing the scale fungi about four or five days after the spraying was done. During the second year very few scale insects developed and it was remarkable to see how free from scale the groves kept.

We used the red-headed, the white-headed and the black-headed fungi. I have used all three. The diminution of scale may have been due to some other cause; it may have been the lady birds, but it appeared to be the use of the fungi,

I think that some of the people in the State are calling the gum disease scaly bark. The true scaly bark is found very little, if at all, outside of Hillsborough County.

DISCUSSION.

Mr. Temple—You say it takes seven years for this disease blight to develop in the tree after the seed is sown. Then you say it is contagious. When does the contagion take place; before it is shown in the tree from which the disease is taken, or afterwards? Suppose I have a tree I suspect of having blight. If I immediately destroy that tree, root, branch and all, are the trees already infected or does the infection not take place until there is a further state of development of the disease in the tree I have destroyed.

Prof. Fawcett—I don't know. Possibly I have mis-stated that a little. Possibly it is that the tree must be seven years old before it can take this disease. What do you think, Prof. Swingle?

Prof. Swingle—I don't know, either. As far as means of contagion are concerned, it has been suspected that the tree may have been infected through the flower.

Now, before we adjourn I wish to say just one word about the blight. Next to the whitefly I don't think anything is more generally feared in this state than the blight, for the reason that it does not spare an orange grower. He may be ever so careful about his method of fertilizing and treatment of the trees but still the blight comes, and it is most discouraging to find symptoms of this seemingly incurable disease. I wish merely to point out the fact that you have in this State a man who is eminently capable of treating just this disease. Now, you know how the government demands results almost immediately after they have appropriated money for a certain purpose. Some sort of result must be shown in a specific time. It is entirely out of the question to get results on the blight in a short time. It simply can't be done. I do believe, however, that the way is open. In case it is not found possible for a committee of this state to obtain the money from the department, I would suggest the possibility of utilizing the Adams fund. This is granted by the government for scientific research. They are not supposed to show immediate results for the Adams fund. This is a sum of money exempt from the pressing demands for results.

You understand I am speaking in a private capacity but have reason to believe if a syndicate could raise as much as $2,000 or $3,000 per annum it would be possible to secure a grant from the Adams fund enough to get a man like Prof. Fawcett, and he would have the liberty to work this problem out in his own good, thorough time. Of course, you must remember that a man doing this work must be paid a good salary and it means the expenditure of a large sum of money and I would suggest that if the orange growers can secure from the state legislature or underwrite it themselves, it would be possible to draw upon the Adams fund for a considerable amount, and I am sure both the federal and state authorities will co-operate with them.

YELLOW SPOTTING OF CITRUS LEAVES.

By B. F. Floyd.

Mr. President, Ladies and Gentlemen:

A greasy yellow spotting of citrus leaves has been reported to the experiment station from numerous localities in the citrus-growing belt of the State. In some cases, it apparently caused much damage. An investigation of this trouble was started in the laboratory of plant physiology in January, 1908. A close study has been made of the distribution and prevalence of this disease in Florida, and of its gross effect upon the affected trees. Its effect upon the leaf has been studied in the laboratory. Numerous attempts have been made to isolate organisms that might be the cause of the malady.

Very little is known of the history of this disease. It has been known for several years, but there are no reports of its presence previous to the freeze of 1894-95. There is no evidence that the disease originated in any particular part of the State. It may almost entirely disappear in localities where it has been present for many years, and appear again after an interval. This is perhaps due to varying climatic conditions.

From the evidence which has been collected, this disease belongs to the same class as Frenching, Melanose, Dieback, and Blight; all of which are due either to unfavorable soil conditions, improper treatment, or to as yet unknown causes.

DISTRIBUTION.

The Yellow Spotting of citrus leaves is met with in the State from the East Coast to the West Coast. It has been reported from Lake City in the North and from as far South as Miami.

Its prevalence varies considerably in different groves in the same locality. In some groves or parts of groves, there may be only a few leaves affected on any tree, mostly in the upper portion of the tree. There may be many trees in between the diseased ones, upon which no spotted leaves can be found. Other groves close by may have nearly every tree affected, and on many trees a healthy leaf may be hard to find.

In November, 1908, a careful survey

Yellow Spotting and Frenching of Citrus Leaves.

Plate I.

Fig 1. Yellow spotting. Upper surface of leaf.

Fig 2. Yellow spotting. Under surface of leaf.

Yellow Spotting and Frenching of Citrus Leaves.

PLATE 1. (Continued.)

FIG. 3. Yellow spotting. Under surface of leaf, showing the melanose-like stage of the disease.

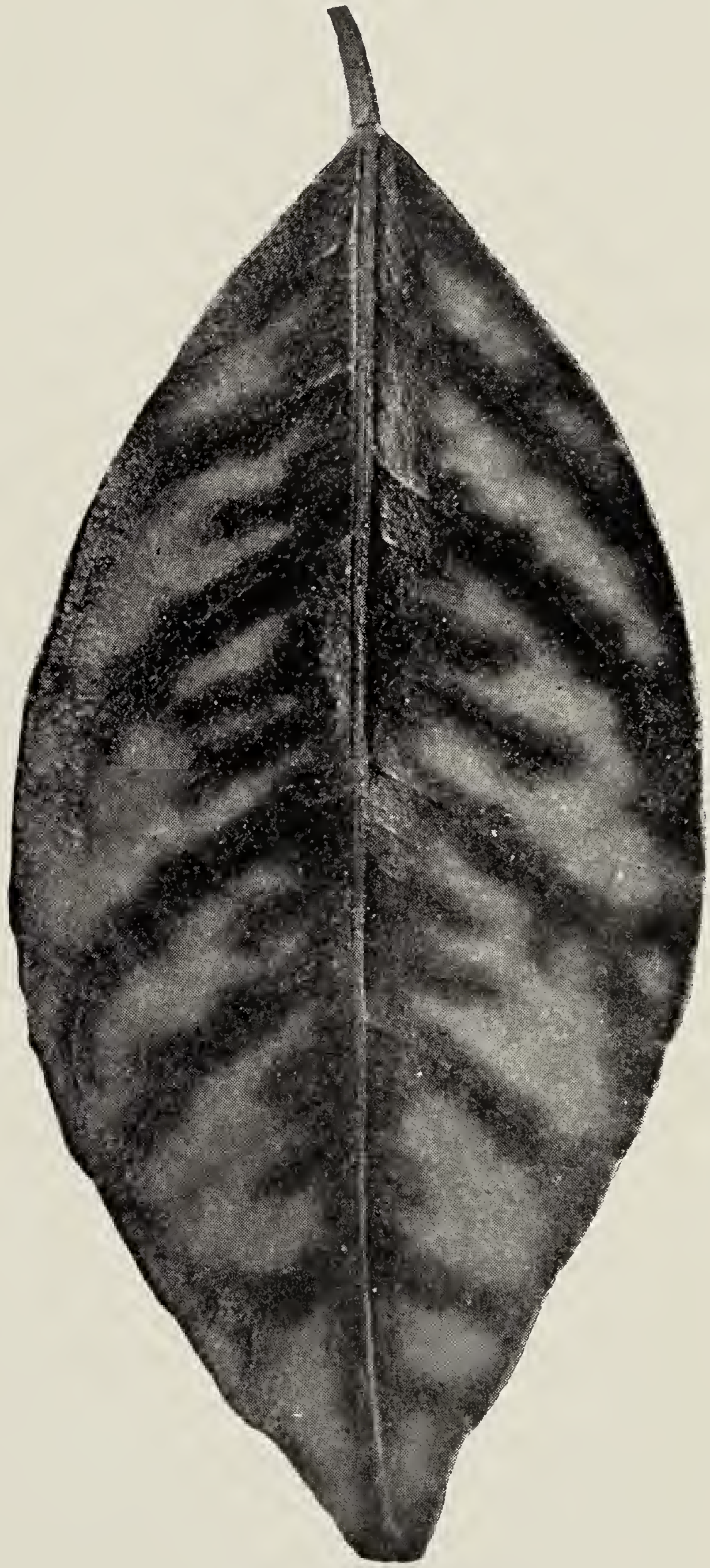


FIG. 4. Frenching.

of the groves in one locality was conducted to see if the disease was limited to any particular soil or method of treatment. The disease was found to be present upon all soils in that section. The soils were mostly hammock or high pine land. The disease was equally present in groves that had received clean culture, in those that had no cultivation, and in those that had been more or less cultivated. The disease was equally prevalent in a shedded grove and in one that was not shedded, the two being located side by side.

In the shedded grove, where sections of the roof had been removed, so as to expose to direct sunlight portions of trees that were previously shedded, the spotting was found to be more plentiful.

Very few trees under three to four years of age were diseased. In the majority of cases, the disease was most prevalent upon trees that had recently borne a heavy crop of fruit. This would suggest a relation of the disease to the weakened condition of these trees.

The spotting was found to be worst in the upper branches of the trees. When present on the lower branches it is usually thinly scattered. It often happens that a particular branch or twig may have the majority of its leaves affected, whereas the leaves of neighboring branches are perfectly healthy. This is particularly noticeable in trees that are only slightly diseased. Since these branches seem equally strong, there is presumptive evidence that the origin of the disease is within the plant, or in the soil.

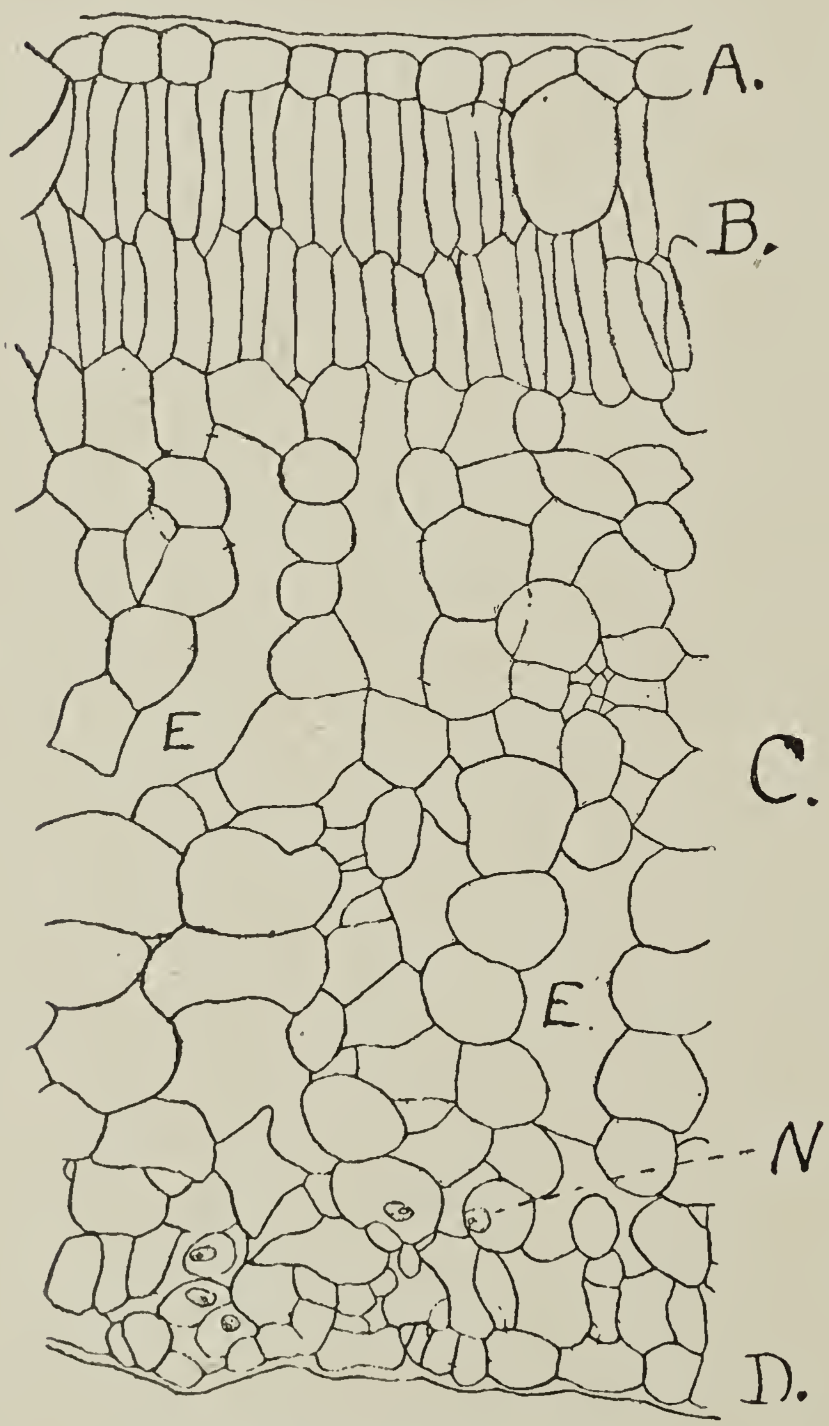
The disease is not confined to any particular variety of citrus. It is most evident on the grape fruit, on account of the larger size and deeper color of its leaves; and it is least evident upon the tangerine, on account of the smallness of the leaves. The disease is equally harmful to all the varieties of citrus which may be affected by it.

SYMPTOMS.

The symptoms of the Yellow Spotting of citrus are confined to the leaves. A spotting of the fruit resembling the spotting on the leaves, has been noticed in only one case.

There are many variations in the gross appearance of the spots, thus making it difficult to give an exact description of them. These variations are evidently due to the different reactions of the leaf-tissue to the disease stimulus. The typical spots on the leaves are yellowish to golden-colored areas, a fraction of an inch or more in diameter. They usually occur between the main veins and extend through the substance of the leaf. The areas differ in appearance on the upper and under surfaces. On the upper surface, the yellowish or golden color is more noticeable; the central portion of the area is often darker in color than the margin. It often presents a shiny, dark-brown appearance. The discolored area is not raised above the surrounding surface of the leaf. The surface of the spot on the lower side of the leaf is often rough and projecting. It usually has a dull, greasy look, and a yellowish-brown or olive-green color. The surface in old spots may become dark colored and melanose-like.

A cross-section of a healthy orange leaf when studied under the microscope, shows the leaf to be made up of layers of cells, Fig. 1. The upper surface of the leaf consists of one layer of cells, known as *epidermal cells.* Just beneath the epidermis lie two layers of cells that are much longer than broad, and are arranged as so many columns standing side by side, giving the appearance of a palisade. These cells are known as the *palisade cells.* Beneath these there are several layers of loosely arranged cells. These form arches and columns, leaving considerable air-spaces in between them. These cells constitute the *spongy tissue* of the leaf. Beneath the spongy tissue is the lower surface of the leaf, which consists of one layer of epidermal cells, with openings for air, etc.



EXPLANATION OF FIG. 1.

Cross Section of Healthy Leaf. (A) Upper Epidermis, (B) Palisade Cells, (C) Spongy Tissue, (D) Lower Epidermis, (E) Air Spaces, (N) Nuclei.

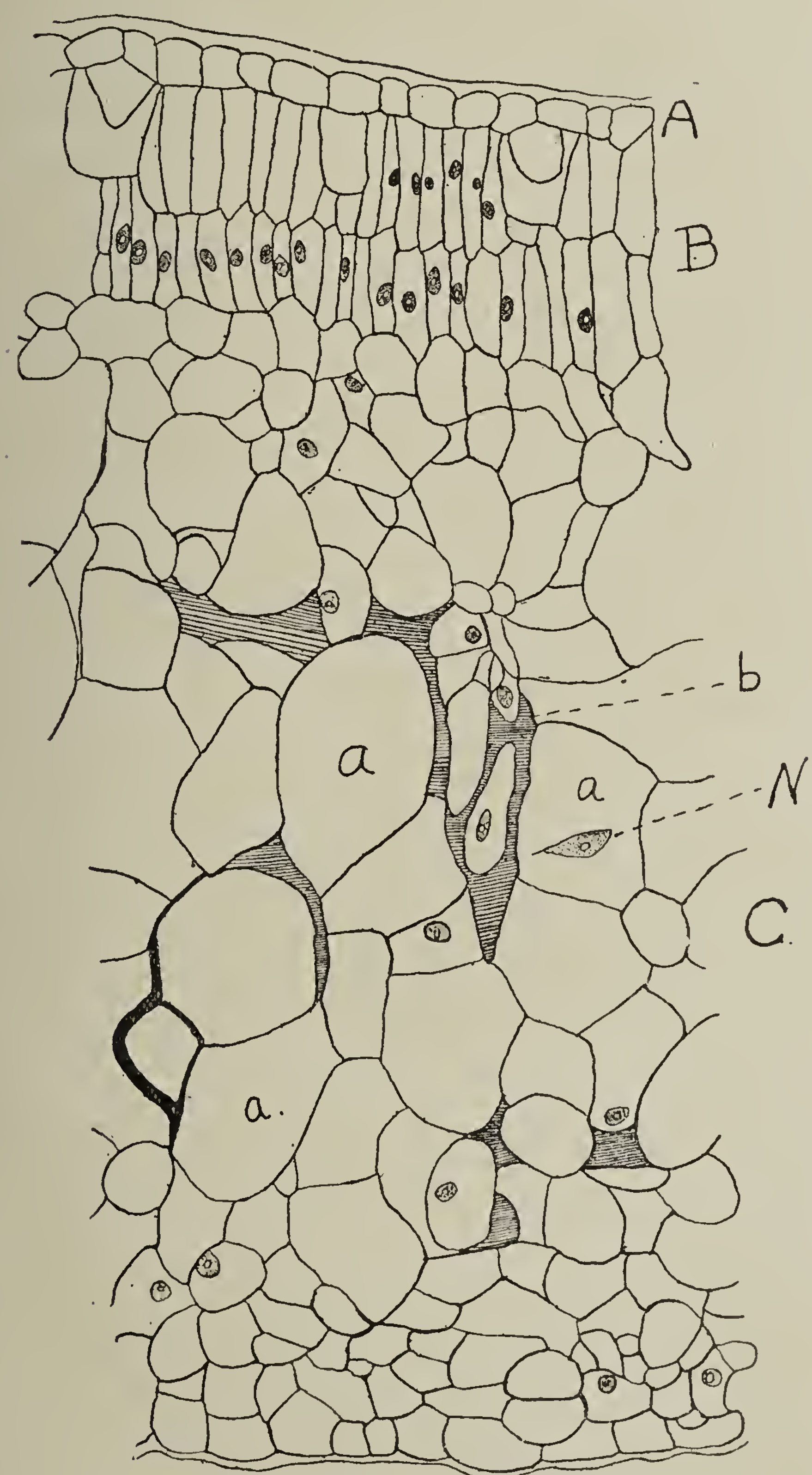
Cross-sections of the yellow spots, when studied under the microscope, show the cells of the spongy tissue to be so swollen that the air-spaces between the cells are completely filled, Fig. 2. This swelling also causes a pushing out of the lower epidermis making the spot project. A brownish gum-like substance occurs at intervals between the cells. This is a secretion from the cells. In Fig. 2 this substance is shown in the shaded portion. A brownish deposit also fills the upper epidermal cells. It is this that gives the dark color to the center of the spot on the upper surface of the leaf.

Corky tissue also develops, particularly in late stages of the spotting. It is the formation of this cork that gives the areas their melanose-like appearance. The corky tissue usually develops only on the lower surface of the leaf. It arises by division of the epidermal cells, Fig. 1. The corky tissue may also develop on the upper epidermis, taking its origin by division of the upper epidermal cells.

OTHER CASES OF YELLOWING OF CITRUS LEAVES.

There are several different yellow appearances on citrus leaves that may be confused with the yellow spotting. The yellow spotting differs in gross appearance from these by its dull greasy look and slight projection on the under surface, Fig. 2.

The most common yellowing with which the yellow spotting may be confused is that produced by the presence of insects such as the purple scale (Mytilaspis citricola), on the lower surface of the leaf. In this case, there is only a loss of green color, and usually the insect or its remains may be found on the lower surface of the leaf. Again, unless the tree



EXPLANATION OF FIG. 2.

Cross Section of Yellow Spot Area. (A) Upper Epidermis, (B) Palisade Cells, (C) Spongy Tissue, with swollen cells (a) and gum-like deposits (b); (N) Nuclei.

is severely infested with the scale, the affected leaves are confined to the lower branches.

There is often a yellowing of the leaves on trees badly diseased with dieback, which much resembles the yellow spotting, on the upper surface of the leaf; but these yellowed leaves lack the greasy projecting appearance on the lower surface that is characteristic of the yellow spotting. The yellow spotting has been found to occur upon trees diseased with dieback, but the yellow spotted areas are readily distinguishable from the yellowing due to dieback.

When trees are being starved, especially with regard to ammonia, there is a yellowing of the leaves. But this should not be confused with yellow spotting, since this yellowing is merely a loss of green color, and does not occur in rounded areas.

A yellowing of the leaves similar to that produced by starvation, is caused by the withertip fungus (Colletotrichum gloeosporioides). It is almost impossible to give a description from which a branch diseased with the withertip fungus may be recognized. Besides the yellowing of the leaves which is caused by a poison secreted by the fungus, the bark of the branch will usually have a dry, dark, iron-gray or steel-gray appearance. The whole branch will appear decidedly unhealthy. The withertip fungus also attacks the leaves, producing rounded areas of an ashy-gray appearance, covered with minute black specks. These specks are the portions of the fungus that bear the spores by which the disease is spread. This is the spotting described by Prof. Hume in his book "Citrus Fruits and Their Culture."

EFFECTS UPON THE PLANT.

Healthy leaves are the digestive organs of the plant. They manufacture the plant-foods, starch and sugar, from water brought up from the soil, and from carbon dioxide obtained directly from the air. When the working surface of the leaf is greatly reduced by any cause, there is a reduction in the quantity of food manufactured. By the swelling of the cells in the spongy tissue, the air-spaces between the cells become closed up. This interferes with the entrance of air into the interior of the leaf. The development of corky tissue also excludes the air from the leaves at these points. This reduces the supply of carbon dioxide from which the starch is manufactured.

The leaves are also the breathing organs of the plant. The energy with which the plant works is supplied by this respiration. The reduction of the air-supply thus weakens the plant by cutting down its supply of energy.

If only a few leaves on a tree are affected, the normal processes of the plant are not interfered with. But when the majority of the leaves are diseased, the life-processes will be enfeebled, and a perceptible weakening of the tree will result. Herein lies the chief harm the disease does to the tree. This reduction of the vitality of the tree allows the withertip fungus to gain entrance.

The withertip fungus is peculiar in that when the tree is of its normal strength, this fungus is unable to gain entrance into the wood. But immediately the vitality of the tree is reduced at any point, particularly in the region of the young tissue, this fungus bores its way into the plant. Once within it secretes a poison that further weakens the tissue, and allows the fungus to proceed farther inwards. When the fungus reaches a point in the tree where its vitality is equalled by that of the tree, it is unable to proceed farther. At this point, the branch will form a callus which may be seen as a ring.

Though in many places the yellow spotting has been seen associated with die-back, yet there is no proof that there is any relation between the two.

Very often the disease is accompanied or followed by melanose. This is particularly so if the trees have not been strengthened by proper care and fertilizers.

The leaves on trees that are badly spotted are usually undersized. This stunted growth is probably due to the starting of the disease before the leaves were fully developed.

CAUSE.

In searching for a cause for a disease one must distinguish between those factors that influence it, and those that cause it. For example, certain forms of fertilizers or certain methods of treatment of the trees may be an aid to the disease in its spread. Yet these are not the causal factors.

As yet no cause has been found for this disease. There is some evidence from field observations that it is transmissible, but attempts to transmit it by inoculation have given negative results.

TREATMENT.

Not knowing the cause a specific remedy cannot be recommended. But inasmuch as the chief harm appears to be due to the withertip fungus that follows the spotting, the recommendation for diseased groves is to strengthen and build up the trees by cultural methods, so that this weakening may be counteracted; and the withertip fungus thus shut out.

WHITEFLY RESOLUTIONS.

Mr. President, Ladies and Gentlemen:

Prof. Hume—If this is considered by you a suitable time at which to do so, I should like to introduce a set of resolutions directed to the Secretary of Agriculture, in the interest of whitefly control. Many efforts are being set forth at this time, looking to the control of this menace to our citrus industry, and good work is being done in working out methods by our Experiment Station workers and by the Bureau of Entomology experts. Much has been added to our knowledge of control both by fungous enemies and by fumigation and these methods properly handled will go a long way toward abating the nuisance.

But the fungous enemies do not hold control without interruption. Fumigation in some sections is not practicable and besides there are localities where re-investation would be impossible to guard against.

Now, in this connection, I believe there is another method of control which deserves careful investigation. The native home of the whitefly is said to be in China, and there is no reason to doubt but that it is there, held in check by natural enemies, the most important of which are doubtless insects. These we should have and since the native home is known, the task of securing the insect foes should not be a difficult one. What is needed is the service of one or two expert men acquainted with insects, and having a knowledge of the whitefly. The introduction of efficient insect enemies would be of immense importance not only to our state but to California and all other citrus districts of the country as well.

Therefore be it resolved that we appreciate the work which is now being done looking to the control of the whitefly in this state, by the Bureau of Entomology, and the Florida Experiment Station. We express our approval of these lines of investigation which have already resulted in much good to the citrus industry both in this state and elsewhere in the United States where Citrus fruits are grown.

Resolved that in furthering this control work we believe the native home of the whitefly should be thoroughly inspected to secure the natural enemies of the insect.

Resolved that we earnestly petition the Secretary of Agriculture and the Bureau of Entomology or other divisions of the Department of Agriculture to send to the native home of the whitefly investigators and explorers to secure the natural enemies, insect and fungous, of the whitefly and introduce them into this country to further assist in reducing its numbers and the damage which it does.

Mr. Temple—I think in my own case and most of the other growers who have that foe to deal with, we find that he is the most active "bird" we know anything about. The people in charge of the various stations with their fungus, Dr. Morrill with his fumigation, other people with their various sprays that I have tried in the most thorough and systematic manner possible; all have some way to combat this pest, and while they are all good to a certain extent, yet they offer only temporary relief. Fumigation I know by experience is good, because I fumigated one of my groves and it killed everything that way in there, but in thirty days the grove was infested again with the whitefly. The methods now employed might be used to advantage if the whitefly was only a local nuisance but there isn't much use in going to all the trouble and expense to fumigate and spray when the first wind that blows will bring in a fresh swarm from an adjoining grove. My home place is on a lake and when the flies are on the wing and the wind happens to be in the north, they come across in swarms like blind mosquitoes. As they are not the result of spontaneous generation, they must come from somewhere. They have a habitat somewhere; Prof. Hume says China; if that is true we should dislike China more for her whitefly peril than her Yellow Peril. We must get at some method of controlling permanently this menace, some whitefly evil that will subject it before it subjects us, and I think the people who suffer from it feel as strongly as I do. Now, you people who haven't the whitefly, don't feel slighted; you'll get it. You are just as much interested in this, because you are going to find out why we feel so strongly.

Mr. Hart—I also wish to second these resolutions most heartily. It is work along the lines I think will be most effective. Mr. Temple has expressed my sentiments in regard to it exactly. I believe to obtain permanent relief we will have to depend on the natural enemies. It is not only on our groves but all about us on other places. If the department will make an effort and it is successful, in a short time I am satisfied it will cause the whitefly to drop back as a minor trouble. I am sure the department will assist us in this matter if we go at it in the right way, and I will be willing to contribute liberally to send a horticultural explorer from this state. I heartily second the resolution.

Mr. Temple—I will be glad to be a second member of Mr. Hart's syndicate to under-write it.

Mr. Parker—I also wish to heartily second this motion. I have several times made a statement to different parties that I thought the time was at hand to locate the home of the whitefly and its natural enemies, and I think the time is now. Fumigation, sprays and fungi are all doing good work. Fumigation and spraying are artificial means and fungi are the natural means, but we need all the help we can get.

I understand our worthy President is

going abroad and expects to spend some time in the eastern countries. I am sure he will be interested in hunting up or finding whiteflies there, and probably sending them to us after he is sure they are all good and dead, for comparison. He must be sure they are dead, though, for we want nothing imported but "good" whiteflies.

Prof. Swingle—I am glad this matter has been brought up because I believe no one subject is of more general interest. I do not think it is generally understood the numerous difficulties that stand in the way of fumigation in this State. The mere mechanical means of handling tents is a serious matter. Then there are people who do not and will not fumigate and we know the whitefly can migrate rapidly to considerable distances aided by a favoring wind.

If it is found impossible, as it often is to secure government aid, because the appropriations are made two years in advance, I would suggest co-operation with the orange growers of Texas and California because it is a great menace in both of these States, and I am sure the growers there will be glad to assist you.

Mr. Painter—Would it not help us to obtain an agent from the government by our offering to contribute towards that expense, showing that we are willing to do our part towards accomplishing the end we seek? If it will, I want to be one of the number to help.

Prof. Swingle—I do not think the matter has ever been adequately presented. It is not realized that fumigation is not a complete remedy. They should have the matter presented to them by someone who is thoroughly familiar with conditions and has the whole situation at his finger's ends.

Mr. Hart—If we could get help by sending a delegation to Washington to bring the matter before committees there, it would be given much more attention than anything we could write out and send them in the form of a resolution. I think action in that line would be good.

Mr. Painter—If the people will offer to pay half or more of the expenses of such an agent, the Department would take to it quicker than if we send a request to them to send an agent.

Dr. Richardson—It sometimes happens that we think we experience religion early in life, but we find that we do not really get down to an enjoyment of its full beauties until we get pretty near the end. I think we have got down now to the most vital matter yet presented to this Society. I think the Department at Washington should take this matter up; independent action may do us some good. There is always a danger, you know, of the introduction of enemies to bring something worse than the pest; therefore it should be a thoroughly competent man who would not do that thing. You remember the story about the two Germans who wanted to go out on a coon hunt and borrowed a neighbor's dog. Finally the dog treed something and Max said "Hans, hadn't I better go up the tree and shake him down?" So he went up the tree and almost immediately a most tremendous racket commenced. Hans yelled "Max, do you vant me to come oop and help you hold him?"' "No, Hans," said Max, "but come up and help me turn him loose." He had got hold of a wild cat instead of a coon. Now, in our business, we don't want to get hold of any wild cat that we can't turn loose. There is considerable danger of it. I know of one man who tried a harmless (?) remedy in his fly infested grove, and it has nearly destroyed his grove. Now, we want to send some man who is willing to take this matter up thoroughly and do it in an intelligent manner. No doubt you appreciate that fact.

Now, so far as your President going abroad, he is going merely as a superficial observer. I will not have time or ability to take up this subject, but of course I will observe carefully and do what I can for you.

I think this resolution is one of the most important things that has been before us and I hope it will be adopted.

Motion made, seconded and carried that the Committee sent to the American Pomological Society, namely, Messrs. Tabor, Hume and Painter, visit the Department and submit this resolution in writing.

Prof. Swingle—I wish to make a motion that our retiring president be appointed an official representative of this Society on his trip and that any courtesy extended to him will be appreciated by the Society. I have had experience, and I think something official will aid him in getting access to gardens, both private and public and get him facilities that a strictly private citizen might not be able to secure. Motion seconded and carried.

Report From Committee Visiting California.

By W. S. Hart.

Mr. President, Ladies and Gentlemen:

I am a little afraid that our members present may be disappointed in the value of my report of the visit to California, for the reason that I did not know until this morning that a report was expected. If the convention had been held a week or ten days later so that more of the members of that committee could have been present, then we might have had a very important and valuable report, I am sure. Since my return I have not really had time to give a thought to the matter much less to get our experiences and impressions up in a systematic form. If I miss any points, just fire the questions at me and I will do my best to answer them.

In the beginning let me say that this party started out, not for a pleasure expedition, but for business. It is true that we had every courtesy shown us, every comfort that modern convenience could supply in the way of Pullman cars, diners, observation car and a club car; three cars being devoted to our exclusive use, and on the way back there was as much of this as we needed, though part of our party was left on the way. We stopped at the Grand Canyon on our way out and the Pullmans were kept there for us. As we went to Los Angeles the next day and while still in the desert a committee came out to meet us from San Bernardino, bringing flowers and fruits and in that party were fruit growers, bankers and others who could answer intelligently almost any question we might ask of them.

When we got to Los Angeles, the Chamber of Commerce gave us the Directors' room in which to hold our meetings, which was most excellent for that purpose. The California Fruit Exchange invited us to be present at their business meetings so that we might see the inside workings of their system and they showed us their books and gave us every opportunity possible to study the marketing system of California which is, no doubt, the best in this country. If their method of handling fruit can be adapted to our state so as to meet the needs and requirements of at least a large portion of the shippers, as I am sure it can be, it will mean a saving of hundreds of thousands of dollars every year.

Leaving our baggage at Los Angeles, Messrs. Powell and Burton conducted our party to Corina, Azuso, Pomona, San Dirnas, Riverside, Redlands, San Bernardino and other places and for two days we were taken through the groves, through the packing houses and through the most beautiful spots of one of the most beautiful countries in the world. We were given every opportunity of studying their system of packing and handling fruit. At Riverside we were taken to the top of quite a high mountain, standing alone in the valley, where we could look down upon twenty-five to thirty thousand acres of thrifty orange groves with the San Bernardino range of snow-clad mountains to shelter them and form a noble background for this beautiful picture.

Leaving Los Angeles, we continued on to San Francisco, then to Chicago where we were taken all over the city in an automobile, through the wholesale fruit districts, etc., then home.

I hardly know where to commence; there is so much material I can only give you a little smattering.

The president suggests that I give you an idea of the size of the groves, trees, etc. I will say that the trees, many of them, are not large; perhaps they may average something like ours, but I was taken through one grove, Mr. Powell's grove, at Azusa, where the record returns for California were made. In one crop they made $5,000 off two acres. These trees were large and being budded at Valencia late, the fruit comes to market in the summer and fall and meets no competion. Further north, in Tulare County, large areas are being planted and a great many young groves are coming on. They tell me they are planting very heavily around that point. I am told that the fruit raised is of a much finer quality, being more like a Florida orange. I saw some of them at San Francisco, that were really very good fruit.

Some of the California handling and packing system can be adopted and applied by the large growers here in this state, but I want to tell you that the California orange will stand treatment that would put a Florida orange out of business. Take for instance, just the mere method of putting on the covers. They fill their boxes full of oranges level to the top, then they put on another layer. It is then put under the press and the cover brought down and nailed. Suppose we tried that with our fruit. The person who did so would be soaking wet in five minutes from the juice flying from the oranges. Yet Mr. Powell who has done so much to improve the methods in California, told me that the top layer did not show decay as much as the middle.

A great many of the packers and shippers think they are handling fruit very carefully and they are taking a great deal of pains to do so, but there are those in Florida who can discount them in the handling and grading of oranges. They really don't know what really careful handling and packing is. Perhaps they do not need to, however, as their fruit will stand much rougher handling than ours. They have been held up to us as models and justly so in many ways and they have many methods that we might follow to our advantage, but they may also learn much from a careful study of Florida methods and practices.

Some of the packing houses are operated by the independents, and some, the greater number, of course, are under the fruit exchange management. There are a great many different methods, but in a general way they resemble each other. In some, the fruit is first washed or brushed and then it goes on to the belts that carry it along to be graded. After grading it goes into the long sizers, thirty-two feet long, most of them. In some of the houses they use an electric sizer where the oranges are carried along on a belt until a certain size will trip a certain finger which causes it to be kicked off the belt into the packing bins. The fruit of California is all sized by the smallest diameter. Our fruit needs to be sized by the largest. Therefore, we have to have a different system of sizing than they have there. They have a box-making and nailing machine that will nail from 1,200 to 2,400 boxes a day. The machine turns them off very rapidly. One man to attend the machine can turn out 1,200 complete boxes or more; two men about 2,400 boxes a day. Their boxes are made with two pieces on each side and this machine turns them off complete. They use a fancy label that they paste on the head of the box, as you probably all know. Quite a number of packers of the state told me that they wish that they had never been adopted, but still they look very pretty and they have a very great variety of designs.

Instead of grading by number, they grade by brand and have a different brand for each quality as put up. There is one packing house at Riverside that now stamps a little tag right onto the orange. When you unwrap the orange, there is a little elephant that stays right with the orange until it is eaten. The orange never loses its identity. Pre-cooling before shipping is being carefully tested there with very satisfactory results. The marketing system was explained at our last meeting. I will not attempt to give you that now, because I think most of you have had it through what Dr. Inman has said.

Question—How far apart are the trees planted in the old groves and the new ones, and about what is the average crop?

Mr. Hart—Well, the trees are planted at various distances as in this state and I think they will average about the same distance apart as on our hammock lands. I don't think many of them are as far apart as in some groves on the pine land here. Those very large trees I spoke of covered only two acres and were much larger than any others I saw. I don't know what their yield was in boxes but four, five and six boxes to the tree seems to be about the average judging from what we could learn there.

Question—Tell us about the cleaning system:

Mr. Hart—Most of the oranges are washed or brushed, although some are not. Where the fruit is clean and they can avoid it, many neither wash or brush it, while in other groves, all the fruit is washed. Some of it is run through a solution of permanganate of potash to kill all germs, but Mr. Powell told me that no chemical could be used that would kill the spores of blue mould.

Dr. Richardson—Is that used in such strength as to color the orange any? It is one of the active discolorants of water and possibly it may color the fruit.

Mr. Hart—No, I don't think you can discover any effect of that kind on the orange.

Dr. Richardson—It is used for the purpose of destroying germs, possibly. It is one of the best germicides known.

Mr. Gillette—How does the quality of their Tardiff orange compare with ours?

Mr. Hart—It is a thicker skinned fruit, and a darker red, but is not as heavy a fruit and I think will average smaller.

Mr. Dade—Do they have rusty oranges there?

Mr. Hart—No, I don't think they have the rust mite there. I talked with the horticultural commissioner about it and they thought they had, but the specimens they showed me did not show the effect of the rust mite. I think it must be something else. They have had a little touch of the whitefly but are confident that they have wiped it out. The commissioner told me he would give me $5.00 to find a whitefly. They exterminated it with fumigation; that is, they cover the trees with tents and treat them with gas. In California, that is a very much more simple matter than in Florida. Where there is irrigation they can raise almost anything—orange trees, pepper trees, eucalyptus and roses galore; oh, such roses!—flowers of all kinds, but just outside the line of irrigation there is nothing but sage brush or scrub; no timber at all, while in this country we have plants and trees that are host plants for the fly, scattered all over everywhere. Now if they can clean up a grove out there, the whitefly does not come in from outside. It is true orange groves there are all in one great body generally, but if they gas their trees and do it universally—and they have laws there which make it compulsory—I don't see why they cannot just about exterminate him. With us it is entirely different and a far more difficult proposition. We have got a state full of china berry trees and all other kind of trees that harbor the whitefly about as well as the orange trees and when we fumigate or spray to kill the ones that are in the grove, the ones from the outside sit around and wait until we have finished and then come right in and live with us.

Their worst enemy seems to be the black scale, which is confined largely to the coast. The purple scale, which with us is a minor trouble, seems to trouble them a great deal. They have a gum disease among them. The gum will ooze from the limb or the trunk. They tell me the disease commences from the inside of the trunk and in a little while the limb or trunk is dead. They have no treatment that they claim to be a positive cure but several things are recommended for it. It very much resembles the foot rot on our trees only that it appears higher up in the tree. The best remedy they have found is to dig out the dirt and expose the roots. Some apply one or another application to it, but I think that the most satisfactory remedy that they use is to just dig under the trees and expose the roots.

Question—I would like to hear about the labor they have in picking and packing fruit. How does it compare in intelligence and availability with ours and what do they have to pay for it.

Mr. Hart—They use white help mostly. The greater portion of their fruit is packed by white men and women. In some packing-houses they use the Chinese and I think they are found quite satisfactory help, too. They seem faithful and a number of growers to whom I talked seemed to think them very good help. There are not many Japanese employed and as a rule they are not liked as well as the Chinese.

Question—Did you see any paraffining process?

Mr. Hart—I did not. They have another trouble that looked to me very much like blight but when I asked about this tree or that tree that was suffering from it, they told me it was caused by gophers. Mr. Chase, who is one of the largest growers in California, told me it cost him $1,000.00 a year to fight gophers.

Question—Why is it necessary to put the extra layer of oranges on top as you spoke of a few minutes ago?

Mr. Hart—It is to make a full box. They claim that unless they pack very full the fruit gets into the market loose. In going through the fruit districts in Chicago, I noticed the fruit coming from California showed full boxes.

Mr.————Did they nail down the head at the center?

Mr. Hart—No, only at the two ends.

Mr.————Mr. Chase has been introducing a bulge pack similar to the California pack. His man at Sanford started it first at Sanford. You know the pack I mean, do you not?

Mr. Tabor—Did you find out what stock those trees were budded on, the ones that showed the gum disease more prevalent?

Mr. Hart—I do not think that the stock, so far as I could tell makes much difference because the disease is up above the bud or in the limb, so that so far as I could learn the stock made very little difference.

Mr. Stevens—Have they a choice of stock?

Mr. Hart—They are getting seeds of sour oranges from this country and prefer the sour stock

Mr. Tabor—Is it true in Florida and in Cuba that trees budded on lemon stock show gum disease much more than sour?

Mr. Hart—I am not an authority on that. I have not had enough to do with the rough lemon stock to know of my own knowledge, but I have had experience enough to make me dislike it, and I do not think I shall ever put any more in my grove.

Mr. Quinby is present, and undoubtedly he can answer a lot of questions that I cannot, and I think you had better ask him to talk a little.

Mr. Gaitskill—Just a moment. Tell us before you go what they have out there in the line you have been talking about that is better than what we have that could be adopted here.

Mr. Hart—I think the belt system of carrying the fruit along for grading will be adopted by a good many of the larger growers. It would not do where extreme care is taken, because the fruit is going along pretty rapidly, and if they miss a No. 2 or 3, it goes into the No. 1 fruit. I do not think their nailing machine would answer for our boxes, because we strap ours while they only nail a little piece across each end of the cover, which is done when the cover is put on. They have a little device for holding the paper wrappers which they all use. It simply holds the paper in the tray when you are packing and keeps it from blowing about. They also use a "nail stripper" that is a help. There are small devices like that, some of which I have adopted and some I cannot. I am not the one to pass on the general packing-house outfit for the larger growers of the State, being only a small grower and requiring a totally different arrangement.

Mr. Gaitskill— I have found your suggestions good and anything that is good for you will be good for me.

Mr. Hart—There is an orange clipper that they use in California, and here is a new one just gotten out which I will leave on the desk for you to examine.

Mr. Quinby—I went with the California party and gathered in a good deal of information while out there, and a lot of it would be interesting and doubtless instructive to this audience. My voice is not at its best, but possibly it will improve the carrying quality of the Florida orange.

I am connected with the firm of Chase & Co., of Jacksonville, who market considerable of the Florida oranges and other perishable products. We examined pretty thoroughly into their marketing system while in California; in fact we went into the intricacies of it and there has been a time set on the 1st of June at Tampa to bring in reports.

When we arrived at Los Angeles, Dr. Inman called a meeting at the Chamber of Commerce, and we undertook to systematize the work for which we had gone there. The subject matter was divided into headings, such as packing houses and their appliances, selling, government investigations, and a number of various heads that we wanted to know about, and committees were appointed to take up specially the matter on which they were to be prepared to make reports to the meeting at Tampa on the 1st of June. I was on one or two of these committees, and while I took copious notes I have not looked over them at all since I came back, and I don't know that I can say anything in addition to what Mr. Hart has said, except to answer such questions as you may ask to the best of my ability. I would not undertake to go into full and complete relation of what we saw and heard and learned while in California.

It seems to have been the expectation of this meeting to have more or less reports from the committee who went to California in a formal way. It was suggested to me that if we passed a resolution to incorporate into the report of the Society the reports and results of the meeting which is to be held in Tampa next month, then it would be in print for the members of this Association and they would have the benefit of it in this way. I do not know your regular custom, but think it would be a good idea to pass a resolution now that the Secretary shall incorporate into the official report of the Florida State Horticultural Society the report that is made in Tampa on the 1st. of June, and then you will have that report in full.

Mr. Temple—Do you know how much their oranges cost them per box on the trees out there as a general thing?

Mr. Quinby—No, I do not know; that is, interest on investment, working, fertilizing, etc. I should say it is just about the same as in Florida for the reason that they cultivate a great deal more and they spend a great deal more money on irrigation than we do here, but they are almost free from having to use fertilizer. That is almost unknown in California. Their oranges are grown on what I have known as clay soil. It has more or less of crushed granite and that keeps it loose. They do not let anything grow on it except the orange trees themselves, and cultivate all the year round.

Mr. Temple—Do you know what they receive as a general thing for their oranges on the trees?

Mr. Quinby—They get about 90 cents. or $1.00 a box on the trees. This is clear of the packing-house charge and the marketing expense.

Mr.——————What variety do they grow principally out there?

Mr. Quinby—We saw very few oranges except the Washington Navels. There are a good many Valencias, but I think about 80 per cent. of the output of California is Washington Navels. Now what they are putting out in Tulare County, which is about 300 miles north of Los Angeles, I don't know. They are planting very heavily there, however.

Mr.——————How does the price of box material compare with ours?

Mr. Quinby—It is cheaper than ours. They buy it by the wholesale. They have their own mills. They have cut loose from a lumber trust out there and have backed up certain independent mills that were about to go broke, and in that way have kept the mills running and have been able thereby to take about all the output of these mills. Their package is not as good material as ours; it would not do with us for shipments in less than carload lots. The bottoms and sides are slats, and the ends are solid.

Mr.——————Is there much setting out of new varieties?

Mr. Quinby—In Southern California proper, that is, those valleys lying around Los Angeles, there is a fair amount of setting out, probably just as much as in Florida today. In Tulare County there are a great many new groves being set out. I am not prepared to tell you whether they are planting in the new groves a larger number of Valencias than the Washington Navels or not.

As to the production of oranges, unless there are disasters to the groves, or crop disasters in the next six or seven years, the output of oranges will be almost overwhelming. We were told that there were 20,000 acres of new grove property coming on in Tulare County alone. They are putting out groves in Arizona and Texas, and the increase in the Florida output in the next seven or eight years will be enormous. This fact is rather significant if you stop to think about it. Of course we don't know what disaster may happen to reduce that output.

Mr. Christiancy—I understand the water supply is playing out on a number of large dams in Southern California. I spent 15 or 18 years in California, and know of two large dams that went dry at one time, and they were a couple of years in getting water.

Mr. Quinby—We did not look into the water supply. We know that the water is sold, and in some sections the water contracts are appurtenant to the lands.

Mr.——————Tell us the methods they use for getting their fruit into the market?

Mr. Quinby—That is a wide question, and the meat in the cocoanut. To handle a Washington Navel orange, considering the geographic position that California occupies in relation to its consuming markets, I don't know of any set of men who could improve on their system unless they were all Solomons. Their system is something that has evolved itself. It is not the work of any one man or set of men. It is the result of experiments and the natural evolvement to fit the conditions of California. The method is this; last year the exact figures that the California Exchange handled in oranges was 5,440,000 and some odd boxes that represented 56 per cent. of the total California output as near as they could get complete record, and that would throw the crop between 9,000,000 and 10,000,000 boxes. The estimate for this year is for a crop of 12,000,000 boxes of oranges and they estimate that the Exchange will market 55 to 60 per cent. The officials of the Exchange do not claim that their control will reach beyond 60 per cent., and Mr. Story, who is President of the Exchange, told me it was not wise for them to undertake to market more than this. He said that in order to make a success of this thing there must be competitive selling, not competitive underselling, but competition to return a better price to the grower all the time. Competitive underselling, which means a cutting of prices, must be stopped. California has arrived at such a point that they are in condition to stop under quoting, and the Exchange desires to market no more than 60 per cent. of the crop, so that conditions may remain as they are today. Now the 40 to 45 per cent. of fruit that is sold by the independents is marketed both by salaried associations and also agencies working by per box contract, and in some instances are affiliated with the Exchange; and most of it is marketed on f. o. b. or in transit basis or else a spot cash basis. This means that if a buyer is putting his money into the fruit, that fruit is going where there is a demand. Under the system of cash buying and f. o. b. and in transit buying, that much of the goods takes care of itself, because it is going where there is a demand. Now the 60 per cent. is the balance of the product, and it is up to the California Fruit Growers' Exchange to take it and develop it into a paying proposition. Their number of f. o. b. and in transit sales are almost minimum. They have abandoned the f. o. b. and in transit sales almost entirely. They have the markets of this country extremely well guaged and they can sit in their offices and tell you just how many each market should take, and how it will make the market waver if you give them any more, and how it will make the price come up if you give them a little less.

Suppose the fruit goes to Kansas City and the market is a little off. The buying trade is told the price is so-and-so. They look at the fruit and take it or reject it. If it is refused the man in charge of the selling end in Kansas City wires in to Los Angeles that the trade will not take it at the price he offered it to them. Then they may tell him to sell so many cars at the price he is offered and divert the other cars. Possibly they may divert the whole lot. They carry their goods all over the country. and the Washington Navel will stand it. There is no additional cost for freight. In other words, after the cars once get to Denver it costs no more to send a car to Boston than to Kansas City. In that way they distribute vast amounts of oranges. and at this present time it is a fact that they have every known market just about crowded without having to make concessions on the price. They have studied this marketing question for years from every possible standpoint. It is a wonderful thing to sit in their office out in Los Angeles and see how they know the exact condition of every market, how they can put their finger on every car that is between California and the Atlantic Ocean, guage almost to a carload what this market will take without the price being lowered, and taking away a little here where there is too much, to hurry it across several states perhaps, where there is not quite enough.

The Board of Directors are representative business men from every orange growing section in California.

Now, those people out there know that the quantity of oranges going into the markets is getting to be enormous. They know that in the next six or seven years the present output will be greatly increased; therefore their far-sightedness is such that they are already beginning to work on the consumer. They have commenced newspaper and magazine advertising that will bring the matter right before plain John Smith and his wife, so that it will create a desire in them to have oranges on their tables. They took the State of Iowa and put aside $————for advertising. They don't work on the jobbing trade nor on the retailer. They went right to work on the consumer. and are making him desire it, and they have increased the consumption in the State of Iowa about 50 per cent. the first year. They have appropriated money out of the common fund to increase the consumption in that way. These people are right up-to-date—in this instance you might say they are ahead of time, and they know what judicious advertising does.

It is going to take lots of time and long-continued efforts to bring order out of the chaos into which the Florida orange growers have fallen; perhaps it is not so much chaotic as lethargic. We have needed an awakening for some time; last winter's prices showed how much. It is going to mean spending money; it is going to mean co-operation, but for every cent that is spent I believe you will get a dollar in return. Above all things it means co-operation, one and all.

Out there they do business by encouraging the small buyer just as much as any other; they give him just as good prices on a one-car lot as on several; they give him just as much advantage of market conditions and just as good grades and brands for the money as they give the twenty or fifty car man, because the small buyer is always ready to do business for a little less than the big one. Now about selling direct to the consumer. I have heard Mr. Chase talk about this. I think there is but one way to do this, and that is to go into the store business in every city. That would mean a good deal, and I don't think we are prepared to follow. The thing is to try to introduce the general use of the fruit into the small communities. Because a small dealer is poor is no reason why we should try to keep him poor.

The independents use the auction to some extent. This is the final court of reckoning for all the California product. They may have peddled it across the country and finally wound up there. They never sell privately in any market, that is, the Exchange does not where there is an auction. In those markets where there is a fruit auction they do not sell outside.

Mr. Christiancy—Can you tell us how long it has been in this systematized condition?

Mr. Quinby—In 1892 they were just as disorganized as we are today and for ten years they had a terrible time and a terrible struggle. In 1903 they began what was known as the Fruit Agency, a joint office of the Independents and the Southern California Fruit Exchange as it was then called. This Agency ran from the 1st of April, 1903, until the 31st of August, 1904, and was a consolidation of all agencies into one selling office. There was only one office from which you could buy fruit. The fruit carried badly that year. They abandoned the Agency and now let the Independents compete with the Exchange, so that the grower has two strings to his bow, and a good many take advantage of it. Until after the season of 1902-3 under the regime of the Southern California Fruit Exchange, was a hard time for California growers. There were individual interests fighting the Exchange, marketing interests fighting it that were tied up with car lines, and corporations fighting it. From 1892 to 1903 they were not making much of a success of it because they were fighting each other. They fought so hard that they agreed to stop fighting. Now with the California Fruit Growers' Exchange handling 55 to 60 per cent. and the Independents the balance, they have things in pretty good working shape, and it would be well for us to follow it as nearly as we can, adapting it of course, to suit our different conditions.

Mr. Christiancy—I have been told that on all fruit that goes out of Riverside the grower is paid the same price per box; that is, every man gets the same per box for his fruit whether he sent 39 or 3,900 boxes.

Mr. Quinby—That is true in California except those growers who put up their own fruit. The grower does not know anything about the price per box. His fruit is weighed in at the packing-house and of course, he knows how much his fruit weighs. Then it practically loses its identity. It is graded and then it goes on the sizer belt. His fruit is entered upon the books of the association by its weight and the distribution of returns is made according to weight. He does not know how many boxes he has, and it would take a Philadelphia lawyer to figure out what his fruit has brought him per box. His fruit loses its identity and individuality entirely after it is weighed.

Mr. Christiancy—The officials of the Exchange then could spend a half million dollars of the money and the growers would not know it.

Mr. Quinby—I must say that I don't think there is any grafting going on in the Exchange. One or two are said to have been made millionaires in the past, but I don't think there is any of that now. I think they are holding back 10 cents a box now to create a fund for advertising purposes and other things possibly. Their fruit is sold on the box basis and the returns come on that basis to the local associations. There it is split up into pounds. The records on the books are generally in pounds and so are the credit to the individual growers. The distribution is made in that way.

DISCUSSION.

Mr. Penny—I make a motion that the California committee be requested to furnish a report to our Secretary so that it may be published in the proceedings of the Society.

Dr. Richardson—You have heard the motion, which is to the effect that the Secretary of the Society be instructed to ask the Orange Growers' Society for copy of the report of the California Committee with the idea of copying it, or such portions of it as the Secretary and Executive Committee may deem wise, in our printed journal. I presume that is the way you wish the motion put, Mr. Penny?

Motion seconded and passed.

Mr. Hart—I want to bring up the matter of this trip to California before we go on to the next topic. On this trip, the greatest benefit I received was contact with the men who made up the party. They are men who are successful in the line of work they followed. Now, I want to urge upon the members of this Association the importance of their going to Tampa to attend that meeting there. It seems to me that the psychic moment for organization has arrived. Of course organization will not make returns of $2 or $3 a box for poorly packed and poorly grown oranges, yet where fruit is properly handled the grower will get better returns for his money invested, his work and trouble in growing the fruit and will not feel that orange growing is so much a venture but more of a legitimate business. I hope that every orange grower, in fact, everyone interested in Florida and her future prosperity will attend the meeting and help in the work, and I think it will be a mistake if the orange growers especially, do not do so.

Dr. Richardson—I most heartily agree with Mr. Hart. I feel strongly every word said in my address last night. I feel that the time is upon us now when we should demand and get our rights. This paper that has been read is of vast importance. It shows us what a small body of men, comparatively speaking, have been able to do with the railroad situation, and this small body of men have prevailed upon the State Commerce Commission to save us a great many thousand dollars. If we all combined, what might we not accomplish? Our savings would mount up into the millions in a short time.

This Orange Growers' Association is, as I understand it, still in an embryonic state. There was a meeting called in Tampa some two or three months ago for the purpose of organization. The organization was not completed at that time. We decided that a committee should go to California and spy out the land and come back and report on the 1st of June to another meeting at which all orange growers and all men interested in horticultural and agricultural matters could come and be welcome. We hope you will all come; as a citizen of Tampa I invite you and as a member of this Society and as its President I urge upon you to come to that meeting. It did me good to go to the preliminary meeting. Mr. Hart says it did him good to be associated with men of their calibre, and I am sure Mr. Hart will permit me to say that it did them good to be associated with Mr. Hart. No thanks are necessary sir, I am sure there are no growers in the State who could not learn many things from you.

You must wake up to the importance of organization. We have to do it some time, and why not now? Why wait another year and get returns that will barely pay the running expenses; perhaps not that. These men in California are reaping a rich harvest as a result of their organization. We must take some decided action if we expect to get anything in the way of returns.

I feel that it is incumbent upon the Chair to reinforce Mr. Hart's and Mr. Quinby's remarks. Get your local papers, if you can, to call attention to it and let it be the beginning of organization that will give Florida her rights which she has been denied so long. Who is to blame for it? Who is responsible for the conditions that are existing today, where we, who grow the best oranges on earth, can hardly make the expenses necessary to grow them? *You* have no one but yourself to blame. In your strenuous opposition to each other you have forgotten that it is only in union that there is strength. Fighting each other, you are like the Kilkenny cats; in joining forces you may assume proportions that will win you the victory over all opposition. Don't let this matter fill you with enthusiasm for the time being, and then be forgotten. Join forces with the most influential men, the brainiest men, the most successful men and help them to make this thing a success. You have everything to gain and nothing to lose.

Dr. Richardson—I have been testing these clippers. I don't know what Mr. Hart intended to do for the people of California in bringing these as samples but have been testing them on some rose stems here on the desk. The clippers from California do not cut rose stems every time, while Mr. Hart's clipper cuts them every time.

Tropical Fruits.

By E. N. Reasoner.

Mr. President, Ladies and Gentlemen:

From the latitude of Florida one would judge that sub-tropical plants would be the limit in tenderness that the inhabitants would try to grow; but its peninsular position with large bodies of water surrounding the southern half of the State tempt us into growing entirely tropical plants, which from time to time are frozen back by the Northers sweeping down on us from "up country."

If Uncle Sam in his reconstruction of the map instead of considering a ship canal across the State would kindly look into the matter of building us a mountain range across the northern part of the peninsula we of South Florida would consider it much more to the point. With that protection we could grow nearly anything, even as it is we are able to raise a great many things of value; fruit trees, economic and ornamental plants, trees, vines, etc., of the more vigorous and hardy members of the Tropics.

The most valuable have come to us from India, Mexico and the West Indies, and in fruit trees and plants the following find a congenial home along the coast and in the protected Lake regions of South Florida, where they are seldom injured by cold; the pineapple, the mango, the banana, the guava, the avocado, the sapodilla, the sugar apple, the custard apple and a few less valuable, all being well known and grown on a commercial scale.

The cultivation of each of these is being extended and the best varieties for Florida conditions are being tried and tested thoroughly. Much assistance has been given along this line by the Department of Agriculture, especially through the efforts of the subtropical laboratory at Miami, where hybridizing pineapples and other work is progressing favorably. However the greater knowledge as to culture and shipment of these fruits has been worked out by individual growers so that now there is a substantial base to work from in selection of suitable location, soil, fertilizing, cultivation, frost protection, packing and shipping the fruit.

The pineapple so far stands out preeminently as our most valuable tropical fruit and the plan of selling fruit through the association of growers is admirable. Pineapples are mostly grown in open air and the principal variety is the Red Spanish. In localities where frost is more likely to occur, sheds have been erected over small areas and the more delicate varieties, notably the Smooth Cayenne, grown successfully. By cheapening the existing express and freight rates a great impetus would surely be given this industry and the finer varieties could then be profitably marketed in large supply, the demand being almost unlimited.

The mango requiring from three to five years to come into bearing has been grown in a limited way for years, but since the introduction of choice East Indian varieties its cultivation has grown wonderfully and one kind has been fruited sufficiently to create great enthusiasm among both growers and market men in the North. The fruit from seedling trees is very stringy and too strong of turpentine scent and flavor for strangers to like, yet has been shipped sparingly for years being salable only in our southern coast cities, while the finer kinds grown from grafted trees find instant sale in all markets at excellent prices. The fruit of the best East Indian sorts is free from fibre, and is of a tender lusciousness only comparable to a perfect, dead-ripe, freestone peach. If one intends growing a mango at all, by all means set a grafted tree as it requires no more care than a seedling and produces fruit far superior to any seedling two years from the graft. The Mulgoba is the oldest East Indian variety in the State, but we now have about forty other kinds, being the cream of East Indian varieties. A number of these were introduced by myself beginning in 1887 from seed of selected fruit grown at Saharanpur, Northwest Province of India where the finest mangoes in the world are produced. The cold weather of the next few years killed out these trees and then I began importing grafted trees from the same locality which are now well established; several have fruited, all of excellent quality. One or two other enthusiasts have also imported grafted varieties and the Department of Agriculture has added considerably to the number, all of which are flourishing. The fruit of the mango must be shipped by express to ensure delivery in perfect condition, and may thus be sent to all parts of the country. I have personally sent mangoes to California, Colorado, Illinois, Ontario, New York and Washington City in perfect order. Here again, as in shipping all our more delicate produce, comes in the matter of cost of handling by express, and it seems a great business may be developed in Florida by the proper co-operation of grower and express companies. It may be that with installation of a Parcel Post service by the Postoffice Department such relief will be given the express companies that they can give adequate attention to shipments of fruit at a lower rate than now exists. The people of Florida should feel especially interested in a Parcel Post service, but so far they have made little effort as compared with Pacific Coast people, to hasten forward this much to be desired institution. The production of mangoes can be profitably done in the open air all along the coasts of South Florida and in the interior of the State with slight protection, such as afforded by cheap sheds or wind breaks supplemented by occasional firing.

Bananas are very susceptible to damage by frost, but the more hardy kinds can be grown largely even where the leaves are frozen off every winter, the stalk being seldom injured and throwing up growth again quickly. The most valuable sort for general growth are the Hart's Choice, or Lady Finger, a very hardy and vigorous kind with delicious fruit. We have the Orinoco, or Horse

Banana, a kind of plantain, valuable for cooking, which is as hardy as the Hart's Choice. The fruit of all bananas sells well in our local markets, but has not been grown to such an extent that shipping a long distance has been found necessary. The Cavendish, or Dwarf, is more largely grown in extreme South Florida and is a valuable sort for the more protected coast regions, standing more severe winds than taller growers; its fruit resembles the Martinique variety so largely imported. There are but few others so far tried that seem to be valuable for Florida conditions, but testing is going forward. Bananas may be grown in a large commercial way on proper soil in South Florida and the industry only awaits capital for further development.

Guavas grow so readily in all parts of South Florida that they seem indigenous. The fruit varies in quality, but all are good to those who have acquired the taste, for cooking and for eating out of hand. The habit of the bush in bearing abundantly for weeks, only eighteen months after being frozen to the ground, makes it extremely valuable for us. Orchards of the more acid sorts are being grown now for jelly making, an industry capable of great expansion. Selection of the best sorts should be encouraged, and every house lot should contain a number of bushes for home use. Cuttings of the guava may be rooted readily; use large wood, making cuttings a foot long in August preferably. In this manner the finer sorts may be raised. The Guinea guava seems to be the most free from seeds of any sort yet introduced, and is a thick meated, sweet fruit of good size. The Cattley and the Chinese are really semi-tropical sorts capable of standing considerable frost. They are fine evergreens and may be grown in hedges, being useful and ornamental. As a hedge plant the Cattley guava is superior to most subjects so far used in South Florida as it is free from insect pests; as a fruit its acidity causes it to be generally liked even by Northerners, but jelly made from it is not so fine as from the tropical forms.

The Avocado has leaped into popular favor during the past few years and its fruit is the most valuable of any grown in Florida at present. The tree is a native of Mexico and the West Indies, and stands a little more cold than the Mango, but seedlings require from six to fifteen years' time to produce their first crop and so their planting has been neglected. Large old trees are now producing wonderful returns all over South Florida and as the trees may be readily budded to fine varieties of known quality, ripening from early summer to January, a great impetus has been given its cultivation along our coasts. The budded trees bear in from two to four years from the bud, and hence a planter may soon realize from his investment. The culture of the Avocado is bound to be one of our leading industries very soon.

Among the uncommon fruits that have proved to be a success in South Florida and which may be grown very easily are the following:—Kai-apple, (Aberia Caffra) of South Africa, and its relative (A. Gardneri) from Ceylon; both bearing when young and as with the guavas sprouting up when frosted down and bearing within a year. The Sapodilla (Achras Sapota), Cashew-apple (Anacardium occidentale), Custard-apple

(Anona reticulata), Sugar-apple (Anona squamosa), Papaw (Carica papaya), Amatungula (Carissa arduina), White Sapota (Casimiroa edulis), Shakewood tree (Cecropia palmata), Otaheite gooseberry (Cica disticha), Sea Grape (Coccoloba uvifera), Rose-apple (Eugenia jambos), Surinam cherry (Eugenia Micheli), Mammee-apple (Mammea Americana), Ginep, or Spanish Lime (Melicocca bijuga), Ceriman (Monstera deliciosa), Granadilla (Passiflora of sorts), Otaheite apple (Spondias dulcis), Hog-plum (Spondias purpurea), Tamarind (Tamarindus Indica), Limeberry (Triphasia trifoliata) etc., all of which may be grown with more or less profit in South Florida.

An abundance of fruit in our diet is a necessity and owners of land no matter how small its area, should devote a little time and attention to this important matter; it would pay in both good health and money. Only lack of energy prevents any landowner in South Florida from enjoying a great variety of luscious fruits every day in the year.

By R. D. Hoyt.

A good many years ago someone stretched a line across our state and called it the frost line. We did not know its exact location but it was supposed to be somewhere about the 28th degree. South of this line we could and did, grow all kinds of tropical fruits galore. We had guava trees, good big ones that one could climb about in and while the summer was guava season there was scarcely a day in the year that we couldn't have a guava pie a foot thick if we wanted it. We didn't have to plant guavas, they just came up spontaneously in fence corners and along the road and during the summer the razor backs waxed fat; if the fruit did not fall fast enough an old sow would get up on her hind legs and grabbing one of the lower limbs with her teeth shake vigorously, generally with gratifying results to the accompanying family. We had alligator pear trees 40 feet high that produced big thick-meated fruits that sometimes reached two pounds in weight, have heard them drop at night with a mushy kind of thud which meant the breakfast salad was already prepared with the addition of a little salt.

We had other tropical fruits too. Mangoes, Tamarinds Rose and Sugar Apples, and others of less note but we appreciated them all and were foolish enough to think we would always have them or most anything else we wanted but one night in December, 1895, something happened to the frost line, possibly a stray mule got tangled up in it, at all events it was broken as many of us remember and regret, and for fourteen years we have been trying to pick up the loose ends and run in a splice, so far meeting with no success.

The guava is very persistent and may be killed to the ground year after year and still keep coming and if fortunate to escape one winter it will produce a few fruit the following summer, but our once big trees are now but stunted bushes that once in three or four years give us a limited supply of fruit. All the other fruits are gone although for years we nursed and coddled them.

I am speaking now of our own place which is situated on the Pinealas Peninsula. There are some favored spots in this modern Garden of Eden that are protected by a body of salt water between them and the break in the frost line, but these are much in the minority.

Of course I am speaking of natural conditions, what may be accomplished with a little protection is wonderful, and if we make up our minds that we want all the good things our soil will produce we can have them just the same. After all it only means that we have to give up a warm bed and turn out for one or two nights and burn up a little wood. Perhaps we will get the frost line mended sometime and get back to conditions as they were twenty years ago.

TROPICAL FRUITS—HOW AND WHERE GROWN.

By E. V. Blackman.

Mr. President, Ladies and Gentlemen:

When I received notice that I had been appointed to write and read a paper before the State Horticultural Society on Tropical Fruits, I felt that the task was too great and that there are many members of the Society who are more conversant with this branch of horticulture and have had many years more experience along these lines than I. This I felt was especially true in the case of Mr. Reasoner, the honored chairman of this committee. A few days since I received a letter from Mr. Reasoner, asking that I prepare such a paper, I concluded to make an effort along the line and do the best I could.

In a paper which necessarily must have for its first essential briefness, it would be impossible to treat the almost numberless kind of tropical fruits, their value, commercially, and the methods of cultivation, hence we shall speak of only a few of the most desirable sorts.

First, let it be understood that we shall treat the growing of these desirable fruits in portions of the State where frosts and winter blizzards do not come with sufficient force to destroy the trees. A large majority of the purely tropical fruit trees, are very susceptible to killing frosts, indeed many of them are so tender that a frost that would seriously kill tomato vines would damage the trees to a greater or less degree, yet there are some that have great vitality and when cut down by cold, sprout from the roots and soon come into bearing again. In sections where this condition is likely to occur, I would not advise planting tropical fruit trees commercially; but if I lived in a part of Florida where these frosts occur only at periods covering several years, there are varieties or kinds of tropical fruit trees which I would plant for family use, taking every precaution in case of cold to protect them. The four kinds I especially call attention to is the Avocado, Mango, and Paw-paw and Bananas, four of the most valuable fruits known to horticulturists, not only for the family table, but commercially, the commercial orchard being of the greatest moment.

WHERE GROWN.

Dade County and the Florida Keys, so far as I know are the only places where these fruits are grown commercially, in the State. In this I may be mistaken as I am not familiar with the country on the southwestern coast of Florida and the adaptability of either soils or climate for the production of these fruits on a commercial scale. If I am wrong it is an error of ignorance, not willfulness.

THE AVOCADO.

(*P.gratiasima.*)

Thirteen years ago when I came to Dade County, the Avocado was found growing luxuriantly around the homes of the early settlers in the rocky lands and in the sand lands in the northern portion of the county. The fruit was then unknown in the northern markets but was highly esteemed by the native population for food. We have heard it said that many of the natives made their breakfast entirely upon the Avocado, accompanied with a small piece of bread and a cup of coffee. It is claimed that it contains a larger amount of nourishment, than any other fruit known. As people came in from the North, they soon became as fond of the Avocado as the natives and each settler proceeded to plant a few seeds, to produce fruit for home use. Trial shipments were made to northern cities, especially to those which had a large Latin-speaking population and it was soon found that there was a good demand for the fruit and each year the demand has increased. The great difficulty found in marketing the Avocado, was, that the trees were all seedlings and while the great majority of fruit was good and could be classed as better, best, (none poor) there were no two trees which grew exactly the same kind of fruit, in size, color and value for eating purposes. The more advanced horticulturists recognized the fact, that in a great measure the seedling Avocado was like the seedling orange or apple and efforts were begun to produce "known varieties." Another difficulty the pioneer had to encounter was that the maturing season did not cover sufficient time to make growing the Avacado, a commercial success. Mr. George B. Cellon, of Miami, who owns the only purely tropical nursery in the State, has the honor of discovering and propagating in large quantities, an Avocado known as the "Trapp." The original tree was found on the Trapp place at Cocoanut Grove. The distinctive value of the Trapp, is that it ripens late in the season. This year a few specimens were exhibited at the Dade County Fair in March. This makes the Trapp the most valuable Avocado grown and the only variety that has been known to hold its fruit so late in the season. The prices received for the Trapp from December to the last of February are almost prohibitive to persons of ordinary means. To illustrate, Mr. Cellon has in his nursery rows a large number of young trees that are holding some fruit every season. For the past two or three seasons, he has had sale for all his fruit at home, at from 50 to 75 cents and sometimes reaching $1.00 each, the parties driving to his place two and one-half miles from the city for them. This was the price unpacked and unwrapped at his door. Mr. S. B. Bliss, who owns the largest budded Avocado grove in the world, sold his Trapps this season at from $12.00 to $17.00 per crate of four dozen f. o. b. and did-not have nearly enough to supply the demand. Mr. W. E. March, who was among the first to plant the Trapp disposes of his fruit to Hicks & Son, New York, for which he receives fabulous prices with a constant cry for more Avocados. Dr. Wetzel, of Cocoanut Grove, informed Mr. March that he received instructions to bill his Trapps out at one dollar each. Among the other valuable varieties grown here are the Pollock, which was originated by Mr. S. H. Pollock, of this city. Many of this variety weigh two and one-half pounds and some specimens have weighed three pounds. The fruit matures from July to October. The Rico, originated by Capt. C. J. Rose, Cocoanut Grove, season from August to November. The Blackman, originated by the writer. Samples of this fruit were sent to the Agricultural Department, Washington, D. C., and after a thorough test were pronounced the best Avocado ever tested by the department and was named after the originator. Season from November to December.

SOILS.

The Avocado will thrive well on any well drained soil, whether it be sand or rock. Those who are anticipating planting Avocados should remember this and not plant on low, wet ground. In the vicinity of Miami, the commercial orchards are planted on the rocky lands.

FERTILIZING.

The Avocado is a gross feeder and will utilize almost any kind of fertilizer manufactured, cotton seed meal or stable manure. On the rocky lands which are lacking in humus, perhaps well rotted stable manure is preferable, but this cannot be procured in quantities sufficient for growing a commercial orchard. The native people never used a fertilizer of any kind for their Avocado trees but experiments have demonstrated that a tree well fed and cultivated produces more and better fruit and of uniform size. We would emphasize the fact that the Avocado tree revels in high fertilization and as before noted, does not seem particular as to the kind of fertilizer used or what it is composed of. Generally speaking, in the rocky soils of Dade County, cotton seed meal is not considered a safe fertilizer, but the Avocado thrives on it when used in quantities.

MANGOES.

(*Mangifera Indica.*)

Mango trees were among the first fruit trees planted in this tropical section. The first settlers came from Cuba, Nassau and other islands bringing with them seed which they planted in profusion around their new possessions. It was found that the mango made a more rapid growth, came into bearing earlier than on the islands, and that the fruit was of better quality. Nearly or quite all of the original trees were produced from the wild jungle seedlings and were known as the turpentine mango. They were of various sizes, colors and shapes, the large flat seed encased with a mass of fiber, making the eating process a most disagreeable one, yet the jungle mango is a most delicious and palatable fruit. The writer has never yet tasted a poor mango and when the proper method of preparing the jungle mango for table use is followed, it is highly prized. For fear we may forget, we will give the method used in preparation for the table in our home. Peel the fruit, and then with a sharp, thin knife slice the mango very thin, sprinkle with sugar and place in the refrigerator for two hours before serving. Great luscious Crawford peaches sink into significance beside a dish of mangoes prepared in this manner. The new comers to this southern section soon become as fond of the mango as the natives. Shipments began in a small way to the northern markets; but it was found that the fibrous conditions of the fruit was a great detriment to it and that unless a variety could be produced without fiber, the mango would never become a popular market fruit. The Agricultural Department at Washington, has taken a great interest in securing this kind of fruit, without the fiber, and all mango countries have been scoured and rescoured to secure choice market varieties without fiber. In this the Agents of the Department have been highly successful. Among the choice varieties imported which have been fruited are the Bennett, which was introduced in 1902, from India, the Gordon, from Trinidad, West India, the Mulgoba introduced in 1889, the Sundasha, a later importation. The latter has been fruited in the United States Tropical gardens at Miami. All of these varieties have proven to be most excellent fruit, and practically fiberless. Among the native varieties is the Perrine, originated by Mr. James F. Roberts, of Perrine, Florida. There are a number of others which have been originated in this section, which have proven to bear fruit of exceptionally good quality. The original Mulgoba tree was sent to Mangonia, from which tree the greater portion of trees which are now bearing have been budded.

SOIL AND CULTIVATION.

The mango is a most hardy tree and flourishes on any well drained soils. At Mangonia, Palm Beach and other points in Palm Beach County the soil is light and sandy and whenever weather conditions are right the trees flourish and bear immense quantities of fruit and of splendid quality. In Dade County, where the soil as a whole is very rocky, the mango makes a phenomenal growth and is a heavy bearer. Budded trees are expensive and the average farmers who are planting the budded varieties, are anxious to get the best possible results, giving the young trees extra good attention and fertilizer. Here is where a great mistake is made and it is safe to say that the greater portion of budded trees that have been lost by the planters have been lost by over fertilization. Experience is teaching the fact that budded mango trees for the first few years develop more rapidly when they are seemingly neglected. When thoroughly rooted a mango enjoys high fertilization as well as any tree that we have planted. Hard wood ashes have proven with us the best fertilizer for the young buds and this applied only in limited quantities.

THE MANGO AND AVOCADO.

These are the coming fruits for sections where they can be safely grown. We do not advise planting these fruits in portions of the State, where frosts are liable to come; but in all portions where the weather conditions are right, a commercial orchard of these fruits will produce more cash to the acre, than any known fruit. It is not to be expected that in years to come, Mangoes and Avocadoes will bring the fabulous prices that are maintained now, but the fact is there are such limited areas of Florida, where these fruits can be safely grown, that the demand will always be greater than the supply and consequently high prices will be the rule.

THE TROPICAL PAW-PAW.

(*Carica Papaya.*)

This at present is one of the least known fruits that is grown in this southern section and when its value as a fruit is understood, will make an unlimited demand for it, both as a table fruit and for medicinal purposes.

The paw-paw is really a melon that grows on a tree, with the fruit attached to the body. One of the greatest difficulties in growing the paw-paw is that there is no way of distinguishing the male from the female tree, until it begins to bloom. Apparently there are many more male than female seeds in the fruit. I have been growing the paw-paw for the past several years and have had one or two male trees bear small fruits of good flavor. The trees fruit in about eighteen months after planting and continue to bear for several years, ripening one fruit at a time.

The paw-paw will grow on any soil that is well drained. Last year the writer lost two large trees by an overflow of salt water. Other trees standing by were not damaged, but have been fruiting throughout the entire season.

This fruit has only to be known in the northern states, when the demand for it will be greater than the supply.

THE SAPADILLO.

(*A Sapata.*)

The Sapadillo is another of the tropical fruits which in years to come will become popular in the markets of the North. So far there has been no attempt to improve the varieties and all trees are grown from the seed. It adapts itself to any kind of soil and is a free bearer. The skin is of russet color, some kinds having a tinge of red on one cheek. This is another fruit for which one must educate the taste before it becomes really enjoyable, but when once the taste is acquired there is a continual desire for more sapadillos. It is a good shipper, standing long journeys well.

THE BANANA.

(*Musa.*)

In this Southern portion of the State, the banana is being grown to a considerable extent commercially. For many years the people living on the Florida Keys have been growing this fruit quite largely for market purposes, their only market being Key West, where the fruit brought remunerative prices. Since Miami has become a city of commercial importance, the growers have found a splendid market for the output here. The soils on the Keys are, as a rule, very rocky. Indeed so much so that they are not cultivated as a whole. The rock formation is what is known as the "pot hole formation," the plants being set in the holes or cavities where there is some soil.

Since the extension of the Florida East Coast Railway to Miami and South, banana growing is assuming greater proportions and many have, and are planting for commercial purposes. One planter in the Homestead country has less than an acre planted from which he has sold this season four hundred bunches at one dollar per bunch.

SOILS WHERE GROWN.

Perhaps there is no other tree or plant which will flourish on all sorts of soils, from the richest mulck to the most ordinary pine lands, as the banana. Seemingly it rejoices in a rich, black alluvial soil, yet at the same time on the poorest sand lands, by the aid of fertilizers and water it seems to flourish equally as well. The dwarf or smaller varieties thrive better on the sand lands than the larger and coarser kinds. It is believed from the experiments thus far made, that banana growing in the near future will become a most important factor in this Southern clime. Cotton seed meal or almost any kind of well balanced fertilizers are utilized readily by these plants.

OTHER TROPICAL FRUITS.

There are a large number of other kinds of tropical fruits which have been and are being grown in this Southern territory which so far have not proven of commercial value; but many of them should be planted for the fruit for home use and for decorative plants. Among these are the Kai-apple, (Aberia Caffra,) Carissa, (Carissa pappaya,) Star-apple, (C. Cainito,) Cocoa-Plum, (C. Niger,) Sour Sop, (A. Muricata,) Rose Apple, (E. Jambos,) Sea Grape, (C. uvifera) Barbados Cherry, (M. glabra) Maumee Sapota, (L. Mammasoa,) Ceriman of Trinidad (M. deliciosa.) This is but a small list of the real tropical fruits which may be grown in the portions of the State where frosts do not occur. Nearly all of the above list are being grown in the vicinity of Miami and several of the most rare kinds of these fruits were exhibited at the Dade County Fair which was held in March last. While many of these fruits will never be of commercial value, they are very palatable and should be grown.

The pineapple, guava and other fruits are not mentioned in this paper as they are being grown extensively in many portions of the State.

Economic Value of Birds to Farmers and Fruit Growers.

By Prof. Wm. F. Blackman.

Mr. President, Ladies and Gentlemen:

There are four chief reasons why the lives of our birds ought to be protected.

The first of these reasons is urged by the poets and the preachers—the birds are beautiful to look at and lovely in song, and hence should be cherished; the second reason is urged by the sportsmen—game birds must be protected in order that they may be reasonably abundant during the shooting season. The third reason is urged by the tourist and those whom he supports and enriches—birds along our seashores, lakes and river courses, especially such as are tropical or semi-tropical in plumage and habit, give a charm to the Florida landscape which is unique; as a valuable asset to the hotel keeper, to the railway and steamboat company and to all those whose livelihood is derived in considerable measure from our winter visitors we should not permit the process of extermination of our plumage birds which has already gone to so deplorable a length to continue.

These three reasons for the protection of our Florida birds, are good, all of them. But there is a fourth reason, to which attention is perhaps less often called, but which is no less cogent than the others. I refer to the economic value of our birds to the farmer and fruit-grower. It is to this matter that I wish to call your attention for a few minutes this evening.

There are three ways in which birds perform services of incalculable importance to the tillers of the soil. In the first place, they help to keep down noxious weeds; in the second place, they destroy injurious insects; and in the third place, they devour rabbits, mice and other rodents, which infest and injure the fields and the orchards.

1. Take the matter of noxious weeds first. How many plows, harrows, hoes, rakes, darkeys, mules and dollars are dedicated to the doleful business of killing weeds? How we sweat and groan over the task, which forever renews itself, year after year! How do these weeds tempt to profanity? How do they test our faith in the divine order of the world? Why, we ask, did a good God create "pusley" and sandspurs? Meantime, millions of feathered field-hands are working tirelessly from dawn to dark every day to "down" these weeds in the gardens; in the plowed fields, in the pasture lands and ranges, in the woods, everywhere, they are at work with keen eye and swift wing and sharp bill and voracious appe-

tite, destroying the seeds which otherwise would cover the earth and quintuple the farmer's toil—and the mule's.

Take the quail, the bobwhite, for example. Dr. S. F. Judd of the biological survey reports having examined the stomachs of thirteen quail, and that these contained 5,584 weed seeds; he also reports that on another occasion 801 stomachs of these birds were examined, gathered from twenty-one different states, it being found that slightly more than one-half their contents was composed of seeds, chiefly of weeds, some sixty different species being represented. It was found that not less than 1,500 such seeds had been devoured at a single meal, and that some stomachs contained as many as 3,000 or 5,000 seeds. A thousand crab-grass seeds were found in the stomach of a single quail, and 10,000 pigweed seeds in that of another. Dr. Judd computes that the bobwhites in Virginia consume not less than 573 tons of weed seeds in a single winter.

The mourning dove is also a valuable assistant to the farmer in this regard. An examination of hundreds of stomachs showed that from 60 to 70 per cent of the food of this graceful and grieving bird is composed of the seeds of weeds; "in a single stomach were found 7,500 seeds of the yellow wood sorrel, in another 6,400 seeds of barn grass or foxtail." The linnet, which is accused, and not without reason, of eating and injuring fruit, nevertheless was found to have 80 per cent of its stomach contents composed of the seeds of weeds, most of them noxious. The food of the red winged blackbird is chiefly the seeds of weeds, as is that of the sparrows, of which there are some forty varieties. Mr. F. E. L. Beal of the Biological Survey, once computed that a single species of sparrow, the tree sparrow, in a single state, Iowa, consumed 1,750,000 pounds, or 875 tons, of weed seeds in a single season.

Now, how many field hands, working with the hoe at $1.50 per day, would be required to exterminate the miserable harvest of 875 tons of weed seeds in the state of Iowa if any considerable portion of these had sprouted and grown? And how much, then, do the farmers of Iowa, owe the tree sparrows of that state for a single season's service? And if they cannot, and need not, pay this debt in coin, what measure of gratitude and of protection do they owe these feathered friends, of this and other varieties.

2. A still more important service to our farmers is rendered by the birds through the destruction by them of injurious insects.

I hold in my hand a letter from Dr. T. S. Palmer of the bureau of biological survey at Washington, regarding the report which is now being prepared for the National Conservation Commission, and which is soon to be published, on the injury done our agricultural interests by insects. Dr. Palmer states that Dr. L. O. Howard, chief of the Bureau of Entomology, estimates "the total annual loss of all kinds caused by insects, including injury to crops, garden truck, forests, domesticated animals and health," at the stupendous figure of $1,200,000,000. An annual loss on account of insect depredations of above $13 for every man, woman and child in our population; a loss each year exceeding by more than 25 per cent the total public debt of the United

States, or the joint capital of all our national banks; a loss greater than the entire annual expenditure of the federal government, including the cost of the army, the navy, pensions and interest on the public debt; a loss equal to the value of all the merchandise imported annually into the country, and nearly seven times the total receipts of the postoffice department, or the salaries of all the teachers in our public schools—this is the almost incredible estimate of our annual loss through beetles, bugs and their kind, which the Washington savants ask us to accept.

Whether the estimate is exact or not, we have only to remind ourselves of the havoc wrought by the boll-weevil in the cotton fields of the south and the Hessian fly in the wheat fields of the north, by the scale and whitefly in our orange groves, and the curculio, the cankerworm, the codling moth, and the tent caterpillar in the orchards of other sections, and by the Colorado potato bug everywhere between the oceans; of the prairies devastated from time to time by hordes of grasshoppers; of the forests infested with caterpillars and borers; of the cattle infected with Texas fever by ticks; of the men and women infected with various grave diseases by mosquitoes and house flies, and of how many hot days and dear dollars we have all spent in warring against these pests—we have only to remind ourselves of these things in order to gain some sense of the burden imposed upon us by these hosts of hostile insects.

How shall they be kept in check? How shall this drain on our resources be diminished? We resort to insecticides—sprays, poisonous fumes, what not—and these afford some relief. Meantime, there is fighting for us, day and night, if we stop to think of it, a countless and patriotic army of birds, swift and skillful and untiring, and amazingly hungry. Among these are some forty varieties of woodpeckers; how marvelously acute the ear which hears the movement of the grub buried within the tree and accurately locates it, how astonishing the muscular power which drives the sharp bill into the wood again and again, with almost unbelievable rapidity and precision of stroke; how wonderfully fashioned as a spear the barbed tongue which pulls the borer from his hiding place! Examine the stomach of a woodpecker, and you will find ants, grubs, caterpillars and scale insects in great numbers, most of them the farmer's foes; 5,000 ants have been found in the stomach of a single "flicker." How wonderful the chemistry by which the cardinal turns "adult beetles, grasshoppers, crickets, flies, ants and their larvae" and rose bugs into brilliant feather and ecstatic song. Mr. E. H. Forbush, ornithologist of the Massachusetts State Board of Agriculture, has recently reported some experiments with a number of chicadees which frequented an old apple orchard in that state. In the stomachs of four birds there were counted more than 1,000 eggs of the canker worm; and in addition to this it was estimated that each chicadee devoured daily during the early spring, on an average, thirty female canker worm moths, each containing in her body more than 5,000 eggs, so that each bird destroyed more than 140,000 unlaid eggs, besides those already deposited, during the twenty-five days in which the cankerworms were creeping up the tree trunks. Was there ever another such omelet?

The Biological Survey examined the stomachs of 420 kingbirds and reported insects, mostly noxious, as constituting 90 per cent of their contents. In the case of the phoebe, the percentage was even larger, and included klick beetles, May beetles and weevils, wasps, flies, bugs and spiders. The stomach of a cuckoo was found to contain 250 tent caterpillars and another 217 heads of the fall web worm; the stomachs of 155 cuckoos contained 2,771 caterpillars, largely of the hairy varieties, which most birds refuse. The blue jay, that burly, self assertive, squalling, pugnacious and rapacious, though handsome rascal, who sometimes no doubt destroys the eggs of other birds, has been shown to be the devourer of large quantities of harmful insects; even the thieving and omnivorous crow, whom nobody seems to love, eats beetles, grasshoppers, cutworms, and other caterpillars, chiefly noxious, in great numbers. More than one-half the food of the meadow lark is composed of beetles, bugs, grasshoppers, caterpillars and a considerable portion of the remaining part of noxious weed seeds. All the several species of swallows, the scurrying cavalry of this beneficial army, live chiefly on winged insects, of which they devour immeasurable quantities. More than 60 per cent. of the stomach contents in the case of the brown thrasher, more than 70 per cent in the case of the blue bird and more than 90 per cent in the case of the house wren have been found to consist of insects. More than fifty species of birds are known to prey on the boll weevil, that implacable scourge of our Southland.

And so the merry and tuneful warriors wage battle against the invading army of bugs all day and every day, especially during the breeding season, in the upper air, among the branches of the trees and up and down their trunks, in the field, in the swamp, and by the roadside. Nor does this battle cease as most battles do, with the coming on of darkness, for then the night hawk, or bullbat, takes up the assault—the most voracious perhaps of all the insect eating birds. Its stomach is enormous, aldermanic, and it is seldom empty. Mr. Beal, of the Biological Survey reports the results of an examination of the stomachs of 100 bullbats; in one of these some 1,800 ants were found, in another the remains of thirty-four May beetles, and in another Colorado potato bugs, squash bugs and leaf hoppers. One stomach contained portions of seventeen different species of insects. Myriads of mosquitoes, among them the fever-carrying kind, are destroyed nightly by this winged and grunting board of health. Yet there are farmers who look on smiling while uninstructed boys amuse themselves by shooting bullbats in the twilight.

To be sure, certain species of birds, like the cherry bird, the blue jay, the crow, the rice bird, the red winged black bird, the crow black bird, the linnet, the sap sucker, the robin and the cat bird are accused of eating and perforating fruit and stealing grain, and no doubt justly so; probably some birds help to spread scale insects from tree to tree, but I am convinced that all of these, taking the matter "by and large," are far more beneficial than harmful and deserve our thanks and protection. Is not the laborer "worthy of his hire?'

3. A third service to the farmer is ren-

dered by such predaceous birds as feed on mice, rabbits and other injurious rodents. In some countries, as in Australia, these rodents inflict almost incalculable damage upon agriculture, and everywhere they are harmful to the nursery, the orchard and the field. It is to the keen eye, the swift, strong wing and the sharp and cruel beak of hawk and owl that we must chiefly look for protection against these gnawing nuisances. There are in the United States above seventy species of these birds, and they all have excellent appetites. Now and then no doubt they snatch a chicken from the barn yard; no doubt they destroy numbers of our smaller and useful birds; but we know that their chief food is not these. Here is one report among many, made by the experts: "In the stomachs of forty-five rough-legged hawks (Archibuteo lagopus sancti-johannis), taken in several different states, were found 128 harmful rodents, one weasel, one schew and seventy insects. The rodents (besides nineteen which could not be determined specifically from the remains) consisted of one gopher (salamander), two rabbits, four house mice, four white-footed mice, and ninety-eight meadow mice. No traces of birds or poultry were found in any of the forty-five stomachs." I once saw a shrike drive his beak into the skull of a sparrow; this was a single instance, but how many hundreds of noxious animals and insects have we all seen impaled on orange thorns by these bloody butchers of vermin? Yet I still recall vividly the sense of noble achievement I felt, as a boy, when I succeeded in kiliing a hawk or an owl; I ought to have been spanked, but there have been state legislatures foolish enough to offer bounties for the destruction of these good friends of the farmer.

This, then, is the service which the birds render to us farmers and fruit growers—they are incessantly at work decimating the army of noxious weeds, insects and vermin, which is ever swarming across our fields—creeping, jumping, burrowing, flying—and which except for the protection afforded by the birds would devour all our substance.

It is computed by some experts that the number of these friendly birds, taking the whole country together, has been diminished in recent years by some 50 per cent.; be this as it may, I think that all observers will agree that they are not so numerous as they formerly were, or as they ought to be.

I appeal to you on behalf of our feathered friends. Seven things you can do to protect those we have and to increase their number—you can refrain from shooting or trapping them, or allowing them to be shot or trapped on your premises; you can provide for them safe breeding places and an occasional lunch about your door; you can prevent your boys and others from destroying or robbing their nests; you can see that the children are properly instructed in home and school concerning this matter; you can assist in preventing the passage of unwise game and bird laws, and in securing the passage of such as are good and wholesome; you can help provide for the appointment of a suitable number of suitable persons as wardens, state and county, and, lastly, you can encourage the Florida Audubon Society, of which it is my privilege to be a vice president, in its crusade for bird protection, by becoming members or by contributing to its treasury.

Fertilizer.

TRANSLOCATION OF PLANT FOOD CONSTITUENTS IN THE PLANT AND THEIR FUNCTIONS IN DEVELOPING AND MAINTAINING. GROWTH.

By J. S. Carroll.

Mr. President, Ladies and Gentlemen:

Once upon a time, it is related that a priest was called upon by his parishioners to pray over their lands and bless them in order that they might yield abundant harvests. As he passed from place to place pronouncing his benedictions upon the soil he came upon a very unpromising field. Surveying these barren acres with great despair, he exclaimed: "Ah! brethren, no use to pray here; this land needs manure."

From the writings of the earliest investigators we find that it was the custom of man to assist nature in yielding abundant harvests by applying to the soil various substances called manure. Little did he know or understand at that time the fundamental principles underlying their use, for little work of any consequence had been undertaken to pry into nature's secrets or to attempt to interpret her immutable laws. As the years moved onward man became more interested in the processes of nature and many learned investigators devoted years to the study of plant growth, the composition of plants, their food and sources of food supply, thereby laying the foundation and paving the way for our present knowledge of chemistry in its relation to agriculture.

While the beginning of true scientific agricultural chemistry may be dated from important discoveries during the latter part of the 18th century by such scientists as Priestly, Scheele, Lavoissier, Cavendish and Black, yet it is interesting to pause a little while to note a few theories advanced by some of the early writers as to plant growth.

It was believed by the alchemists that manure acted in some mysterious way—that "spirits" left the decaying manure and entered the plants producing a more vigorous growth. The worthless character of leached manure was attributed to the fact that the "spirits" had departed from such manure. From this source we have handed down to us such expressions as "spirits of hartshorn," "spirits of nitre,' and many others, showing the ideas then entertained as to the composition of matter.

Early in the 17th century van Helmont undertook to solve the problem of plant growth and proved to his satisfaction that all the products of plant growth were derived from water.

Some fifty years later Digby (1660) attributed the growth of plants to a kind of "Balsam" which the air contained.

A theory advanced later by Jethro Tull was to the effect that the food of plants consisted of soil particles and that these soil particles must be rendered very minute before they could be absorbed by the rootlets. This theory is of interest since the importance of good tillage is emphasized in crop production.

The first contribution of importance to the subject of plant nutrition was made by a Swiss naturalist, Bonnet, during the 18th century. He found that air is the true source of carbon which forms so large a part of the plant substance.

The first work written in the English language on Agricultural Chemistry was in 1795 by a Scottish Nobleman, the Earl of Dundonald. His teachings were that plants 'are composed of grass with a small proportion of calcareous matter."

DeSaussure in 1804 gave to the world the most important contribution to science up to this time. He was the first to call attention to the mineral or ash constituents of plants and maintained that these ash ingredients were essential, for without them plant life was impossible.

In the early part of the last century Sir Humphry Davy published a series of lectures on Agricultural Chemistry which added to the knowledge of the composition and functions of the soil.

Boussingault in 1838 was the first chemist to carry out elaborate experiments to determine the question whether plants could assimilate the free nitrogen of the air.

It was not until 1840 when Liebig published his celebrated work "Organic Chemistry in Its Application to Agriculture and Physiology" that the new science of Agriculture was inaugurated. In his preface he states that "perfect agriculture is the true foundation of all trade and industry, but a rational system of agriculture cannot be formed without the application of scientific principles, for such a system must be based on an exact acquaintance with the means of nutrition of vegetables and with the influence of soils and actions of manures upon them. This knowledge we must seek from chemistry which teaches the mode of investigating the composition and of studying the character of the different substances from which plants derive nourishment."

Chemistry tells us that the materials of which all matter is composed consist of some seventy distinct elementary forms of matter known as chemical elements. It is by means of chemical analysis that we are able to determine the elementary composition of the earth and its life.

Less than one hundred years ago it was learned that plants are built up from materials from the air and soil, water being one of them. The number and kind of elements that have been found to be absolutely essential to the growth of plants are ten—carbon, oxygen, hydrogen, nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and iron. These are called plant food elements and all healthy plants must contain them and in the absence of one of them the plant cannot make a normal growth.

Plants derive their food from the air and the soil. The air supplies direct chiefly the element carbon, although it is the original source of hydrogen, oxygen and nitrogen. Hydrogen and oxygen are supplied mainly through the soil in the form of water.

About 95 per cent. of the total dry matter of plants comes from the air; the remaining 5 per cent. is in the incombustible or ash constituents which are supplied exclusively by the soil. These ash constituents are indispensable for without them the carbon of the air, the hydrogen and oxygen of the water and the nitrogen of the soil and air could not enter into plant life.

The plant takes its food through the leaves and roots which are called the organs of nutrition.

The chlorophyll or green coloring matter in the leaf-cell plays an important part for it is in these leaf-cells that the carbonic acid of the air is decomposed through the influence of light and heat, the carbon being retained while the oxygen is given off. This process is called assimilation and takes place during the daytime, while at night the food made during the day is changed, whereby it can be transferred in solution wherever it is needed. Iron as well as daylight is necessary in the formation of chlorophyll. The carbon absorbed by the plant and the hydrogen and oxygen taken up by the roots in the form of water meet in the leaves of the plant and are formed into starch, sugar, fat, etc., and the same elements together with nitrogen and a little sulphur form the albuminoids.

The manner in which the roots take up food is very different from that of the leaves, for the surface membranes of the roots are not full of holes and solid matter cannot pass through. Therefore, the food must be in solution and its absorption by the rootlets is obtained by means of diffusion or "osmosis." The food derived from the soil is not taken up as individual chemical elements but chiefly in the form of acids or salts. Thus nitrogen is combined with oxygen to form nitric acid and when united with bases like potassium or calcium forms potassium nitrate or calcium nitrate. These weak solutions taken up by the roots are concentrated in the upper part of the plant owing to rapid evaporation by the leaves and are used in the formation of new tissue.

While considerable research has been given to the work of determining the functions performed by the different constituents taken into the plant, yet there is very little definite knowledge on this subject at the present time.

As the material furnished by the air is supplied freely and abundantly to every plant it will not be necessary to devote any time to it but we will turn our attention to the substances furnished by the soil. The soil does not always supply the plant with sufficient material for its growth and as these deficiencies must be made good by man before he can hope for abundant harvests we will consider for a few moments the part they play in plant life.

Of the elements supplied by the soil as plant food, magnesium, iron and sulphur, and sometimes calcium, are usually found to exist in sufficient quantities to supply the requirements of plants. Potassium, phosphorus and nitrogen, and sometimes calcium, are not always present in sufficient amounts in an available form to supply the needs of the growing plants.

Sulphur occurs in plant tissue in comparatively small amounts. It is taken into plants in the form of sulphates, as potassium sulphate, calcium sulphate, and other sulphates, and plays a very important part in the formation of albuminous matter of plants. These albuminoids move about in the plant, principally towards the grain and fruit. In some plants sulphur is a constituent of the essential oils and can be detected by the odor such as in the onion, garlic, horseradish and others.

While iron is necessary for plant growth and is always present in plants, it occurs in about the smallest amount of any of the ash elements. The function of iron is to assist in the formation of chlorophyll or the green coloring matter of plants. It is not known yet whether iron enters into the chemical composition of chlorophyll or is merely associated with it..

Magnesium occurs in much smaller amounts than calcium does although it is stored up in the seeds about three times more liberally than is calcium. Magnesium assimilates more slowly than any of the other ash constituents of plants. It enters into the chemical composition of the chlorophyll although plants do not require much magnesium until the period of formation of the seeds. It has been found that plants grown with an incomplete supply of magnesium frequently have sterile seed.

Calcium is always present in the ash material and plants cannot reach full maturity without it. In fact some crops, such as clover, peas, alfalfa, require so much calcium that they are called "lime plants." The special function of calcium is in assisting in the construction of the cell walls, and no new plant cells can be formed without it. Calcium is found in the leaves of plants at all stages of growth and is very essential for their full development. It has been stated that calcium compounds are necessary for the conversion of starch into cellulose.

When the growth of a plant has been checked by withholding calcium, the plant will show increased vigor within a few hours after supplying it. Calcium unlike magnesium is assimilated in the early stages of the plant's growth, for example in wheat 80 per cent. is assimilated before the plant heads. It does not accumulate to such an extent in the seeds as do some of the other ash elements for only about 1-10 of the amount removed by grain crops is in the seeds, the remaining 9-10 being distributed throughout the straw.

It is probable that more work has been devoted to the study of nitrogen as a food for plants than to any other element. This is a specially interesting subject for the reason that plants are surrounded by an atmosphere of nitrogen and it was to determine whether it was possible for plants to use the nitrogen direct from the air. It has been found that there are only certain plants called legumes that have the power of utilizing this nitrogen for food by means of nodules or tubercles on their roots. Nitrogen is taken up by the roots of plants in the form of nitrates and combines with carbon, hydrogen and other elements to form the nitrogenous compounds so largely present in plants. In the absence of nitrogen a plant makes no appreciable growth and when there is an insufficient supply of this element the plant's foliage does not develop a rich green color but takes on a yellowish tinge.

Phosphorus occurs in parts of the plant in the form of phosphates. These phosphates play a very important part in the development of the young plant at the time of germination.

Phosphoric acid is one of the constituents of chlorophyll and is necessary for the building up of every plant cell. It is not only important to young plants but is necessary at all stages of the plant's growth.

The chief function of phosphorus may be said to be to aid in the production and transportation of the proteid substances. These proteid bodies which are produced in the leaves are finally transported to the seed where they accumulate to the greatest extent. From 60 to 75 per cent. of the total phosphates removed in a crop is found in the seeds.

The translocation of phosphoric acid in the plant is very interesting. It is the most mobile substance of all the inorganic constituents of plants. It is continually moving from the lower to the upper part of plants, and a large percentage of phosphoric acid found in the grain was moved from the leaves and stems of plants even after it had once come to a rest in these organs.

In speaking of the function of potassium Prof. Harry Snyder in his excellent work on "The Chemistry of Plant and Animal Life" says: "Potassium is one of the most important and least variable of all the elements found in the ash of plants. It is quite evenly distributed throughout the growing plant and generally occurs in the entire plant in the largest proportion of any of the essential ash elements. It is taken up in the early stages of plant growth and is always present to the greatest extent in the active and growing parts as in the leaves where the production of plant tissue occurs. Potassium is one of the elements most essential for the plant's development.

"The function of potassium is apparently to aid in the production and transportation of the carbohydrate compounds, as starch and sugar, and thus indirectly in the formation of all organic matter. In sugar and starch-producing crops, as sugar beets and potatoes, it takes an important part in the growth and development. Potassium doubtless has much to do in the way of regulating the acidity of the sap by forming organic salts such as potassium bitartrate in grapes. At the time of seed formation there is a slight retrograde movement of the potash, in some cases a small part being returned to the soil. The supply of available potash in the soil has great influence upon the vigor of plant growth. Weak and sickly plants are always deficient in potash. Some crops require more growth than do others and some experience difficulty in obtaining it. Some plants contain such large amounts of potash that they are called 'potash plants.' "

All research shows that in the higher order of plants potassium cannot be replaced or substituted by any other element.

It is a common fact to all plants that the various constituents move about in the plant during its growth.

The leaf of the plant is its laboratory where food is prepared for the support of the parts of the plant. But when the leaf has grown old and the purpose of its existence has been performed, it gives up its life and substance to perfect the parts of the plant and finally to the perfection of the seed whereby the plant may perpetuate itself.

It is known that plants do not have the same chemical composition at different stages of growth and it is due to the discovery of this scientific principle that we have been taught some highly important lessons as to the times and seasons at which crops may best be harvested.

There is yet much work to be done in adding to our present knowledge of the special functions of different plant food constituents and no field of research offers better opportunity to our scientists than investigations of this character.

THE STATE CHEMIST'S AID TO THE FARMER.

By B. H. Bridges.

Mr. President, Ladies and Gentlemen:

Having been placed on the committee to report on Fertilizers, and being familiar with the control of the state's supply, I have decided to devote my paper to the discussion of the fertilizer trade, paying special attention to the past year.

At the outset, I may say that the fertilizer found upon the market during the past year has fully met, and on the average been above, the standard represented by the analysis on the tags. It is my belief that no manufacturer of a commodity in this country is so careful as to the quality of his goods as is the manufacturer of fertilizers.

In this day when the spirit of commercialism has permeated every endeavor we may justly ask the question if it is business for the manufacturer of fertilizer to try to defraud the consumer of fertilizer. Those who are not intimately acquainted with the facts might say that any manufacturer will defraud the consumer when he can. I do not believe this to be so for the reason that it is not to the best interest of the manufacturer to practice fraud. And the reasons why it is not to the best interest of the manufacturer to defraud the consumer is because there is a true co-partnership relation between the consumer and the manufacturer; and second, because of the enforcement of the fertilizer law by the state authorities and the exercise of the privilege of the special sample by the citizens under the law.

It is an unquestioned fact that a majority of the fertilizer sold, is sold on time, i. e., the manufacturer receives his pay for the fertilizer when the consumer has received payment for his crop. Now if the manufacturer sells his customer a bill of fertilizer and depends on the success of his crop for his pay, does this not establish just as true a co-partnership relation between the farmer and the manufacturer as exists between Smith and Brown who sell dry goods in co-partnership? The manufacturer who sells goods on time is interested in the success of the farmer because he has money invested there. If the farmer fails, then there is hardship on him to pay his fertilizer bill, and hence the pocket of the manufacturer is touched. Mr. F. B. Dancey, in a paper delivered in Atlanta, a few months ago, said that as a farmer followed his wandering boy because his heart was touched, so the manufacturer of fertilizer follows his wandering dollar because his *pocket* is touched.

If the average farmer could once understand that it is not profitable for the manufacturer to practice fraud there would be a better understanding of the manufacture, control and demand of this indispensable commodity—fertilizer. No man can judge accurately as to the quality of a fertilizer by the senses of appearance, smell and touch. There is one and only one way to test fertilizer and this is the chemical laboratory. For this reason, not many years ago, there was perhaps more sophistry practiced in commercial fertilizer than any other manufactured product. The average farmer bought Brown's fertilizer because he heard some one say Brown's was good. Gradually conditions have changed. More farmers are buying fertilizer on a guarantee basis, the same as the manufacturer does. What manufacturer would purchase a cargo of Brown's potash, without knowing how much potash was in it? There is more competition in the manufacturing industry and our manufacturers are nearer home where we can get at them should they attempt deception. And again, as stated above, the saying that honesty is the best policy was never truer relative to any business than when applied to the fertilizer industry.

It is not my intention to discredit our state control department in the least, nor to minimize the importance of this branch of government. Were it not for the state laboratory the consumer and the honest manufacturer would suffer at the hands of the dishonest manufacturer. It seems to be an universally recognized fact that the *farmer* does not get his share of this world's goods. So if it were not for the control afforded by the state laboratory the honestly inclined manufacturer would be compelled to seek dishonest methods in order to succeed in business, and hence the farmer would be the ultimate loser. The commissioner of agriculture in his report for the years 1907 and 1908 says: "The people as a whole reap more direct benefit from the proper application of the stock feed and fertilizer laws than from any other statutes that mark the pages of our law books."

The fertilizer law is enforced by the taking of what we designate as official samples, and analyzing the samples so taken, and publishing the results in the Florida Quarterly Bulletin. These samples referred to are taken by the state chemist himself, or by other sworn inspectors of the department. There has never been a complaint, so far as I know, of a manufacturer or consumer, that we did not procure a fair sample of any goods. The law itself designates how samples shall be taken and inspectors comply with its requirements.

Nearly all the states have a fertilizer law which embodies about the provisions of our official sample, but very few have the special sample. Under the Florida law, the consumer may, under proper safeguards, have samples of his goods analyzed by the State chemist. We think this provision of the law affords an additional protection to the honest manufacturer and to the consumer, which can not be had by the official sample alone; and accounts in a good measure for the excellence of the fertilizer sold in this state during the past years.

Another fact which contributes to the efficiency of the fertilizer law is the representatives of the different fertilizer companies. If there are goods on sale below the analysis printed on the guarantee tags, agents of other companies are quick to dscover it and take advantage thereof.

Finally, as evidence of the status of the fertilizer trade during the year 1908, I incorporate in my paper the facts set forth in the annual report of the state chemist, wherein he says: "The average of 127 complete fertilizers was:

Ammonia	3.82 p. c.
Available Phos. Acid (P2O5)	6.94 p. c.
Potash (K2O)	7.08 p. c.

The average state value of the 127 samples of complete fertilizer was $28.82 per ton. The average price of the various brands sold throughout the state was $33.04 per ton an excess over state values of $4.22 per ton."

CHEMICAL COMPOSITION OF PLANT FOODS.

By Mrs. N. M. G. Prange.

I am asked to continue an account of my study of plant foods and to tell how it has benefited me practically. I can not tell just how much practical good I have gained. The greater benefit from such things comes in indirect ways and I know my life is broader, my enjoyment has been greater, my interest keener—all my faculties more alert, because of this study, and a wide-awake person is likely to get his share of the dollars and cents. I have not tried to become a scientist, nor have I *experimented* with the idea of "adding (?) to the world's knowledge." This last is a dangerous and expensive proceeding for a beginner. My aim is first to learn and understand things that have been learned by others, to acquire what I can of what has been gathered through many years, by many men of many minds; after which I hope to use some judgment in selecting the methods that are adapted to my situation.

He who criticizes "book farming"

should remember the good he has gained from other books. Take geography, for instance, he would feel it to be unwise to depend entirely upon his own explorations, and also would find it hard to tell where his study of geography has added to his dollars, still he recognizes its need; and it is just such a need that I feel for all information pertaining to plant foods, especially as applied to citrus culture.

My first problem was the K_2O used as standard for potash. I do not buy potash any cheaper because of tracing it out through chemistry as follows: The least part of a substance which retains the identity of that substance is called a molecule. Each molecule is composed of a definite number of atoms. An atom is the smallest part of an element. An element is a substance that can not be divided into other substances and is represented by a symbol—a letter or letters from its English or Latin name—standing for one atom of that element. Each compound has, in chemistry, a formula showing how many atoms of certain elements are found in each molecule of this compound. The K_2O is the formula of pure potash, the K standing for kalium, the latin name for potassium, and the 2 showing there are two atoms of potassium, and the O indicating one atom of oxygen. The chemical name is oxide of potassium. No, I don't buy potash for any less money and it doesn't do my trees any more good, but *I do* feel more self-respecting when I talk about it, and besides, doesn't one stand a better chance to choose a suitable method of cultivation and fertilization if he understands just what his plant foods are, just what changes must take place to make them available to the plant, and just what conditions will facilitate or retard those changes?

The question that naturally comes next is, "What is sulphate of potash?" It is not the fault of the kali works if one lacks information about potash. In their "Stassfurt Industry" we find "Sulphate of potash is simply actual potash combined with sulphuric acid." What *is* an *acid?* "Something sour?" Well then what makes things sour? "The acid in them *of course.*" And there we are, in a neat little circle.

Chemistry tells us "An acid is a compound formed by the union of a non-metal with hydrogen and usually oxygen." When formed of two elements it is a *bi*nary acid and when formed of three elements it is a *ter*nary acid. Webster ends his definition with "and in its compounds exchanges its hydrogen for a metal." It is this quality of exchanging its hydrogen for a metal that gives to us our chemical fertilizers. When the metal acts thus it is in the form of a hydroxyl, that is, is combined with hydrogen and oxygen, and is called a *base.* When the change has taken place we have neither *acid* nor *base,* but a *salt* and *water.*

*Bi*nary salts, that is, salts made from binary acids, are named by adding *ide* to the name of the non-metal. *Ter*nary salts are named from the acid that forms them. If an acid ends in *ic* the salt ends in *ate.* Nitr*ic* acid (HNO_3) makes nitr*ates.* If the acid ends in *ous* the salt ends in *ite.* Nitr*ous* acid (HNO_2) makes nitr*ites.*

A ternary acid ending in *ic* is far stronger than one composed of the same elements ending in *ous* but the only difference in the formula is that it has one atom more of oxygen.

The name "Sulphate of potash" tells us it is a salt formed by the hydrogen in sulphuric acid being displaced by the *base* KOH. We wonder how it "works out" so turn to acid formulas. Sulphuric acid is H_2SO_4 and we write out our example:

H_2SO_4 +	2KOH =	K_2SO_4 +	$2H_2O$
Sulphuric Acid	Potassium Hydroxyl	Sulphate Potash	Water

It would take too long to explain why we take KOH twice but there is a reason given in chemistry under the head of "valence."

What we buy as high grade sulphate of potash is guaranteed to be from 90 to 95 per cent chemically pure and to give 49 per cent K_2O. Let us reckon it out. An atom is so inconceivably small it cannot be weighed and the calculation must be made by proportion. As hydrogen is the lightest substance known, other atoms are said to weigh "so many times as much as hydrogen." We turn to the table of atomic weights and find two atoms of potassium weigh 78.2, one atom of sulphur, 32, and four atoms of oxygen, 64; making the molecules K_2SO_4 and K_2O weigh 174.2 and 94.2 respectively. Therefore in 174.2 ounces, pounds or tons of sulphate of potash (K_2SO_4), 94.2 ounces, pounds or tons would be pure potash (K_2O). We have to buy 193.55 lbs, of 90 per cent sulphate, or 183.36 lbs. of 95 per cent sulphate to get 174.2 lbs. of pure sulphate (K_2SO_4). Our 94.2 lbs. K_2O is 47.63 per cent of the former and 51.3 per cent of the latter, so we are sure of our promised 49 per cent, and we see all these formulas and per cents that have seemingly been so intricate are readily mastered when given a little thought. But—do I hear not one but many ask what is that 10 per cent of the high grade and 52 per cent of the low grade sulphate of potash that is not sulphate of potash chemically. It is a variety of natural salts formed with the sulphate of potash and not entirely removed because of the expense. They do no damage and indeed many consider the large percentage of sulphate of magnesia found in the low grade a decided advantage.

Though we do not use muriate of potash on our trees, as we were looking at the acid formulas, we wondered what element gave it the name "Muriate" and glanced down the list but did not find it. It was some weeks before we stumbled across the statement that "Sulphuric acid is often called 'oil of vitriol' and hydrochloric acid is generally known as 'muriatic.' Muriate of potash then would really be chloride of potassium, (Kcl), but why called 'muriate'?". A good friend tells us the name has its origin from the Latin "muria" meaning salt, because the acid was commonly made from salt or brine. We find salt is chloride of sodium ($NaCl_1$). Its chlorine is made to unite with hydrogen to form hydrochloric or "muriatic" acid (HCl_1). No wonder we are cautioned against the use of muriate of potash when chlorine will hurt the proposed crop—for nearly one-half of it is chlorine!

Sulphate of ammonia ($2NH_4,SO_4$) should be called sulphate of ammonium. There is one atom more hydrogen in ammonium (NH_4) than in ammonia (NH_3). By far the greater portion of this salt is a by-product of coke and gas works. Coal contains from 1 1-5 per cent to 1 3-5 per cent nitrogen, or from 24 lbs. to 32 lbs. per ton. Upon reckoning the atomic weights of the formula $2NH_4,SO_4$, we find 28 lbs. nitrogen makes 132 lbs. sulphate of ammonia. When we read that 20 lbs. to 22 lbs. of the sulphate is considered a fair yield per ton of coal, at either coke or gas works, and that comparatively few works try to save any at all, we think it would be well for some genius to perfect machinery for this purpose.

Nitrate of soda, or properly, nitrate of sodium ($NaNO_3$) shares honors with sulphate of ammonia as a source of nitrogen for plant food. It is found in Chili and like the sulphate and muriate of potash from Germany is made by the great chemist, Nature, but is as truly formed as described as though the nitric acid and sodium were mixed with human hands.

Guano is another valuable source of plant food, giving us some of all three essentials. There are many different deposits but in our market we hear only of Peruvian guano from the islands off the rainless coast of Peru. It is formed by sea birds, seals, etc., during life and after death. The deposit is often over 100 feet deep. The lower layers are so fossilized as to be "rock guano." Above this have been found seal fur, and sometimes petrified birds' eggs are taken from a depth of from two to twenty-five feet. One kind of egg is filled with pearly crystals, but you may be sure no such curios find their way into a fertilizer sack. Being of such origin the constituents of guano vary greatly and each lot must be analyzed. It used to be high in ammonia content but now is often classed as a phosphatic fertilizer. It contains plant food in many different combinations and is especially fitted to some lands; but like all good things it has its place, so make sure whether your land requires it, for it costs high. And, too, make sure you get it when you *do* buy it. I may as well confess right here that, thinking it as well for the consumer as the manufacturer to be "up-to-date," I subscribe for a magazine published for the fertilizer trade. From it I learn some points that otherwise I might not come across. One thing I noticed was the way garbage, leather and wool waste, etc., are treated. From them can be and *is* made a very good substitute for guano when put in a ready mixed fertilizer. It is good, and such things should be utilized, but it is not guano, and when we buy it we do not want to *pay* for guano! So let us be thankful for our fertilizer laws and LOOK AT THE TAG.

As we study the sources of phosphoric acid, we remember the contents of Farmers' Institute Bulletin No. 1, and decide to skip "dissolved bone," "boneblack," etc., and learn all we can of plain acid phosphate. We find the largest fields of the best phosphate here in our own fair Florida. From them is shipped 80 per cent. of the world's product. It is sold under a guarantee of minimum 77 per cent phosphate of lime and maximum 3 per cent oxides of iron and aluminum. This standard is far higher than the English products, yet Griffiths says in his "Manures": "It would be well if the prejudice against manures containing mineral phosphates were stamped out, for even measured by a standard of purity, minerals can hold their own against bone phosphates." Let us see exactly what acid phosphate is. The chemical formula of the *pure* tri-calcium phosphate is $Ca_3P_2O_8$. By recokoning atomic weights we find the proportion to be—120 lbs. calcium, 62 lbs. phosphorus, and 128 lbs. oxygen. Though there is a excess of lime, the impurities in the Florida rock are of no moment except the oxides of iron and aluminum. These are kept at an extremely low per cent by careful washing, after which the rock must be well dried. The process of making soluble phosphate is based on the stronger attraction for lime, sulphuric acid (H_2SO_4) has over phosphoric acid (H_3PO_4). The sulphuric acid used is very weak—only about half strength, for the water is needed to facilitate the chemical process. While Voorhees ignores the fact that one thinks of the "parts" as being equal when told that a substance is divided into certain parts, he has made the change very clear to one's mind by describing the rock as three parts lime to one part phosphoric acid. Just the right amount of sulphuric acid is added to combine with the other constituents and leave one part lime with the phosphoric acid, in which combination the phosphoric acid is easily dissolved. So were our acid phosphate pure and well made it would be a phosphate of lime mixed with sulphate of lime or gypsum. The making is merely a matter of fine grinding and thorough mixing with the proper amount of acid. Things easily done in these days of first class machinery and skilled chemists. The acid, weak as it is, costs $6 per ton while the phosphate rock is worth less than $8, and it takes 63 lbs. of acid for each 100 lbs. of pure tri-calcium phosphate. We can readily see that it behooves the manufacturer to look well to the economical using of his acid. This same question of cost insures us of his being most exacting about impurities, for sulphuric acid will combine with the oxides of iron and aluminum before it will with the lime. Every 100 lbs. iron oxide will take 184 lbs. acid and 100 lbs. alumina absorbs over 285 lbs. of acid. The manufacturer can not *afford* impurities. Another safeguard is the ease of detecting a poorly made or impure acid phosphate. If an excess of sulphuric acid is used it combines with so much lime as to leave free *phosphoric* acid. I underscore phosphoric, because so many think the "free acid" they hear about is sulphuric. The free phosphoric acid attracts moisture from the air and the fertilizer containing it is a damp lumpy mass. Too little sulphuric acid leaves some of the phosphate in the di-calcium, which is the same as the "reverted" state. Too high a percentage of impurity makes a sticky product, high in insoluble phosphoric acid. We are well protected. It is cheaper for the manufacturer to make a good article, and besides a poor acid phosphate proclaims itself. So now we understand quite clearly, *just what* we are feeding our orange trees, and our next step is to learn just how this food reaches them and is assimilated.

Acknowledgment due to Profs. P. H. Rolfs and A. W. Blair, Dr. E. R. Flint, Capt. R. E. Rose and others for their kind help over any difficult places in my

studies; also to Chemist McMurtree's articles in the *American Fertilizer,* Griffith's *Manures,* Muir's *Chemical Elements,* Warrington's *Chemistry of the Farm* and other books and publications; especially those issued by our state and the United States and sent free to all.

FORMULA WORK.

By Mrs. N. M. G. Prange.

Before presenting this work, I wish to assure those who are chafing at the thought of being bored by figures, that I shall give but two illustrations.

All will please remember that these are fanciful formulas and are not recommended for use. In my grove I use the standard formulas of trade, considering my conditions are in no way so peculiar that they cannot be met by some of the various formulas on the market. Knowing these formulas are the result of years of patient study and trial to supply the needs of trees at all seasons and in all parts of the State, I feel it needless for me to go back to the beginning, trying perhaps what others before me have already found lacking. Rather would I benefit by what they have learned and spend my time in a careful selection from what has proven to be of value.

I use this formula work simply to ascertain the market value of the plant food offered in a formula and trust others will do the same.

As simple a formula as we can find can be made from sulphate of ammonia, dissolved boneblack and high-grade sulphate of potash. We write its name "Fruit and Vine" at top of sheet, its percentages, 3-6-12, at left hand corner and the catalogue price at right of name. Our next step is to write the name of materials to be used in a column, leaving space at left for the number of pounds, and spaces at right for content in pounds of ammonia, phosphoric acid, and potash—for price per ton and for cost of quantity used, making in all seven different columns.

Ammonia 3 per cent. gives 60 lbs. in a ton. In the State Chemist's report we find sulphate of ammonia contains 25 per cent. ammonia and is worth $74 per ton. Since there are 25 lbs. Ammonia in one hundred pounds of the sulphate, it will take as many hundred pounds to supply the 60 lbs., as 25 is contained in 60 which is 2 2-5; equalling 240 lbs., or we can add two ciphers to the 60 and the answer will come in pounds—that is 25 will go in 6,000, 240 times. We write "240 lbs." before the item "Sulphate of Ammonia," "60" in the column for ammonia content in pounds and $74.00 in column for prices per ton. The easiest way to reckon the cost of an irregular number of pounds is to multiply cost of one thousand pounds, or one-half ton, by number of pounds taken and point off three figures—240 lbs. of sulphate of ammonia at $37.00 per thousand amounts to $8.80, which we write in the last column on the right.

Dissolved boneblack contains 17 per cent. phosphoric acid and is worth $24 per ton. We need 120 lbs. available phosphoric acid to make 6 per cent. By annexing two ciphers to 120 and dividing by 17 we find it takes between 705 and 706 lbs. boneblack. As we believe in good measure we take 706 lbs. which gives 120.02 A. P. A. and costs $8.47. We put all these amounts in their proper columns on the boneblack line.

High-grade sulphate of potash contains 48 per cent. potash and costs $50.00 per ton. We need 240 lbs. potash which necessitates buying 500 lbs. high-grade sulphate of potash. As 500 lbs. is just a quarter of a ton, we divide $50.00 by four and get $12.50 to complete our cost column. Oh no—not "complete" for to have our per cents right we must have a bulk of 2,000 lbs. and to get this we add 554 lbs. land plaster at $12.00 per ton which amounts to $3.33. Then we allow $1.50 to pay for mixing and bagging and find the total cost to be $34.60.

Do not object to that land plaster. You need it and it is worth the $12.00 per ton, but DO notice what you are buying and get your fertilizer for what it *is* worth.

Probably the hardest formula to figure is one made with Peruvian Guano as a base. We will call this *Peruvian manure* and have our per cents. run 4-6-2-8; but in figuring the formula we count all the phosphoric acid together for one never tries to get a certain per cent. of insoluble. Whatever insoluble matter there is in any formula naturally accompanies the soluble matter or in treated goods is proof that no "free acid" exists. Besides the guano we will use nitrate of soda, sulphate of ammonia, ground bone and sulphate of potash. Guano varies in its percentages and is bought on its analysis so we find no standard price and content. For our purpose today, we will take figures from a trade list that is out of date—ammonia 3 1-2 per cent., phosphoric acid 16 per cent, potash 2 per cent., price $32.00 per ton. We have been told that 900 lbs. guano is a good foundation so we start with that:—900 lbs. Guano gives 31.50 lbs. ammonia, 144 lbs. phosphoric acid and 18 lbs. potash and costs $14.40. We write all these amounts in their proper columns.

As we are to get the rest of the phosphoric acid from ground bone we make that the next item. Its content is ammonia 4 per cent and phosphoric acid 22 per cent. and its price is $32.00 per ton. As we need 16 lbs. more phosphoric acid we take 73 lbs. ground bone which gives us 16.06 lbs. P. A. and also 2.92 lbs. ammonia and costs $1.17; all of which we enter in the proper places. We still lack 45.58 lbs. ammonia. We will use 100 lbs. sulphate of ammonia to give 25 lbs. and to cost $3.70; and 122 lbs. nitrate of soda which contains 17 per cent. ammonia and costs $60.00 per ton; therefore from the nitrate we got 20.74 lbs. ammonia at a cost of $3.66.

Our guano gave 18 lbs. potash and 547 lbs. L. G. sulphate of potash analyzing 26 per cent. K2O, price $30.00 per ton supplies 142.22 lbs. potash and costs $8.20. Our ton is completed by the addition of 258 lbs. land plaster for $1.55, and mixing and bagging $1.50 making a total of $34.18. If the catalogue price is much in excess of this we shall look for a lower priced dealer for we are buying standard materials and there is no efficacy in the name on the bag. Still we must remember a ton of this analysis of these materials costs the manufacturer some more than we have figured for he is obliged to give excess over guarantee to make sure the analysis will actually test as guaranteed and besides he has to deal in round numbers and cannot weigh out these odd amounts as we have figured. However, all manufacturers have to meet these conditions so our work is as fair to one as another and does very well for what we intend it. When completed it should look like this:

4-6-2-8	PERUVIAN MANURE.	A.	P.A.	P.		$40.00
900 lbs.	Peruvian Guano	31.50	144.00	18.00	$32.00	$14.40
73 lbs.	Ground Bone	2.92	16.06		32.00	1.17
100 lbs.	Sulphate of Ammonia	25.			74.00	3.70
122 lbs.	Nitrate of Soda	20.74			60.00	3.66
547 lbs.	L. G. Sulphate of Potash			142.22	30.00	8.20
258 lbs.	Land Plaster				12.00	1.55
	Mixing and Bagging					1.50
2,000 lbs.	20)	80.16	160 06	160.22		$34.18
		4 —	8 —	8 —		

We have divided the contents in pounds of the different plant foods by 20 because there are 20 hundred in a ton and this would give the number of pounds in each hundred or in other words the per cents.

PRODUCTION OF PHOSPHATE ROCK IN FLORIDA.

By E. H. Sellards, State Geologist.

The first attempt to use Florida phosphates as a fertilizer, so far as the writer has been able to learn, was made by Dr. C. A. Simmons, of Hawthorne, Fla. Dr. Simmons is said to have recognized the phosphatic character of certain deposits lying near Hawthorne as early as 1879, and to have operated a mill for grinding pebble phosphate for direct application to soils as early as 1883 or 1884. In 1880 Professor E. A. Smith collected samples from a quarry being operated for building stone by Dr. Simmons. Analyses of these samples made at Washington under the direction of the Census Bureau showed this building rock to contain 12 to 13 per cent. phosphoric acid.*

*Hawes, G. W.; Nat. Mus. Proc., 1883. Smith, E. A., U. S. 10th Census, Vol X., 1883.

The mill operated by Dr. Simmons was subsequently abandoned, and the production of phosphate on a commercial scale is commonly accepted as dating from the first shipment of river pebble from Peace River in 1888.

The phosphates of Florida are known in the market as hard rock phosphate, land pebble phosphate, and river pebble phosphate. The plate rock phosphate now being mined near Anthony is included in this paper with the hard rock. The soft phosphate of which there is a considerable quantity intermixed with other phosphates is, under present methods of mining, unfortunately not recovered.

The hard rock is a high-grade phosphate. Most of it is sold under a guarantee that the entire shipment will average 77 per cent. calcium phosphate ("bone phosphate of lime;") that iron and alumina combined will not exceed 3 per cent.; and that the moisture content will not exceed 3 per cent. The hard rock which is now being mined occurs along the gulf side of the Florida peninsula from Suwannee and Columbia Counties on the north to Citrus and Hernando Counties on the South. It lies in pockets of irregular occurrence and extent and rests usually upon limestone of Vicksburg (Lower Oligocene) age.

The land pebble deposits are of Pliocene age, and are less irregular in their manner of occurrence than are the hard rock phosphates. The chief land pebble region lies to the South of the hard rock region. The deposits being worked lie in Polk and Hillsboro Counties. Most of the land pebble is sold under a guarantee of 68 per cent calcium phosphate, iron and alumina not to exceed 3.5 per cent. to 4 per cent, and moisture not to exceed 3 per cent.

River pebble has been produced chiefly from Peace River and its tributaries. The usual guarantee is 60 per cent. calcium phosphate; iron and alumina 3 per cent. and moisture 3 per cent.

Phosphates varying in quality and in quantity, mostly low-grade and at present undeveloped are found at numerous other localities in Florida from the Apalachicola River on the West to Lee County on the South.

The production of river pebble, the first of the Florida phosphates mined, increased gradually from 1888 to 1893 when the maximum production of 122,820 tons was reached. From the year 1893 to the present time there has been with some fluctuations a decrease in the output of river pebble, the total for 1908 being 32,950 tons.

The discovery of hard rock phosphate was made soon after the beginning of mining of river pebble. The first shipment of hard rock was probably made in 1890. The output of hard rock phosphate has gradually increased from the beginning of mining to the present time. The total hard rock mined during 1908 was 768,011 long tons, which is a considerable increase over the production of any previous year.

The first shipment of land pebble was probably made in 1891, although development began somewhat earlier. In 1892 the production amounted to 21,915 tons. The rate of increase of land pebble was at first gradual, but in late years has been very rapid. In 1906 the output of land pebble for the first time exceeded that of hard rock. The amount of land pebble mined during 1908 is greatly in excess of that mined during any preceding year, falling little if any short of 1,150,000 tons.

The total amount of phosphate mined in Florida during 1908 was 1,950,961 long tons. At the present rate of increase Florida, five years hence, may be expected to be producing 2,000,000 tons of phosphate annually.

Practically all of the hard rock phosphate produced in Florida is exported, the home consumption of this grade being insignificant. During 1908 only 9,900 tons of hard rock was consigned for use in the United States, 6,000 tons of which is reported as having been used in Florida. The river pebble, although not used in Florida, is used entirely within the United States, no part of the 1908 output having been exported. Of the land pebble output for 1908, 150,377 tons is reported as consigned for use in Florida. Of the total amount marketed the remainder was approximately equally divided between domestic and foreign ports.

In the United States, Tennessee and South Carolina are, next after Florida, the largest producers of phosphates. Other states which in 1907 produced a limited amount of phosphate were: Arkasas, Idaho, Utah and Wyoming. The deposits of the western part of the United States although as yet undeveloped are reported to be very extensive. The recent withdrawal from settlement by executive order of large tracts of public lands will somewhat delay the exploitation and exhaustion of these western phosphates. The United States is now supplying almost two-thirds of the total phosphate produced in the world. Of the total for the United States, Florida produces more than one-half, and of the total for the world approximately one-third.

LOSS OF PHOSPHATE IN MINING.

That there is considerable loss of phosphate in mining is well known. Practically all deposits contain along with other material more or less phosphate in a soft or pulverulent condition. Under present methods of mining, this "soft" phosphate is necessarily lost in the process of washing, being carried to the dump along with the sand, clay and other ingredients of the matrix. The amount of phosphate thus discarded may be expected to vary with different deposits and under different conditions. After reaching the dump there is also more or less mechanical separation, so that samples taken from one part of a dump may be found much richer in phosphate than samples from some other part of the same dump. Samples taken by the writer somewhat at random from the dumps in the hard rock region gave the following results: Sample No. 1 is from mine No. 5 of the Cummer Lumber Company, at Newberry; No. 2 is from the dump of the Camp Phosphate Company, five miles southeast of Dunnellon. Analyses by the State Chemist:

	No. 1.	No. 2.
Total phosphoric acid	9.99	12.14
Equivalent to calcium phosphate	21.81	26.50

A sample of floats from the dump in the land pebble section gave the following results. This sample was taken by the writer from the dump of the Charleston Mining and Manufacturing Company at Ft. Meade. Analysis by the State Chemist:

Total phosphoric acid	11.47
Equivalent to calcium phosphate	25.04

Selected samples of floats could undoubtedly be taken containing much more phosphate than the samples analyzed.

Analyses of two samples from the wash of the plate rock phosphate mine at

Anthony, made by Mr. P. Jumeau, manager of the plant, gave the following:*

	No. 1.	No. 2.
Silica	58.95	60.10
Iron and alumina	11.70	11.20
Calcium phosphate	27.92	26.80
Not accounted for	1.43	1.90
	100.	100.

Mr. Jumeau estimates that in this plant approximately four tons of material are handled in order to obtain one ton of high grade rock phosphate (77 per cent). In other words, of the material taken from the pit three-fourths carrying about 27 per cent calcium phosphate goes into the dump, while one-fourth carrying 77 per cent calcium phosphate is saved. It is thus seen that of the total phosphate taken from the pit in this instance fully one-half goes into the dump.

*Composition des Gisements de Phosphate de Chaux des Etats-Unis, Paris, 1906.

From these analyses it is apparent that a very large amount of Florida phosphate is being lost annually. Methods of utilizing these floats, or of reclaiming this waste if such can be devised are clearly of the greatest importance both to the phosphate producers and to the agricultural interests. Phosphoric acid is a soil essential, and any permanent system of agriculture must provide a phosphoric acid supply. With the extension of agriculture necessary to support increased population, together with and naturally rich soils there arises increased demands upon the phosphate supply. At the present time this demand is coming chiefly from the older countries of Europe. The time is not far distant, however, when an equally strong demand will come from the exhausted soils of our own country.

Peaches and Other Deciduous Fruits.

By W. L. Floyd, M. S.

The cultivation of peaches as a commercial crop seems to be on the decrease. One reason for this is the competition of cantaloupes which have become an important crop in the South in recent years.

There is an average crop on the trees this year, but the quality is not satisfactory because of more worms (curculio larvae), in them than usual. Our growers need to be impressed more fully with the importance of gathering up and destroying all fruit that falls to the ground. Old settlers tell us that the peaches of the pioneer days were almost free from worms. To-day they are abundant in all orchards, and are increasing because the number of trees planted has increased the food supply. Prices this year for good early fruit promises to be quite satisfactory.

The selection of the proper variety for planting needs re-emphasis. Representatives of outside nurseries are coming among us and by persuasive voice and attractive illustrations are selling kinds that do well in states near by, but to the north of us, but which will not do well in middle and South Florida. The derivatives of the Peento and Honey groups for commercial planting, and some varieties of the Spanish for the home garden are all we can expect to grow with success here, certain varieties of these are specially suited to certain localities. Our people need therefore to observe closely what succeeds about them then buy from a reliable nearby nursery what has proven good.

The San Jose scale is being held in check in some of our largest orchards by the red-heated fungus (sphaerostilbe cocophila) and black fungus (myriangium duriaei). Our climatic conditions are peculiarly favorable to the growth of these fungi and when applied at proper time and in proper manner are quite effective.

The growing of the peach on Pasco plum roots in order to avoid root knot is reported a success in some places. Many of us are trying this and can report more fully as to its value later.

Pears are of but little commercial importance, and their planting in the home garden is decreasing because of blight. No preventive has been found for this bacterial disease, pruning off diseased branches back to the healthy wood is the best thing we know to do. Beware of the agent who offers a blight-proof tree, we doubt if such a thing exists. The Suwanee pear is a new variety now being introduced by a prominent nursery of the state, which promises well, its advantages over the LeConte and Keiffer need yet to be proven.

Plums of the pure-bred Japanese varieties seem to be unsatisfactory in Florida, the cross-bred kinds especially the Excelsior and Terrell do well. Florida Queen and Howe are two new varieties that deserve a trial.

Of apples there is little to be said. The Jennings does reasonably well in some places in the northern and eastern part of the state. The settler who has come here from an apple-growing region, and desires to grow a few apple trees for old association's sake we think will find this the best to plant. We have heard of the successful growing of apples on a haw (crategus) stock but have not tried it nor seen it tried.

Figs, grapes and Japan persimmons may properly come under the subject given. There are varieties of each that do fairly well in Florida and should be given a place in the home fruit garden, we recommend consulting a near by, reliable nursery if the planting of these is being considered and there is doubt as to what will do well.

DISCUSSION.

Mr. Henderson—This is the subject in whch I am most interested. One thing about which I think growers of these fruit should be warned against is putting too much confidence in the nursery drummers who come down from the north. They come down with their nice cuts of fruit and show what nice fruit they produce, but when they are planted down here nine times out of ten they don't bear fruit at all. The pictures are seldom a true representation of the fruit produced. There is an agent around Gainesville to-day who is selling peach trees at $1 apiece from the book, that they can buy from the Florida nurseries for 10c. You never can get a peach from them that will bear fruit here. I have tried all those northern peaches, and you can't grow them at all here. You never will get more than a half a dozen peaches to the tree, if that many, from the northern grown trees. The Peento and Honey varieties are the ones we have to depend on in Florida for our crop. South of Ocala we have to depend almost entirely on the Peento varieties such as Hall's Yellow, Jewell, Bidwell's Early and a few others practically of the same type.

Now, as I have said, these agents come in and sell peaches, pears and plums absolutely worthless here.

As to the apple, that may be grown for ornamental purposes and for old association's sake. I went to the woods and took up a couple of haw roots about the size of my thumb and put apple graft in them and then put them in the ground and the first year the graft grew six feet high. I never saw such a growth. The third year it had a pretty nice crop of apples on it. Then the San Jose scale got on it before I learned how to kill it with fungus, and it never was any good after that. I believe we can make a success of growing a few apples for apple pies around the home in Florida, but I don't think it will ever be grown for commercial purposes.

I think the fig is a coming fruit. I don't think we have given enough attention to figs. I have a fig tree in my yard that I would not take $50 for. It produced enough for my own table, we put up about four gallons of preserves and gave our neighbors all they wanted. There are several varieties of figs that are very hardy and they are very easily raised and anyone who has a back yard can have a fig tree that will give him all the figs he wants.

The pear tree, I am pleased to note, is recovering from the blight very rapidly in all sections of the country. The pear will not stand much cultivation and too much ammonia. In some orchards, the blight has almost disappeared. They need phosphoric acid and potash. I believe the blight is caused by improper treatment and fertilizing with too highly ammoniated manures.

I do not think the deciduous fruits are given the attention in this society that they should have.

As to the decline of the peach business in Florida, possibly the San Jose scale has done as much to discourage it as any other one thing. It has gone all over the state. However, it is very easily overcome now by the use of red-headed and the black fungi. The curculio from the north is advancing very rapidly down the state. It is down perhaps to Ocala. Down about Lakeland and that country the worms have not appeared. It seems to be our most dangerous enemy to the peach. They have had it in Georgia since I was old enough to know much about worms. They have been trying to learn ways to fight it for the last twenty-five years. I know it will destroy the fruit, but don't know how to destroy it. To the peach, it is worse than the whitefly to the orange. You can't touch him with the spray, because when the spray hits him he curls up and drops off on the ground. You can't hardly see him or find him. You simply have to burn him up with fire to get rid of him at all.

Another thing I notice is that when peaches are stung by the curculio it does not necessarily ruin every peach, because hundreds of them that are stung make good peaches. Of course, you can see where they were stung, because a little bit of white wax comes out where it is stung. As I said before, I think we ought to give some attention to other things besides oranges. We spend two or three days talking about oranges, and then put off the other fruits with an hour or two. It isn't hardly fair to those of us who are interested in other things.

Ornamentals.

THE PRINCES OF THE VEGETABLE KINGDOM IN OUR FLORIDA GARDENS.

By H. Nehrling.

I.

Palms! The very word creates visions of beauty and magnificence in our minds. Groups of palms! Avenues of palms! Forests of palms along our streams and bordering our clear water lakes! Thickets of palms in our flat woods! Groves of Cocoanut Palms on the East Coast! Royal Palms on the borders of the Everglades! Florida is the land of palms. They are inseparably connected with this land of flowers, clear water lakes, invigorating breezes and bright sunshine. The word "palm" stands for all that is noble and grand in the plant world. Linnaeus called them the "princes of the plant-world." And, indeed, they are a royal family, glorying in isolation, proudly waving their graceful foliage in the breezes of a tropical landscape. Not all the members of the tribe, however, show this nobility and grandeur. As in every-day life, they have—like many noble families—low connections and poor relations. It is only necessary to allude to our proud and elegant Cabbage Palmetto on one side and its congener, the lowly Saw Palmetto, on the other. Both reveal a very strong and unmistakable family likeness. But how very different are both!

Systematic botanists tell us that in their external structure, as well as in their internal organization, palms approach nearest the grasses—plants which have been termed by Linnaeus the "plebejans" of the order. Superficially viewed, this appears a rather distant relationship. In making comparisons, however, we must not select the Cabbage Palmetto and the Bermuda grass for examples, but, replacing the latter by the giant bamboo, we immediately see the truth of the above statement. And, indeed, palms and bamboos are the greatest attractions of our Florida gardens. Grown side by side, they create unique tropical effects, charming pictures of beauty and poetry not obtainable by other plants.

The chief feature of the palms consists in the cylindrical trunk, crowned by a mass of either plume-like or fan-shaped leaves. Our native palmettos belong to the last group, while the Date Palm, the Royal Palm and the Cocoanut Palm have pinnate or plume-like leaves. The different species vary in height from a few feet to a hundred and more. Some are stemless, but the great majority have slender tall trunks. In some species the diameter of the stem, which does not vary very much in its whole length, is thick and massive, in others, slender and polished, while some of the smaller species have trunks not thicker than a walking stick or a pen holder. Most of the palms have a single stem, not producing any side shoots at all; others send up quite a number of stems from one root-stock. The trunks are sometimes smooth or ringed, but more frequently they are covered with the old bases of the fallen leaves and sometimes they are armed with formidable spines. In some cases the leaves fall to the ground as they decay, leaving a clean scar, in most cases, however, they are persistent, rotting slowly away and leaving a mass of fibrous stumps attached to the upper part of the stem. This rotting mass next to the trunk forms an excellent material, a kind of a peaty soil, for ferns, orchids, many tillandsias and arads, which form an exceedingly decorative feature on what would otherwise be an unsightly object. Thus nature gives us a hint how to decorate the bare stems of our garden palms. The sheathing margins of the leaves often break up into a fibrous mass, sofetimes resembling coarse cloth and sometimes bast or even horse hair. The climbing palms are very remarkable. These are the Ratang Palms, which supply the rattan from which the seats, etc., of our cane chairs are made. Naturally very prickly, these stems, by means of reflexed hooks, with which the ribs of the leaves are provided, climb high up into the loftiest forest trees. All the species of the genus Calamus of the Old World and of the genus Desmoncus of tropical America are climbing palms. The stems of these "vary in size from the thickness of a quill to that of a wrist, and where abundant they render the forest almost impassable. They lie about the ground coiled and twisted and looped in the most fantastic manner. They hang in frestoons from trees and branches, they rise suddenly through mid air up to the top of the forest, or coil loosely over shrubs and thickets like endless serpents. They must attain an immense age, and apparently have an unlimited power of growth, for some are said to have been found which were 600 or even 1,000 feet long, and, if so, probably are the longest of all vegetable growths." (Wallace on "Tropical Nature.")

The leaves of many palms are of immense size even under cultivation. A specimen of the Cohune (Attalea Cohune) in Horticultural Hall, Fairmount Park, Philadelphia, not yet having formed a trunk, has pinnate leaves 30 feet long. Those of Manicaria saccifera of Para are 30 feet long and five feet wide. They are not plume-like, but entire and very rigid. Some of the pinnate leaved palms are much larger, those of Raphia taedigera and Maximiliana regia being both sometimes more than 50 feet long. The fan-shaped leaves of the West Indian Cabbage Palmetto (Sabal umbraculifera) are eight to ten feet in diameter.

In tropical countries the uses of the palms are so exceedingly important and so varied that it would fill volumes to go into detail. Suffice it to say that they furnish everything to the inhabitants of the tropics: food, cloth, houses and ornaments. We all know something of the uses of the Cocoanut Palm and the Date Palm, but these are only two species while there are hundreds of other useful kinds. Sugar of the best quality is made of the sap of the Sugar Palm (Arenga saccharifera) and the Indian Date Palm (Phoenix sylvestris), the latter a most beautiful palm of our gardens. "The sap which pours out of the cut flower-stalk of several species of palms," says Alfred R. Wallace in Tropical Nature, "when slightly fermented, forms palm wine or toddy, a very agreeable drink, and when mixed with various herbs or roots check fermentation, a fair imitation of beer is produced. Other articles of food are cooking oil from the Cocoanut and Baccaba Palm, salt from the fruit of a South American Palm (Leopoldina major), while the terminal bud or 'cabbage' of many species is an excellent, nutritious vegetable, so that palms may be said to supply bread, oil, sugar, salt, fruit and vegetables. Oils are made from several distinct species, especially the celebrated Oil Palm of West Africa, while wax is secured from the leaves of some South American species (Copernicia cerifera, etc.). The resin called 'dragon's blood' is the product of one of the rattan palms. The fruit of the Areca Palm (Areca Catechu) is the 'betel nut' so universally chewed by the Malays as a gentle stimulant and is their substitute for the opium of the Chinese, the tobacco of the European and the cocoanut leaf of South America."

The so-called vegetable ivory is supplied by a beautiful plume-leaved palm (Phytelephas macrocarpa) of South America.

Many of the most beautiful and most impressive palms are at present cultivated in the palm houses of our large cities. The "Palmengarten" in Frankfort-on-the-Main has a world-wide fame, not only as a scientific institution, but also as a resort of pleasure and recreation. The largest scientific collection is found at Herrenhausen, near Hanover, over which the celebrated palm specialist, Hermann Wendland, presided for half a century. In our own land the rare collection of magnificent palms in Horticultural Hall, Fairmount Park, Philadelphia, is undoubtedly the finest in the country. This palm house is almost seventy-five feet high and many specimens reach quite the top of the glass roof. When I first saw the tall and majestic specimens of Livistonia sinensis, Cocos plumosa, Ceroxylon andicola, Phoenix Canariensis, Seaforthia elegans, Attalea Cohune and many others in company of the Norfolk Island pine (Araucaria excelsa) and the Bunya-Bunya (Araucaria Bidwilli), large clumps of bamboos, clusters of screw pines (Pandanus), masses of bananas, huge tree ferns, immense specimens of the glossy

Cycas circinalis, I had the impression of being in a fairyland. The trunks of most of these palms were densely covered with conspicuous tropical creepers, particularly philodendrons, anthuriums, Monstera deliciosa, Pothos aurea and other arads. Underneath them were fine masses of the pretty flowering banana (Musa coccinea), almost always in bloom and extremely showy; of garland flowers (Hedychium Gardnerianum), of Pandanus Veitchii and P. caricosus, thickets of Bamboo Palms (Rhapis flabelliformis and Rh. humilis), clumps of fancy-leaved Caladiums, spider lilies (Hymenocallis) and crinums, exquisite specimens of Maranta zebrina, Phyllotaenium Lindeni, various Alocasias and of ferns and selaginellas. How often have I feasted my eyes on these tropical landscape idyls! How charmingly was Nature in her poetic beauty copied here by the artistic hand of the landscape gardener! There is no doubt that in our Florida gardens similar effects can be obtained by judicious planting—indeed they have been obtained in many of our gardens. Wè have a large assemblage of highly colored and beautiful leaved plants and tropical flowers at our command which form charming adjuncts to our garden palms, an advantage not found in any other part of our country, and we should make extensive use of them.

Though mainly inhabitants of the equatorial regions of both hemispheres, there are quite a number of palms growing in high altitudes or overstepping their northern or southern limit. About 1,200 different species are known to science, their greatest abundance having been recorded by naturalists to be in the Amazon valley and adjacent regions. About 14 species are indigenous to Florida. One is found in California and there are several species occurring as far north as South Carolina. Many of the strictly tropical palms thrive splendidly in South Florida, while many of the subtropical species find a congenial home all along the gulf coast.

While I have seen grand specimens of the Canary Island Date Palm and the Cabbage Palmetto in New Orleans, it can be safely said that extensive collections can only be formed in Florida and California. These two states, however, have a very different climate. Florida is rather humid, but the soil is usually light and not rich, while California has a dry climate and a very heavy, rich soil. Florida has, during the summer, heavy rains, while in California no rain falls during this season. For this reason it is evident that many palms, growing well in Florida, cannot be grown successfully in California and vice versa. Howeas (Kentias) and Arecas do very well in Southern California, but they are no success in Florida, even under the most favorable conditions. On the other hand, such glorious palms as the Cocoanut, the different Royal Palms, Acrocomia Totai and numerous other species do not seem to thrive at all in California. The richest collections of palms in the latter state are found in Santa Barbara, Pasadena and Los Angeles.

In our own state the late Mr. Edmund H. Hart, of Federal Point, has brought together a most beautiful collection of species. Mr. Theo. L. Mead, of Lake Charm, has experimented for years with a large number of palms, and Mr. George Abbott, of Orlando, has a very representative collection. Mr. J. F. Dommerich at Maitland has also a fine collection. In Orlando, the floral city of our State, there are numerous large specimens in many gardens, notably in Mr. Overstreet's and Fuller's, the latter planted by the late Mr. Geo. B. Breen, Bishopstead, is also replete with palms and bamboos. Mr. E. N. Reasoner, the introducer of hundreds of beautiful tropical plants adapted to our soil and climate, has disseminated many fine and rare palms. There is a wealth of grand specimens, tall and majestic, in the grounds of the Royal Palm Nurseries. Many of them were planted by the late P. W. Reasoner more than thirty years ago. Florida is a large state, touching almost the tropics. Many species not hardy enough in the northern and central parts of the state can undoubtedly be grown successfully in the extreme south—in places where the mango, the sapodilla and avocado ripen their fruits. I am of the opinion that as yet we only have touched the fringe of what we may hope to achieve in the cultivation of tropical palms. What a magnificent sight do the groves of Cocoanut palms present at Palm Beach and elsewhere on the East Coast, where the glowing blossoms of the royal poinciana light up the landscape like fiery flames, where the leaves of the traveller's tree attain gigantic proportions and where thickets of crotons abound in every good garden! The Royal Palms of Biscayne Bay and of Fort Myers are well known to all plant lovers who visited these places. Seaforthia elegans thrives splendidly in Bradentown. Elais Guineensis, the Oil Palm, is a feature in Mr. Chas. T. Simpson's garden at Little River near Biscayne Bay. Why should not the magnificent Cohune, the various Astrocaryums and Raphias, Euterpes, Caryotas, Arengas and others thrive equally well in South Florida? Copernica cerifera, the Wax Palm of Paraguay and its near allies thrive splendidly in Southern Italy, and I am sure these fine palms will do equally well in Central and South Florida. Mr. A. Fiehe under the late H. P. Plant—a real benefactor of Florida—landscape gardener of the Plant Railroad System, set out years ago an avenue of the beautiful Cocos plumosa in front of the Tampa Bay Hotel. They are today about 50 feet high and bear fruits heavily. I have scarcely ever seen a more impressive picture. Then there are in the same grounds avenues of Cabbage Palmettos and fine bearing specimens of the Chinese Fan Palm (Livistonia sinensis). Cocos plumosa and C. flexuosa are successfully grown on Mr. Dommerich's place, "Hiawatha," at Maitland. Mr. E. H. Hart at Federal Point has successfully grown the beautiful Diplothemium Caudescens and D. campestre of Southern Brazil, the very beautiful Livistonia Hoogendorpii of Java, Livistonia olivaeformis (Corypha Gebanga) and the splendid Livistonia rotundifolia, also of Java, for many years. He wrote me that all these palms, Livistonia sinensis and L. australis included, need shade and very rich soil in order to grow them successfully. Many of the pigmies of the family, particularly the species of the genus Chamaedorea, Geonoma and others thrive well in sheds from which frost can be excluded, and on verandas.

I cannot refrain from mentioning in this connection, as a matter of fact, that the two Fan Palms from Lower California, Washingtonia robusta and W. Sonorae, thrive better in our state than they do in California. And I also want to impress on the mind of my reader that these two palms are the coming avenue palms par excellence for Florida, thriving as they do equally well in Jacksonville and in Miami. Majestic specimens of these palms are met with all over the state, especially in St. Augustine in the grounds of the Ponce de Leon, etc., in Federal Point, Lake Charm and elsewhere.

Florida, the home of so many wild species, should everywhere abound in groups and avenues of palms. They imbue dignity, beauty and an indescribable charm to every place where they have been rightly used. The Cabbage Palmetto should always be planted in groups or avenues while the massive Canary Island Date or the Indian Date look very beautiful as isolated specimens on the lawn, the former having a spread of 30 feet in diameter. A group of the various species of hardy Cocos is very charming, particularly when magnolias, araucarias, cupressus torulosa and other evergreens form the background.

Small palms are very cheap. Set out in rich soil and carefully attended to, they soon attain their unique beauty. They increase from year to year in beauty and in value. With a comparatively small outlay the most exquisite landscape pictures can be created, the like not to be seen in any other part of our country. How barren and desolate do our small towns and cities generally look. It has always been a pleasure to me to return to Orlando with its beautiful garden homes. This state is pre-eminently the home of countless winter sojourners and pleasure seekers, not only from the north but even from Europe, people who are not only equipped with a full pocketbook, but also with a broad mind, an excellent education and a good taste. They will not stay in desolate places. In order to attract them many things are essential, but I think nothing is more imporant than to beautify our cities and rural homes with tropical vegetation. Every community in Florida, every city and town should not only embellish their homes but also should create attractive public places. Large and well laid out parks are a necessity ot every larger town, not only in an educational sense for the residents but primarily to attract the winter visitor. Such men like the late H. B. Plant, and in our days, Mr. H. M. Flagler, were well aware of this fact. There are thousands upon thousands every winter pouring to the East Coast, to St. Augustine, Palm Beach and Miami, because these places have a world-wide fame as points of beauty. And this beauty mainly consists in the art of the landscape gardener. Particularly the palms, so lavishly planted around the great hotels, in connection with other tropical plants, are the foundation of this fame. Earthly paradises have been made out of sandy tracts and mosquito infected marshes. If Mr. Flagler had done nothing else in his life but to create these enchanting gardens, he would deserve an everlasting monument.

The palm is a formal tree. No other plant can be used so advantageously in connection with classic architecture. While the Giant Bamboo, formal, too, in outline, is more a plant to hide unsightly places and to overshadow the cabin of the simple dweller, the proud and majestic palm always heightens the effect of refined and beautiful architecture. But palms never must be grown to the exclusion of other fine evergreens. Avenue of palms, groups of palms and single specimens look most beautiful when bamboos, magnolias, royal poincianas, rubber trees or banyans form the background. Especially the bamboos are excellent companion plants of all palms.

I grow over 70 different palms in my garden, the most tender and the shade-loving species under a lath shelter. Though this number may perhaps be reduced considerably from a strictly botanical standpoint, they are all different horticulturally.

It may be well to state here that hardiness is frequently a question of size, the larger ones passing a cold spell unharmed, while the small ones perish if not protected. Many palms also need protection from sun more than from frost. This particularly holds true in the case of Livistonia sinensis and L. australis, two very beautiful and imposing Fan Palms. The dwarf Bamboo Palms (Rhapis flabelliformis and Rh. humilis) and all the Chamaedoreas and Geonomas will only grow in the shade. Most all species of Cocos, Phoenix, Sabal, Acrocomia, Oreodoxa, Caryota, etc., revel in bright sunshine.

The preparation of the soil preceding the planting is the most important point in the cultivation of palms everywhere, but particularly in Florida where the sandy soil is very deficient in plant food. Undoubtedly, many palms will grow in rather poorly prepared soil, but they have to keep up a constant struggle for existence, growing either very slowly or being at a standstill for an indefinite period. Such specimens never will reveal their beauty and are always a pitiful sight.

In setting out palms it must be our aim to grow them into fine specimens as rapidly as possible. Only as such do they reveal all their elegance and grace, their refined and unique beauty. For all large growing palms, such as Sabals, Phoenix, Washingtonias, Acrocomias, Livistonias, Cocos, etc., it is necessary to dig large holes —six feet deep and six feet in diameter is not too much. These holes should be filled two-thirds with rotten wood, pine needles, leaves, bones and stable manure, preferably cow dung. Bones and old tin cans should be placed at the bottom. The entire mass must be well trodden down and left to the elements, rain and sunshine for at least six or eight months. The upper third should be filled in when the planting is done. It should consist of a mixture of well rotted stable manure and surface soil. If there is no stable manure at hand, cotton seed meal may be used advantageously, but this must be applied several months before planting as it would be injurious in a fresh state. It must be well mixed with the soil, but in every case planting must be deferred until this material has become well decomposed. After the hole has been brought into a good condition, plant your palm in the center, spread out the roots with the hand, fill in the soil and tread it down with your feet; then apply water to settle the soil. A mulch of leaves, pine needles, or grass is the next procedure. Place it thickly around the plant. Later, when the roots have taken hold of the soil and a vigorous growth has followed, a mulch of stable manure is necessary. When this rots it should be dug in around the plant. Never burn old rotten wood, leaves or weeds, but dig them in around your plants. In order to keep up a vigorous and rapid growth and to obtain grand and imposing specimens, fertilizer and water are the most important factors. The far-famed specimens of beautiful palms in the Riviera every spring receive a one-horse cart of stable manure each In our soil two applications of fertilizer should be given—one in May or June, consisting of a thick mulch of stable manure or cotton-seed meal. In October this should be dug in and an application of commercial fertilizer, rich in potash and phosphoric acid, should follow. This will harden the plants sufficiently to withstand our occasional cold spells. When setting out small specimens from pots just received from the nursery it is not necessary to prepare large holes. In this case it will suffice to dig holes 3 feet deep and 3 feet in diameter.

In dry weather all newly planted palms must be well watered. Applications of manure water now and then also prove exceedingly beneficial.

Our open air palms are rarely troubled with insects. Some time scale insects infests the leaves, but they are easily eradicated by spraying with soap water to which some kerosene oil has been added—about a cup of kerosene to a large bucket of water. The underside of the leaves particularly must be sprayed.

Small palms are easily protected from frost, but banking with soil is of little use if we fail to protect the heart. This is best done by placing evergreen boughs over the center of the plant, followed by old bags, Spanish moss, paper and straw or hay. This material must be removed as soon as the cold wave has passed. I usually place over the center of my large tender palms bunches of excelsior and dry pine needles, followed by green pine branches and Spanish moss. Of late years I have never protected the tender Phoenix species or Date Palms, and they have not suffered in the least.

II.

The following four genera of rather tall-growing and hardy palms are the most important for our Florida gardens.

Cocos, or Cocoanut Palms.

Phoenix, or Date Palms.

Sabal, or Cabbage Palmettos.

Washingtonia, or California Fan Palms.

Among the palms suitable to our soil and climate, I must assign the first place to the genus Cocos. This consists of the true cocoanut; of the tender soft-leaved section, including the beautiful Cocos plumosa, C. flexuosa and C. Romanzoffiana; of the dwarf and elegant C. Weddelliana and, most important of all, the species of the C. australis group. They are not only the quickest growers and the most ornamental and elegant palms, but many of them grow faster and better in our high pine land than any other palm, being particularly adapted to poor and rather dry soils. On my place in the high, dry pine region, self sown seedlings come up everywhere without any care. This genus is pre-eminently American, being found in many species in Brazil and extending southward to Argentina. Mostly the species are gregarious, like our Cabbage Palmetto, growing together in large groups or groves.

Cocos nucifera, Linn., the true Cocoanut Palm, is at present a cosmopolitan, being found in all tropical coast regions of the world, never occuring far inland. Very likely, an inhabitant of the American continents in remote times, it has found since times immemorial a home in all warm parts of the world, the waves of the ocean having acted as a means of distribution. In Florida it has evidently been introduced from the West Indies. It is a common and most conspicuous palm all along the east coast from Palm Beach—this far-famed winter resort takes its name from the groves of Cocoanut Palms along its beach—southward. On the west coast it grows as far north as Punta Gorda. The large groves of these palms all along the ocean form very impressive and lasting pictures in the mind of the lover of the beautiful. They thrive like native plants, fruiting heavily and being rarely injured by frost. In one of his interesting letters, Prof. C. T. Simpson of Little River writes me as follows: "I wish you could sit here by me, in this pavilion eighty feet out in the bay, on the end of the wharf and enjoy the breeze and the lovely view over and down Biscayne Bay, with a peep out through the keys in the open Atlantic. Down the shore along Lemon City the growth is largely tall mangroves where they have not been cut away, and, where they have, everybody has planted Cocoanut Palms until they look like a forest along the beach, from twenty to fifty feet high. Away down at the lower end of Lemon City a few scattered, tall ones cut the sky-line with beautiful effect and they always look better that way than in groves or rows.

The Cocoanut generally bears all the time here and I have seen trees with a two-horse wagon load of nuts on at one time, but I have seen Cocoanut trees twenty-five feet high so scorched by the freeze that for months I thought they were dead."

Stoddard, in his delightful book "South Sea Idyls," calls the Cocoanut palms "the exclamation points in the poetry of the tropical landscape."

In Polynesia this is the most valuable of all plants, supplying oil, clothing, all kinds of important utensils, food, drink in the shape of Cocoanut milk, and an excellent palm wine is made from the sap by the Singhalese. Nowhere it thrives far inland and rarely specimens are seen in our large conservatories. The aid of the sea water, crushed shells in the soil and the sea weeds acting as a fertilizer are needed to grow them successfully. The Singhalese have a saying that the "Cocoanut trees do not thrive unless you walk and talk amongst them," which indicates that they must receive loving care in order to supply the wants of the people.

Everywhere along our coast this magnificant palm should find a place in the gardens and parks and should be largely planted.

Cocos Weddelliana Wendl is one of the most popular palms for home decoration in all civilized countries, its easy growth, small size, elegance and beauty adapt it particularly for this purpose. It is a native of Braizl where it rarely grows taller than 6 or 7 feet. The delicate, glossy, deep, green, feathery leaves form a perfect circle of elegance. It is a shade and moisture-loving plant, growing finely in plant sheds. In such plant sheds, which should be added to every good garden in Florida, it can be easily protected from sun and cold. My specimens have not been injured by a temperature of 26 degrees Fahrenheit, but they were covered with pine needles and green pine branches. In Orlando a specimen has borne good crops of seeds for several years. This shed, in which asparagus plumosus is grown for the market, is heated by stoves during very cold weather. It also makes a fine veranda plant.

Cocos plumosa, Hook, is one of the most elegant and beautiful of all palms, and it has the additional good quality of being a very fast grower. Its native home is central Brazil, where it usually grows in rich, moist soil. This is one of the most important palms for outdoor culture, being hardy as far north as Orlando and Lake Charm. Mr. Mead, the introducer of many a garden jewel, was the first who grew this and other species of the genus. When the great freeze of 1895 occurred, his tall and imposing specimen was killed outright. There are fine young specimens at Mr. Dommerich's place, "Hiawatha," at Maitland. In the idyllic grounds of the Tampa Bay Hotel I feasted my eyes on a long avenue of these palms which are about 50 feet high. They have magnificent crowns of leaves, and ripen annually large bunches of fruit. The tallest and most impressive specimens of this palm I saw in the grounds of Reasoner Bros. at Oneco, Fla. Lofty and graceful, their magnificent crowns of feathery leaves, touched by the soft breezes, appeared to be pictured from dreamland. And near them grew large specimens of Acrocomia Totai, tall and massive Phoenix Canariensis, P. sylvestris, Ph. reclinata, and nearby the finest and densest coniferous tree I ever saw, Araucaria Bidwilli. Gigantic specimens of feathery bamboos stood in the background, swaying their leaf-masses in the breezes. In and near Orlando this palm needs, during the first few years, some protection from very cold weather. It should be largely planted where there is a chance that it may prove hardy, because it is one of our noblest palms and has a beauty and elegance entirely its own.

Cocos flexuosa, Mart, is another of the of the feathery soft-leaved species from Brazil and in its young state is scarcely distinguishable from the former. In older specimens the leaflets along the midrib stand more closely together and the entire aspect, though not easy to describe, is somewhat different. It is also a much hardier plant, a slower grower and not so tall. I have a specimen 8 or 9 years old that has been outgrown by 3 year old plants of Cocos plumosa.

Cocos Romanzoffiana, Chamisso., an exquisite palm closely related to the two former. It is hardier than both, more massive and very ornamental. The trunks attain a height of 30 to 40 feet and the leaves are 15 to 20 feet long. It is a common palm in Southern Brazil near the sea and is largely planted in the parks and streets of Buenos Ayres and other places of Argentine, where magnificent avenues of it form the delight of travellers. Unfortunately, it has not yet gained a foothold in our gardens, young specimens only being known and these look very much like those of the two preceding species. There is no doubt that it will be hardy in Central and South Florida. My young specimens have not suffered from frost during the past few winters. Seed can easily be imported from Buenos Ayres.

Cocos coronata, Mart., another Brazilian species which has been disseminated by Reasoner Bros. of late years, looking very much like C. plumosa in its young state.

We now come to the most important members of the genus,—important because they all revel in rich and rather dry soil, are perfectly hardy as far north as Jacksonville, bear immense quantities of plum-like, intensely fragrant, juicy fruit and are comparatively rapid growers. Their leaves are mostly bluish-green, hard to the touch and recurved in outline. All my specimens, with a few exceptions, were raised from seed which I mostly obtained from Southern Brazil, Blumenan, Porto Alegre and other German settlements. Some came from the Riviera, where these elegant palms form a most charming feature in the sub-tropical gardens. None of these species are adapted to moist flat-woods soil, but they are easily grown in high hammock and pine lands. When planting young specimens, set them in depressions at least half a foot deep. If set too high they will not have a tight stand and are easily blown over when large. The seeds of all species of the genus have the characteristics of the true cocoanut—in fact they are cocoanuts in miniature. This class, known as the Cocos australis group, has the leaf stems nearest the trunk provided with blunt spines.

Cocos australis, Mart., the Pindo Palm is a native of Paraguay, Southern Brazil and Argentine, where it occurs in a wild state on rather high river banks, and in mostly immense groves to the exclusion of almost every other taller plant. The glossy, bluish-green, pinnate leaves are recurved and very elegant. It is one of the fairest palms known, and of a charm entirely its own. The flower-spathe is long, pointed on both ends, club-like in the center and contains a spike of yellowish-red flowers. The fruit is not produced in such quantities as in some other species, usually only a hundred reddish-yellow, fragrant, cherry-like fruits on a spike, but often much less. Dr. T. Morong says, that the fronds are largely used in Paraguay in the decoration of churches, dwelling-houses on festive occasions, and that on Palm Sunday crowds may be met on the streets bearing the green fronds in their hands. He also asserts that it makes a beautiful shade tree, being a great ornament in the parks and gardens of Asuncion.

Cocos Datil, Drude, the Entre Rios Palm, the most masssive of all the species, rivalling in this respect almost the Canary Island Date, though the leaves are much shorter. In mature specimens the trunk is about 30 feet high. I have a few fine photographs of these palms, said to have been taken by Dr. G. Niederlein in the Missiones, Argentine, which exhibits quite large dense forests of tall specimens growing in rather rocky and stony soil. I have only one specimen now, about 15 feet high with a very thick and massive trunk about seven feet high. Ferns (Phlebodium aureum) grow all around it in dense masses and form a beautiful decoration on the rough stem which is still provided with the old leaf-bases. The magnificent crown of stout, almost upright leaves, overtopping the sturdy trunk, make the specimen an exceedingly stately one. Each year it matures about eight to nine fruit-bunches, weighing from 35 to 50 pounds each. Each fruit, of a light orange color, is as large as a plum, very rich in sugar, juicy, intensely fragrant, like a combination of bananas and pineapples, and edible. The fruits are as closely set as a bunch of grapes. I have counted over 1,000 in one cluster. The large divided flower-scape is enclosed in a very massive spathe of the size and form of a baseball club, or, as a visitor expressed himself, of a "huge Hercules' club." An excellent wine, jam and jelly can be made of the fruits. It grows freely in rich, dry pine land soil and, like all the other species of this group, it does not seem to require much attention. To Mr. Theo. L. Mead belongs the credit of having introduced this palm into cultivation, but I think his specimens on rich, moist land all have perished. It is perfectly hardy and should be grown everywhere in the state and all along the gulf coast where the soil is suitable.

Cocos eriospatha, Mart., From Southern Brazil where it attains a height of 20 to 25 feet. A particular characteristic of this palm is the very recurved leaves—more recurved than in any other species. The trunk is short and thick and the flower-spathe is large and club-like. This usually bursts open with a loud crack, and reveals a very large and much branched flower-truss of a deep violet-red color which soon becomes darker yellow. The flower-spathe, as well as the flower-stem, is thickly covered with a mealy powder. The fruit is almost as large as a good sized plum and of the form of a peen-to peach, i. e., flat on both sides, and when ripe, of a deep yellow color. It is very juicy and so full of sugar that it becomes very sticky when fully ripe. It is strongly aromatic and of a delicious flavor. The bunches weigh from 25 to 35 pounds and consist of about 500 fruits. This is the best fruiting kind and, next to Cocos Datil, the most prolific, outrivalling all others in quality. I have already alluded to the fact that the nomenclature of these garden palms is in a chaotic condition and it will require the painstaking study of a trained botanist to clear it up. Like almost all the other species, this is also a very elegant palm and perfectly hardy all over the state and along the gulf coast.

Cocos petraea, Hort. also comes from Southern Brazil. It is a very distinct plant with rigid leaves not as numerous as in other species. Their color is glaucous green. The long petioles are provided with blunt spines. My specimen has not yet flowered.

Cocos campestris, Mart. Stem slender and leaves short—not more than four feet long, very numerous, which gives the plant a dense aspect. This palm attains a height of only eight or nine feet and is well adapted to be planted in the foreground of palm groups. The fruit is creamy in color and not larger than a pea. About 100 to 150 are contained in one bunch. It is a fast grower and does well in the shade of tall trees. A specimen near a camphor tree and several magnolias has outgrown all others standing in full sun. Native home, Southern Brazil.

Cocos Gaertneri, Hort. This is one of the very best of our garden palms, a fast grower, very elegant, with a dense leaf crown of rather erect fronds. My specimen is about fifteen years old. I raised it from seed which was sent me by the late Mr. Gaertner from Southern Brazil. He wrote me that the stems in its native habitat were mostly decorated with ferns and bromeliads and not infrequently with clusters of a fine cactus (Epiphyllum Gaertneri). The trunk is at present six feet high and is covered all over with several species of orchids, bromeliads, cacti, (Phyllocactus latifrons), ferns (Phlebodium aureum). It bears heavily and I have counted as many as 980 fruits in one bunch. They are closely packed, of the size of a small plum, orange-yellow with a red cheek, very juicy, intensely fragrant and of an apricot flavor. Chickens and children are very fond of them, and so are opossums, raccoons, squirrels and bluejays, not to mention the very injurious fish crows which mostly in swarms settle in the trees and destroy the entire crop in a very short time. This is a most beautiful palm, reminding in its shape very much of C. Datil, but it is not so massive. The leaves are about ten feet long.

Cocos Yatay, Mart., with a trunk of about 10 to 15 feet in its habitat, Southern Brazil. The beautiful, gracefully recurved leaves are abount nine or ten feet long. Dr. Udo Dammer, the greatest living authority on garden palms, states that the leaves in full-grown specimens are 4.25 meters (about 13 feet) long. The spines on the leaf-stems are described as black, but in my specimens they are, like the entire leaf-stem, deep violet purple and the leaves arch gracefully to all sides. This species grows extremely well under the shade of oaks, grevilleas, magnolias, gordonias and bamboos in my garden. It has not yet flowered.

Cocos Blumenavia Hort. This very fine and elegant palm comes from Blumenau, Southern Brazil. The stem of my largest specimen, about fifteen years of age, is about six feet high, surrounded by a dense crown of arching glaucous fronds, about seven to eight feet long. At first sight it seems to resemble Cocos australis, but it has a much denser leaf-crown. The small cherry-like fruits are produced in dense clusters almost all the year round, as in C. Gaertneri.

Cocos Bonneti, Hort. From the Riviera. There is a great confusion among most all the species of these garden palms and quite a number, distributed at present from the Riviera and Southern Italy, may have originated through accidental cross pollination. This variety is very likely such a chance hybrid. It reminds very much of the former, but the leaf-crown is more open and altogether less beautiful. The lower leaves die off much quicker than is the case in other species. It ripens large bunches of strongly aromatic fruits the size of a hazelnut.

Cocos argentea, Hort. This is one of the most striking and beautiful of all my palms, the leaves being very long, quite erect and the lower ones gracefully recurved and of a very striking, silvery whiteness. The fronds are about 12 feet long and the trunk is at present 5 feet high. It has not yet flowered and I have seen this most impressive palm nowhere else. The seeds were received from Hoage & Schmidt, Erfurt, Germany, in the fall of 1891, who had imported them from Southern Brazil.

Cocos Nehelingii, Hort. This name was given to this most singular palm provisionally by Mr. George Abbott, the palm specialist of Orlando and Philadelphia. He was so struck with the indescrible beauty and elegance of this Cocos that he insisted upon naming it after the author in order to distinguish it from other kinds. It is the fastest grower of all the species of this group, my largest specimen being about 16 feet high and a little more in diameter. It was raised from seed ten years ago. They came from Blumenau, Brazil. The trunk is about 15 inches in diameter, densely covered with fibrous masses of brown bast. The lower leaves are about 15 feet long, gracefully arched and touching the ground while the central ones are more erect. The color is a deep glossy green with a slightly glaucous hue, and the underside is more silvery. The flowers appear early in the season, often in January. The spathe is very slender, thin, sharply pointed and about 3 to 4 feet long. The flowers are very different from all others, the scape being much branched, of a deep purplish color and the flowers are very conspicuous violet or lavendar and very ornamental. Only about fifty fruits are usually scattered over the large scape. They are as large as a hazel nut and of a very striking red color with a small green apex. When ripe they are glossy red with a small greenish-yellow point. They are quite dry and of little aroma. This exquisite palm grows vigoriously on high, dry pine land. As it ripens about ten spikes of fruit annually, I hope to be able to distribute it over the entire State. The two last named species are the finest of the genus in my garden.

Cocos Meadiae, Hort. This name I apply to a very distinct, small-growing Cocos which was introduced by Mr. Theodore L. Mead of Lake Charm. It is a dwarf-growing species with short, much recurved fronds, about 3 feet long. The color is a very striking bluish-green. The young leaves when unfolding are provided with brown filaments which are very brittle and drop when the full growth is finished. The stem is short and stout. At present my two specimens, about seventeen years old, are scarcely more than 5 feet high. They have not yet flowered.

Cocos Alphonsei Hort., the Belair Palm common in our gardens. Large specimens of this fast growing kind I examined years ago in the once famous grounds of the late General Sanford at his place, Belair, near Sanford. They were about 50 feet high with tall, slender trunks and rather small, thin crowns of leaves. At the time they did not strike me as particularly impressive, and I must admit that I was quite disappointed when I saw them. It seems to me that this palm grows better on low, moist ground than the other members of the C. australis group. A few specimens in my collection, about thirteen years old, are not more than 3 or 4 feet high, though they look quite healthy. I think they are the least beautiful of all the varieties of Cocos I so far have seen. As the Belair specimens have ripened seed for many years, this kind has been widely distributed over the State.

"Fortunately for horticulture," says the late Mr. E. H. Hart, "there are many species of palms in existence capable of enduring the asperities of winter in Florida without material damage. When these shall have been collected and naturalized here, it will be possible for us to achieve scenic effects in landscape gardening that would have thrown Charles Kingsley into raptures," and I add, all other lovers of beautiful and refined tropical plants also. The species and varieties of Cocos described in these lines take the lead among hardy palms.

The next most important group for the embellishment of our gardens are the members of the genus *Phoenix,* or the Date Palms. They are all inhabitants of the warm regions of Asia and Africa, and, while a few occur in swampy places, the majority is found in rather high and dry ground, some even in the driest and hottest regions of the world, where scarcely any other form of vegetation exists. About twelve to fifteen well defined species are known to science, and all of them grow well in our climate. They vary considerably, and there are quite a number of distinct local forms all placed under one name, though different in a horticultural sense. In the Riviera where most of the species are extensively grown in gardens, and whence most of the seeds come, they cross freely amongst themselves and many hybrids have been produced. This also ocurs in my garden, where most of the different species ripen abundant crops of seeds. For this reason the cultivated species of Phoenix are the most difficult to define. All the species are dioecious, that is, male and female flowers are borne on different plants. They differ from all pinnate palms in having the leaves folded upwards, lengthwise, and in the peculiar form of their seeds, as seen in the common Date Palm stones. Some of the species, like the Canary Island Date and the Indian Date, have solitary trunks, very massive and of great height, while others are tufted, producing suckers freely, like Phoenix reclinata, etc. Most of the latter group are small, some of them belonging to the smallest and most charming of pot palms, like Phoenix Roebbeleni, Ph. rupicola and others. The tall growing kinds usually have very rigid leaves, their bases being provided with very long and formidable spines, inflicting severe wounds when carelessly approached. The leaves of the small-growing species are often very soft to the touch, and the spines at their bases are not quite so sharp and dangerous. They all require a very rich soil and during their growth an abundance of water.

While all the Cocos species spread their roots along the surface soil and are easily blown over if not set deep in planting, the Date Palms send their long rope-like roots to a considerable depth. It is not unusual to find roots of the Canary Island Date Palm twenty feet deep in the soil. All the tall growing species look very imposing as avenue trees, of which fine examples can be seen in the Tampa Bay Hotel grounds, on Fort George Island and elsewhere, they ought not to be used indiscriminately. Many years ago, the late P. W. Reasoner gave the following advice, which is worth repeating:

"In planting out large and extensive grounds one mistake is commonly made, that of dotting the trees around at regular distances apart, giving the appearance of a checker-board in a great degree. A group here and there, with now and then a single specimen apparently planted indiscriminately, but really with an eye to the future and general effect, will make a great difference in the beauty of the picture. No rules can be laid down, however, upon this subject, but good taste, common sense and general fitness of things should go hand in hand with careful thought of how it will look in the future in laying out such grounds."

The Date Palms for horticultural purposes can be divided into two groups:

1. Tall growing species, hardy all over Florida.

2. Tufted and tender species, hardy in the orange belt only.

Phoenix dactylifera, Linn, the Common Date Palm, is, after the Cocoanut Palm, perhaps, the most useful fruit tree of the world, and the most celebrated palm in existence. It is the palm tree of the Bible, and Palm Sunday has been named in honor of it. Enormous quantities of fruits are harvested in North Africa and in Persia, supporting whole populations of those dry and hot desert countries with food. Immense quantities are annually exported to Europe and America. Although growing very well in Florida, the fruit of the Date Palm is valueless in humid climates. In the dry and hot regions of Southern Arizona and California it grows and fruits, however, very satisfactorily. For this reason the Bureau of Plant Industry, U. S. Department of Agriculture has sent an expert, Mr. Walter Swingle, to the home of the Date Palm to collect the best varieties and to introduce them to our extreme southwestern border.*

It requires a very dry and hot atmosphere to mature its delicious fruit bunches. The Arabs have a saying that the "Date Palm must have its head in the fire and its feet in water" in order to be a success as a fruiting tree. Volumes have been written on the uses of the Date Palm. There are numerous distinct varieties of dates grown, all readily distinguished by the Arabs and provided with names. These varieties are propagated by suckers which appear more or less numerously around the bases of the trunks. Many large Date Palms are found in the gardens of Florida, grown by the earlier settlers from the stones of commercial dates. Most of these, often quite tall, have only a scanty crown of light grayish-green leaves, while others are extremely dense and very beautiful, showing a much darker bluish-green color. They usually also produce numerous suckers almost as large as the main stem, forming in this way frequently very tall and impenetrable thickets. When these side shoots are removed, the main trunk usually grows much faster. Years ago, I received seeds of a variety, Ph. dactylifera excelsa, from the Riviera, which is perfectly identical with many of the dense and darker green seedlings found in our gardens. Though well grown specimens of the Date Palm are beautiful, they cannot rival in beauty with the two next species.

Phoenix sylvestra, Roxb. East Indian Wild Date Palm, Sugar and Wine Date Palm. This is one of the most beautiful and one of the grandest palms in existence. It is also one of the fastest growers with an immense crown of bluish-green leaves, having a spread of 20 to 25 feet in diameter. This most exquisite palm should be grown everywhere in the State, as it is hardy from Jacksonville southward. To do its best, it requires a rich—in fact a very rich—soil and moisture. It will grow well in poor uplands, but then extra applications of fertilizer must be given. There are a few fine specimens in Florida, the most beautiful, I think, can be seen in the grounds of the late Mr. E. H. Hart, at Federal Point. I quote from one of his articles: "In the vegetable as well as in the animal kingdom, the most useful are not always the most beautiful, hence we need not be surprised at finding some palms whose fruit is comparatively worthless to be the most desirable for ornament. Chief among such is Phoenix sylvestris, the Wild Date of India, whose rapid growth, hardy constitution and dense crown of elegantly curved leaves, densely set with narrow leaflets, especially adapt it for decorative purposes. Although yielding a small and inferior berry, yet as an economic plant it stands in the foremost rank. In India it is extensively cultivated for the sake of its sap, which, drawn off from the bud, is boiled down into syrup and sugar, or by distillation converted into arrack, a fiery tipple of the Orientals. The fresh juice in the early stages of fermentation becomes a pleasant and wholesome wine, and later on it furnishes a yeast of excellent leavening power * * * * It may surprise many in this hemisphere who love the drink which 'gladdeneth the heart of man' to learn that among the

*See Bulletin No. 53, Bureau of Plant Industry.

nations of the earth there is consumed, in the aggregate, a larger measure of wine from the palm than of the juice of the grape." Mr. Hart describes a specimen twelve years old in his grounds with a clean trunk of 7 feet, and with a very large and dense leaf-crown.

In my grounds, there are two specimens fifteen years of age with immense leaf-crowns and a trunk 6 or 7 feet high. They grow on very dry and poor soil. In good, moist ground they would be at least double that size. The most beautiful specimen I have seen was near the office of Jessamine Gardens, in Pasco County. The leaves were deep bluish-green. There are tall wild Date Palms in the Royal Palm Nurseries at Oneco and at Mr. Mead's and Mr. Hart's places. This extremely magnificent palm should find a place in every garden in Florida.

Phoenix Canariensis, Hort. (Ph. tenuis. Versch., Ph. Jubae, Webb). This is a most glorious palm, and no garden is complete without it. It is the noblest of all Date Palms and one of the most majestic palms in cultivation. No other palm thrives so well in this State, and none other is so massive and full of grandeur. On high, dry land it suffers very much from drouth, but if the ground is made deep and rich and kept moist, it will even here form fine specimens, but it takes much longer than on naturally rich and moist soils. In all the large gardens of the State the Canary Island Date is cultivated and there are everywhere magnificent specimens. It makes a fine and imposing avenue tree and single specimens with their huge crowns of spreading leaves, often 30 feet in diameter, are often seen. It is also fine in groups. In Orlando may be seen large and massive specimens in company of large masses of bananas and clumps of bamboo, and this combination is extremely effective. In order to grow this stately palm well, a deep, rich soil, much water and regular applications of stable manure and commercial fertilizer are necessary. On dry land, mulching is a very important point, particularly when the plants are young. Frequent applications of manure strong in nitrogen, and irrigation will help them along wonderfully. As in most Date Palms, the strong spines along the leaf-stems nearest the trunk are dreadful weapons, therefore, great caution in handling them is necessary. All the old leaves should be cut off with a sharp pruning knife or a clipper as near to the trunk as possible.

The Canary Island Date is a hardy palm, the hardiest of the genus. I have seen large specimens in St. Augustine, Jacksonville, Pensacola, Mobile and New Orleans, where the mercury quite often drops to 15 degrees Fahrenheit, and now and then even to 10 degress Fahrenheit. The leaves are bright, deep, glossy green—a very peculiar tint and difficult to describe—and the midrib has a somewhat yellowish cast. The outer ones are gracefully arched, while the central ones stand upright. The crown often consists of over 100 leaves, each one being from 12 to 15 feet long. Planted together with other palms, tall, tufted bamboos and magnolias, it creates wonderful scenic effects. Young plants are very cheap and no garden, large or small, should be without one or more specimens. In New Orleans I saw a specimen in a park with a leaf-crown fully 30 feet in diameter. Seats were placed all around the massive trunk, and I was at once convinced of the fact that it makes an ideal park tree for sub-tropical regions. Phoenix tenuis seems to be a more slender form of this palm. I have a few hybrids between this species and Ph. dactilifera which I raised from seed coming from the Riviera. They are quite massive, bluish-green, with a wreath of small suckers all around the bases. Hybrids of this palm and Ph. sylvestris are very massive, but also very variable, no two being alike.

We now have to consider the tender species of Date Palms. The very beautiful and more elegant, they cannot compare in massiveness and grandeur with the hardy species. They all can be grown successfully in the orange belt. In my garden the entire leaf-crowns of most all the species are now and then cut back by frost when the thermometer falls to 20 degrees Fahrenheit. Though the heart is in such cases usually lost—I have frequently pulled it out as a rotten mass—they soon recuperate, forming a new crown in a short time.

Phoenix reclinata, Jacq. Of this fine African species there are quite a number of distinct varieties in cultivation which have not been admitted to specific rank by botanists. It is now generally conceded that Phoenix spinosa, Schum. and Ph. Zanzibarensis, Hort, belong to this species, though these and several others have to be considered as distinct local forms. Some of these varieties are single stemmed, others show a more tufted growth, often five or six stems springing up from one root-stock. Not quite as hardy as the large growing species, Ph. reclinata is found in magnificent specimens in the gardens of Mr. E. H. Hart, at Federal Point and in the grounds of Mr. Theo. L. Mead and my own. Beautiful specimens also can be seen in several gardens of Orlando. The long plume-like leaves are so much reclined that they gracefully hang down, the lower ones almost touching the ground. The finest specimen which I ever saw grows in Mr. E. N. Reasoner's nursery at Oneco, Fla. It is about 30 feet high and a picture of tropical beauty. Young plants are easily lost by a strong freeze. Therefore a protection of pine-needles is necessary, or pine-boughs must be placed over young and newly set specimens. Soil banked around such plants also proves an excellent protection.

Phoenix Senegalensis, Van Houtte, as growing in my garden, is certainly not synonymous with the former, being entirely different in habit and growth. It is a very dense, soft-leaved, deep-green Date Palm, growing in very large and tall clumps or tufts. A specimen in my garden, about twelve years old, has reached a height of about 20 feet with very thiick stems about 8 feet high. The spathe and flower-spikes are bright yellow. While the former species comes from South Africa, this one has been introduced from the region of the Senegal and other tropical places of Central Africa. It is very tender, but is well adapted to all the gardens of the orange belt.

Phoenix Leonenesis, Lodd, another palm from tropical Africa, is one of the most distinct and beautiful of the family. Though said to be identical with Ph. reclinata, my specimen is very distinct. It is the fastest grower of all Date Palms, very massive, with a dense crown of long, glossy, green leaves. The leaflets along the midrib are arranged in two's and sometimes three's and stand close together. The flower-spathes appear in March in a circle all around the upper part of the stem. I counted twelve of them at one time. They are about two feet long and are of a beautiful orange-yellow color. The spike is much branched and of the same color. The fruit is deep purplish-brown, as large as the common date and very sweet. None of my Date Palms have grown so rapidly. The trunk of the specimen, which is about twelve years old, is about seven or eight feet tall and there are quite a number of small suckers all around the base. It is easily hurt by a strong freeze but soon recuperates.

Phoenix padulosa Roxb., from India, is a fine tufted palm with long, gracefully arched, spreading leaves eight to ten feet long; trunk 12 to 15 feet high. The leaves are whitish beneath. Rare.

Phoenix rupicola, Anderson. The Sikkim Date Palm from the Himalayas, from whence so many beautiful magnolias (M. Campbelli, Talauma Hodgsonii), tree rhododendrons and elegant bamboos come. It is an exceedingly graceful and elegant palm, having a slender stem 12 to 20 feet high. The numerous, glossy, green leaves are all on one plane. It is very tender and must be protected a little in very cold weather, especially in its younger state. I have only seen young specimens in our gardens, but all are perfect pictures of health and beauty.

Phoenix pusilla, Gaertn. (Ph. Zeylanica, Hort., Ph. cycadifolia, Hort.). This is also a tender and beautiful species from Ceylon, reminding, in the arrangement of its flat leaflets, of certain species of Cycas. Though a very slow-growing palm in my garden, it attains a height of 10 to 15 feet in its native home. The foliage is deep, glossy green, with a yellowish midrib.

Phoenix farinifera, Roxb. From Ceylon and India. A shrubby palm with very rigid leaves and strong spines. The leaves are covered with a whitish powder. As in most species of the small and tufted Date Palms, the leaf-stems of this species at their bases are provided with long, stout spines, which make it impossible to walk through clumps of it, and it is always necessary to be careful when working among them. It would make a fine hedge-plant, as neither man nor beast can penetrate thickets of it. It never grows tall.

Phoenix humilis, Royle, from India and its variety, *Ph. humilis Hanceana, Beccari,* from Southern China, are extremely handsome and elegant tender palms, never growing very tall.

Phoenix Roebbeleni, O'Brien, from Assam and Cochin China, is also closely allied to the former. It is such an elegant small palm that it has become a rival of Cocos Weddelliana in pot culture.

Phoenix Loureiroii, from Hong Kong *Ph. peduncalata,* from Khasya, and *Ph. Ouselyana,* from Central India, have all been reduced to varieties of P. humilis by Beccari, though in a horticultural sense they prove distinct enough to deserve a place in all our gardens. They are all charming little palms and are particularly adapted to small gardens where the massive growing species cannot be grown. They are all hardy in South Florida and in rich soil soon form very graceful specimens.

Phoenix aculis, Burch is a stemless Indian species, with leaves five to six feet long and upright.

Phoenix glauca, Hort. I received the seed of this Date Palm from Haage & Schmidt, of Erfurt, Germany, about twelve years ago. It has formed a very slender stem seven feet high, with long, arching leaves of a glaucous color. Quite a number of strong suckers are found around the base. The flower-spathe is greenish-white and the flower-scape, sulphur-yellow. The small fruits, the size of a coffee-bean, are deep red. This is one of the most distinct and elegant of all my palms.

Phoenix tomentosa, Hort, in my garden seems to be identical with Ph. farinifera.

All the foregoing palms belong to the feathery or pinnate-leaved section. The members of the following two genera have all beautiful fan-shaped leaves. I shall first call the attention of my readers to the genus *Sabal,* the Cabbage Palmettos. The genus is strictly American. Our native Cabbage Palmetto is fully described in a previous paper.

Sabal Mexicana, Martius, Mexican Cabbage Palmetto, closely allied to our native species. It is found in extreme Southeastern Texas and in Mexico, where it forms a beautiful feature in the landscape, often growing together in immense numbers. Up to a height of 15 to 25 feet, the bases of the old leaf-stalks remain on the trunk adding much to its picturesqueness, precisely as in our Florida Cabbage Palmetto. As this species has been distributed for quite a number of years, all over the state, there must be large specimens in many gardens, though there is a possibility that they may be confounded with the native species. Both are, however, easily told apart. The Mexican Cabbage Palmetto is more robust, has a broader and denser leaf-crown and grows much quicker. The entire aspect is quite different. The trunk attains a height of 50 feet and is two feet in diameter. The leaf-blades are very large, sometimes six feet long and seven feet wide, "divided to the middle in very narrow two-parted segments, which are filamentous near the margin." It grows easily and should be found in all gardens where the beauty of palms is appreciated.

Sabal Blackburniana, Glazebrook, Bermuda Cabbage Palmetto. There is some confusion about this species. The seeds from which my specimens were grown came from Bermuda, the botanical authorities give the West Indies as its habitat. I call special attention to a very fine article on the subject in that fine publication of Prof. C. S. Sargent, "Garden and Forest" (Vol. IV., page 307), where a full description and an illustration is given. I have quite a number of specimens in my garden, but they are all very slow growers. The leaves are flat, divided into about forty lobes. Where the rather short leaf-stem joins the blade there is a triangular, greenish-white spot. It is a large and distinct palm, and closely allied to our native species. See "Garden and Forest," Vol. IV., pages 302 and 307 for further information.

Sabal umbraculifera, Mart., Jamaica Cabbage Palmetto, Palmetto Royal, Giant Fan Palm, Big Thatch Palm of Jamaica. Some botanists have made this species synonymous with the former, but it is decidedly distinct from the palmetto coming from Bermuda. A magnificent palm, very massive and noble in appearance. The trunk attains a height of 90 to 100 feet, and according to Sir D. Morris, the leaves are five to six feet across. "This palm," he continues, "is essentially gregarious; it is found covering several thousand acres, literally forming extensive groves in the Pedro Plains * * * They occupy, chiefly, dry, elevated banks and dry strips of land between numerous lagoons and morasses—the haunts of turtles and alligators. Seen across one of these lagoons, the effect produced by a view of this palm forest is indescribable. The tall, straight, cylindrical columns surmounted by their globular masses of fronds, often 25 to 30 feet across, are seen to rise out of the sea of green sedges and grasses, and as no other growths intervene the result—merely as a matter of scenery—is well worth a visit to the tropics to behold. Under such circumstances even the most sceptical would admit that palms are rightly named 'the kingly race of plants.' Riding underneath nothing could surpass in grandeur and beauty tall stems, canopied by immense fan-shaped leaves rustling and rattling against each other in the refreshing breeze." The very word of these lines fits our native Cabbage Palmetto as seen in groves in many places of our beautiful state, the Jamaica Royal Palmetto is much larger in all its parts. Of the economic use of this species, mention may be made of the leaves, which form the only thatching material of the houses of the region for both negro and European. Mats, ropes, hats and baskets are made and the hollowed trunks, cut into short lengths, make admirable bee-hives and are even used as flower pots.

I have fine specimens of this grand palm in my collection, and I have found that they are entirely hardy. They were raised from seed received from Mr. Wm. Fawcett, Director of Public Gardens and Plantations, Jamaica. Only the following species seem to have larger leaves. On my young specimens they are 8 to 10 feet in diameter. There are quite a number of fine specimens growing in various gardens in Florida. Mr. Theo. L. Mead, at Lake Charm, has a magnificent specimen on his place, fully 30 feet high, with a very broad and imposing leaf-crown. Like all the Cabbage palmettoes it is perfectly hardy in the orange belt, growing with great vigor in rich, moist soil, but when well cared for, it also grows finely on high pine land. Several palms in my garden grow under the names of Sabal princeps and S. Ghiesbreghtii seem to be identical with this species. The Sabals develop slowly, and it does not seem unlikely that one or the other may prove distinct when fully grown. This species has the habit of flowering and bearing fruit when just commencing to form a stem. I have quite a number of such specimens in my garden. Neither S. Palmetto nor S. Blackburniana show this trait. The berries are as large as a grape and deep bluish-black.

Sabal mauritiaeforme, Griseb, and Wendl., Savana Palm, is common in the West Indies, and is very likely identical with Sabal Havanensis Lodd., S. glaucescens Lodd., or these latter may be merely local forms of it. According to Mr. E. N. Reasoner, it is the largest of all palmettos, having gigantic leaves 12 feet across. My specimens are all small, but they have proved to be perfectly hardy. It grows best in rich, moist soil, but can also be grown on higher and drier land if kept moist and well fertilized. Palms give dignity and an indescribable grace and glory to every garden, and the Sabals can be particularly recommended to all lovers of the beautiful.

There are quite a number of dwarf stemless species, such as *Sabal Adansonii, S. Mocini, S. longipeduacalata,* etc., which are only valuable for large collections, being far less ornamental than many other small growing palms. All are perfectly hardy. Dr. Wm. Trelease, Director of the Missouri Botanical Garden, decribed a tall growing species new to science, from Mexico. This may be a valuable addition to our garden palms. Its scientific name is *Sabal Uresana,* Trelease.

The next most important group of Fan Palms for our gardens are the species of *Washingtonia,* the California Fan Palms. They are all large growing species with massive trunks and beautiful leaf-crowns. Three distinct species have been described.

Washingtonia filifera, Wendl. (Brahea filamentosa Hort., Pritchardia filifera Wendl.), the California Weeping Palm. It has a cylindrical trunk, much enlarged at the base with a crown of large fan-shaped leaves provided with numerous threads or filaments. It is not rare in the foot-hills of Southern California bordering the desert. Where it is found, the soil is usually black and it always grows—mostly in groups—where it can obtain a constant supply of water. In the high pine lands of Florida this, the most hardy species of the genus, cannot be successfully grown, and the lower leaves always get yellow. I have a specimen twelve years old, growing near several Phoenix and Cocos species, but it is still dwarf, overtowered by all the rest. There are, however, magnificent, tall specimens in St. Augustine, on the place of the late Mr. E. H. Hart and elsewhere, but they always grow in rather rich, black soil which is always moist.

Washingtonia robusta Wendl. In aspect and growth this beautiful palm is decidedly different from the former. It was first discovered near the coast of Western Mexico in the vicinity of Guayamas. In California it is much grown and is the more satisfactory of the two. Mr. Ernest Braunton, one of the leading authorities on California horticulture, says that it grows four times as fast as the former. "Grown under identically the same conditions, this species, at twenty years of age, had made 40 feet of solid (matured) trunk, while the more common species had made 10. The deeper and more constant green of W. robusta is a strong point in its favor as a decorative plant." It also differs from the former in its shorter leaf-stalks and more compact habit—the darker color in all its parts. The base and edge of the petiole are light brown in W. filifera, but violet-black in W. robusta. The latter also has a much darker colored trunk, and the seeds are only half as large as those of W. filifera. With the exception of Cocos plumosa, this is the fastest grower of all garden palms, and it has the great advantage of being hardy in all parts of Florida where Sabal Palmetto is found wild. Though preferring moist, rich soil, it grows tolerably well on high pine land, provided the soil is made very deep and rich and kept moist. Mr. Theo. L. Mead has a wonderfully glorious specimen on his place "Wait-a-bit" at Lake Charm. It is so noble and distinct in aspect, so immense and majestic on the side of Sabal umbraculifera and Phoenix Carnariensis that it arouses the enthusiasm of every passerby. This palm must be about 40 feet high and has a broad, spreading crown. Mr. C. T. Simpson, of Little River, near Miami, writes me that these Washingtonias "are going to be *the* avenue palms here" (at Miami). This and the following species should be largely planted everywhere in the state. They look very beautiful in groups of a few to even a dozen or more; they are fine as single specimens on the lawn, and they are exquisite as avenue trees.

Washingtonia Sonorae, S. Watson. This fine palm is a comparatively recent introduction from La Paz and San Jose, Mexico, promising to rival in beauty with the former. It has been much planted in Florida, seedlings having been distributed all over the state by Reasoner Bros., Oneco, Fla. This firm has also disseminated the gigantic Sabal umbraculifera and S. mauritiaeforme in large numbers over Florida, and we may be sure to see a wonderful display of these large palms in our gardens in the near future. Of the Sonora Washingtonia I have only seen small plants, but they all grow beautifully, particularly in rich, hammock soil, and even in rich pine land. The trunk is said to grow 20 feet high, the leaves being three to four feet in diameter.

III.

Other Hardy Palms.

There are quite a number of most beautiful and elegant, hardy palms which are only rarely seen in our gardens. The cause of this singular fact is difficult to understand. It is true they mostly like shade and rich, very rich soil, but both can easily be provided by a true lover of these royal plants. The palms in question belong to the following genera:

Chamaerops.
Trachycarpus.
Livistonia.
Rhapis.
Erythea.
Diplothemium.
Jubaea.

Though growing so easily the fact must always be remembered that while many palms will bear much neglect, yet the best results are only to be had by giving them plenty of nourishment and good cultivation. If this is kept in mind and carried out, most members of these genera will grow well here.

Chamaerops humilis, Linn., the European Fan Palm, is the only species of the genus, but it is split up in quite a number of more or less distinct varieties. It grows wild in Sicily, Spain and Northern Africa, where it is found in dry, uncultivated, sandy tracts in the same way as our native Saw Palmetto. This palm and its various forms are very distinct and beautiful and are well adapted to our soil and climate. They all are excellent palms for all parts of Florida and along the Gulf Coast west to Texas. They grow well and rapidly in good soil. I have a few specimens that are pictures of beauty, but they were cared for, while others that remained in the nursery rows are small and poor. All the varieties sucker very much. These should be removed if a single-stemmed specimen is desired. If carefully taken off they can be used for propagation. Mr. Theo. L. Mead has such a single-stemmed European Fan Palm with a beautiful round leaf-crown about 15 feet in height. In February, my plants begin to bloom, and this is noticed with surprise even by people who do not care for plants that do not furnish a money crop. We see now, densely attached to the stem, bright yellow sponge-like masses, looking like a large fungus. I grow the following varieties:

Chamaerops humilis elegans, tufted, the stems growing about five feet high. Leaves very soft on long petioles which are, like all the varieties, provided with short spines.

Ch. h. argentea, with glaucous, scurfy foliage, deep green above, silvery beneath.

Ch. h. macrocarpa with black spines along the leaf-stems.

Ch. h. arborescens, growing much taller than the other kinds.

C. h. tomentosa, covered with a whitish powder. All these local forms or garden varieties are very elegant, and should be largely planted. They form fine groups by themselves or in connection with other small palms. They do not always come true from seed. The best way is to propagate them from suckers, which appear numerously around the base of the stem. All grow very well on high, dry pine land, in fact they do better here than in moist black soil.

The genus *Trachycarpus* consists of four species of hardy fan-leaved palms, two of them being indigenous to the Himalayan region, and two are found, respectively, in China and Japan. The last two have fine polished trunks, while the Himalayan kinds have their stems clothed with the old leaf-sheath. I have never seen the latter in cultivation in Florida, while the Japanese and Chinese species are only sparingly represented in our gardens. They require more care and attention during the first years, being easily lost if not attended to in a proper way. The soil should be very rich and rather heavy, and a little shade is necessary for young plants. Lack of water for any length of time proves fatal to them. When once well established and in full flourishing condition, they are all fine and elegant palms.

Trachycarpus Fortunei, Wendl. Fortune's Palm, is of unique interest as it is the hardiest of all palms, growing well in many parts of England in the open air. Its growth is rather slow, but eventually it attains a height of 30 feet. This species should be planted everywhere in Northern Florida, in Georgia, South Carolina and West to Texas. It would undoubtedly look very well in groups and on the lawn.

Trachycarpus excelsa Wendl., the Chusan Palm. In California, where it is one of the most common garden palms as far north as San Francisco, it is called the Chinese Windmill Palm. Though this species is said to have a smooth trunk, I have only seen specimens which had their stems clothed with a network of fibers from the old leaf-stalks. It is a very beautiful and distinct looking species, especially in a large state. As it comes from Southern China it is perfectly hardy all over the state, and there are a few specimens found in several gardens. The finest Chusan Palm I saw in Florida is in the grounds of Mr. Wm. J. Ellsworth at Jessamine, Fla., a plant of very striking beauty and elegance. In my grounds there is also a fine young specimen with a trunk about three or four feet high. This palm should be planted largely in all our gardens and its hardiness, beauty and distinction entitle it to a foremost place wherever these noble plants are grown.

Trachycarpus Khasiana, Wendl., Himalayan Fan Palm. Major Madden found it at 6,500 to 7,800 feet altitude amidst rhododendrons, bamboos, andromedas, etc. "In damp, shady glens," he writes, "on the north and southeast but chiefly on the northwest exposure, this palm is found in great numbers, forming clumps and rows, the trees rising from 30 to 50 feet high, each with a superb crown of large flabelliform leaves, rattling loudly in the breeze. At six feet from the ground the stems are two feet in circumference, but become thicker above. The flowers appear in April and May, and the fruit, which is of a dark, glossy blue, about half an inch long, ripens in October and, at the time of my visit, (March 20, 1847) lay strewed in abundance at the foot of the trees."*

Trachycarpus Martiana, Wendl. Another Fan Palm of the Himalayas, said to be very similar to the former from a botanical point of view. In fact, the two are united by recent botanists and the name "T. Martiana" is used for both. I am not aware that they are in cultivation in Florida. I had them both raised from seed which was sent me from Darjeeling, but all the small plants succumbed to the heat on my dry pine land. Had they been planted

*"The Annals and Magazine of Natural History," No. 65, May, 1853, pages 346-355.

in sheds in moist cool soil they would undoubtedly have made a good growth. Palm specialists should again introduce these species.

Another genus of palms, far too rarely grown in our gardens, are the *Livistonias*. This group consists of about fourteen well-marked species of stately fan-leaved palms, but only three or four are now and then found in our gardens. There are magnificent specimens in the late Mr. E. H. Hart's collection, even a few of the strictly tropical species. Most people who only look at these palms superficially find them too much like our common Cabbage Palmetto, and for this reason pass them by. But there is, however, a great difference, not only in aspect, in the foliage and flowers, but also in the short, dense fruit-clusters. In order to succeed with these palms, which are hardy in the orange belt, rich, moist soil and—in their young state—shade are essential requisites. On high, dry pine land not under constant irrigation they are a failure. Large and well developed specimens are very beautiful and show a grandeur entirely their own.

Livistonia Chinensis, R. Br. (Lantania Borbonica, Hort.), of Southern China, is one of the most numerous and popular Fan Palms in cultivation, being undoubtedly the best commercial Fan Palm for pot culture. In all the large conservatories it is never absent. In Horticultural Hall, Fairmount Park, Philadelphia, there are several specimens 60 to 70 feet high—tall and imposing palms with slender, smooth, gray trunks and magnificent leaf-crowns. The leaves are flat and perfectly fan-shaped, three to four and even six feet in diameter and of a beautiful light green color. The fans imported in such large quantities from China are made of the leaves of this palm. In Orlando, where particularly the older and more enthusiastic settlers planted many exotic trees and shrubs, this palm is scarcely met with. There are, however, noble specimens in Mr. Hart's garden, at Federal Point, and in the grounds of the large hotels along the East Coast many good Chinese Fan Palms can be seen. I saw recently a few fine young specimens near the entrance of Tampa Bay Hotel. They are about 15 feet high, very dense and perfect in form, bearing large bunches of nearly ripe fruit when I saw them—February 27, 1909. These home-grown fruits should be carefully gathered and planted, as they very likely will produce plants perfectly acclimatized. This palm is a fast-grower in rich, moist soil, but it needs shade, particularly in its younger state.

Livistonia australis, Mart. (Corypha australis, Hort.), the Australian Fan Palm, another exquisite and distinct palm that should find a home in our gardens. The leaf-crown is somewhat denser and the color a deeper green than in the former. It is perfectly hardy in Central Florida, being found in Australia as far south as Melbourne. It grows best in rich hammock and low pine land, where it never suffers from lack of water. My specimens had attained the height of six or seven feet and the diameter of the leaf-crown was 10 feet. A dense and well-grown specimen is a very charming and refined object. It is very seldom seen in our gardens and should be largely planted. Baron Ferdinand von Muller, the great Australian botanist, described a number of other Australian Fan Palms, which appear to be closely allied to this species.

Livistonia Hoogendorpii, Hort., from Java, a very striking and grand palm from Java, perfectly hardy at Federal Point. A large and broad specimen which stood the large freeze of 1895 almost unharmed was the pride of Mr. Hart. It occasionally loses its leaves, but these are soon replaced by new ones. The leaves are four to six feet in diameter and their stems, being of a very conspicuous reddish-brown color, are three to five feet long and armed with stout spines. Shade and rich, moist soil is the secret of the culture of all Livistonias.

Livistonia humilis R. Br., another Australian Fan Palm, said to be identical with Baron F. von Muller's L. Mariae, has stems four to twelve feet tall and large fan-shaped leaves about three feet in diameter. It grows abundantly in North Australia and will undoubtedly prove hardy in the orange belt.

Livistonia rotundifolia, Mart. (Chamaerops Biro, Sieb.), one of the most popular pot palms from Java, is not quite as hardy as L. Hoogendorp II, but, if well protected when young, I believe it will be able to stand sharp freezes when it has attained a good size. There is no doubt that it will be one of the best garden palms for South Florida. I had planted out all these species, and also L. olivaeformis, Mart. in my plant shed. They grew vigorously in the rich, moist soil in half-sheds, came through a number of winters unharmed, but were finally destroyed by the rise of the lake during my absence. Not the cold, but the water killed them.

All the members of the genus *Rhapis* are well adapted to our soil and climate, thriving admirably in rich, moist land and shade. There are five distinct species known to science all coming from Southern Japan and China where they are grown since time immemorial as decorative plants. As they are small and of an elegance and beauty distinctly their own, the Japanese plant them largely around their homes in company with Cycas revoluta, Camellia Japonica and bamboos. They are among the few palms producing suckers at the base, thereby forming very beautiful, large clumps often 50 to 60 stems being counted on one plant. No other palms are so well adapted to ornamental plant-sheds as the Rhapis species. My specimens are growing together with ferns, fancy-leaved Caladiums, xanthosomas, colocasias, alocasias, marantas, calatheas and similar shade-loving plants, and, among them, they form pictures of elegance and beauty. The leaves are small, much divided and fan-shaped. All the species will be hardy anywhere in Florida in sheds. They must be handled with care as the leaf-stems are quite delicate and are easily broken. Good plants, about two-and-one-half to three feet high with two or three shoots, are usually sold at $5 apiece, wholesale, while plants six feet high and six feet in diameter can rarely be bought for less than $150 each. These beautiful palms are not easily obtainable, even in a small state, and lovers of palms should be on the lookout for them. Thousands are annually imported from Japan, but the demand is always larger than the supply. Propagation is effected by severing side-shoots from the mother plants and potting them separately. This is a very slow process and it explains why these charming dwarf palms are more expensive than most others. Seeds are rarely produced and are rarely offered.

Rhapis flabelliformis, L'Herit., common Bamboo Palm, Ground Rattan Cane, from China and Japan where it is much grown. The most common species of all the Bamboo Palms, growing in large, dense tufts 7 to 8 feet high in moist, rich soil and in shade. Large, well-grown specimens are marvels of beauty. Shade, very rich soil and moisture are necessary for its well-being. It will not grow in the sun or in dry, high soils, but it is a most beautiful plant for shady nooks and corners near the house where it can have plenty of room to develop its charms. Full-grown stems are about as thick as a thumb and are covered with the old leaf-sheaths.

Rhapis humilis, Blum, from China and very likely also from Southern Japan, where it is much grown on account of its delicate beauty and density of form. It is smaller in all its parts, rarely growing more than 3 or 4 feet high, but in general aspect it is similar to the former.

Rhapis Cochinchinensis, Mart., from Cochin China. This species I have never been able to obtain. It is said to be the largest and most imposing of the genus, growing 8 to 10 feet high, and some authors say that it even attains a height of 12 feet or more. There is a magnificent clump of a Rhapis species in the grand collection of Horticultural Hall, Fairmount Park, Philadelphia, which I have always thought to be this species. It is at least 12 feet high and consists of a dense mass of perfect stems. It stands in the foreground and there are some tall plume-leaved palms, araucarias and rubber trees in the background—a very impressive combination. There are only a few gardens in Florida where these fine, small palms are grown. They deserve a growing interest and many friends.

Erythea, one of the Hesperides, Daughter of Evening, is the poetical name given to a distinct genus of beautiful Western American Fan Palms by Sereno Watson. They are spineless, of robust growth and would be perfectly hardy all over our State if soil and climatic conditions would be to their taste. They like a rather heavy soil and a long, dry season. In Italy and the Riviera and in California they belong to the grandest of all palms. Many years ago, I sent a large number of seedlings to my place in Orange County. They were set out on high, dry pine land and all pined away. A few years later I sent a few larger ones, but they also succumbed to our hot dry soil. Mr. George Abbott has a fine, healthy young specimen in his garden at Orlando, and I have been informed that there are a few others in various parts of the State. These palms are so charmingly beautiful and so distinct that they should be planted wherever palms are admired. In moist, rich soil—perhaps with a small admixture of clay—they will undoubtedly thrive just as the Washingtonias, from the same region, thrive with us. Only two species are known.

Erythea armata, S. Wats., Blue Palm, California Blue Palm, in Italy mostly known under the name of Brahea Roezli, is a native of Lower California, where it is called "Palma azul." It is one of the most glaucous palms known and deserves its name, Blue Palm with perfect right. In its distribution it is strictly limited to the peninsula of lower California, making its first appearance about 40 miles south of our boundary line, and ranging south to almost St. Lucas, always in the dry, mostly hilly and stony interior, never near the coast. It is therefore essentially a palm of dry regions, contrary to E. edulis, which effects moist canons. Under cultivation, the Blue Palms show a remarkable adaptability to better conditions, not even disliking irrigated California gardens and parks, provided the soil is well drained, and making a very fast growth when planted out. A specimen about 13 years old flowered for the first time in a Santa Barbara garden in 1895. It sent out three flower-scapes over 12 feet long, gracefully arching and of a feathery appearance, bearing myriads of exceedingly minute flowers. In California this magnificent palm is getting a feature of all the better gardens, why not in Florida? With a little experimenting and coaxing it will undoubtedly thrive.

Erythea edulis, S. Wats., the Guadelupe Palms, from the lonely and gloomy-looking island of Guadelupe, about 250 miles south of San Diego, California. It was discovered by Dr. E. Palmer, who found it "frequently in deep, warm ravines * * * * It attains a height of about 40 feet, and 15 inches in diameter. Each tree bears one to four clusters of fruit, 4 feet in length and weighing 40 to 50 pounds. The fruit is eaten by men, goats, birds and mice. In flower near end of March."

A recent writer states that it is the most elegant of all Fan Palms from North America—a fast grower, quite suitable to conservatories and the open air in the South, "where in a prominent place it is likely to thrive, also in regard to its fruits, which are similar in size and taste to prunes." A peculiar characteristic of this palm is that the trunk is quite slender in comparison to its height and often is slightly bent at the base, so that it has nothing of the heavy massiveness of the Washingtonias and Sabals. The leaves do not stand stiff and rigid, as in other species of the temperate regions, but droop gracefully, owing to the length and flexibility of the petioles. What adds much to the elegance of the plant is that the old leaves, when dead, do not remain to disfigure the upper part of the trunk, but fall down by themselves. The flower stalks reach fully 6 feet in length, and they must be grand indeed, those huge bunches of fruit, quite black when ripe, weighing 40 to 50 pounds. The fibrous expanse of the petioles, when the leaves die off, falls down in a sort of soft, thickly-woven mat—a splendid material for packing plants,—and it may also be used for other purposes. It grows abundantly on the north side of the little island where the climate is quite foggy and humid. This is very likely a good palm for Florida. I have given as full an account as is possible here, in order to induce all plant lovers to try this fine palm. No time and money should be spared to introduce it in large quantities. Its beauty, distinctness and utility deserve that every lover of the palms concentrate his attention on this noble Erythea, which attains, when fully grown, about 30 feet in height.

The*Diplotheminms* form a small genus of about four dwarf palms, reminding somewhat of the species of the Cocos australis type. They are all inhabitants of Southern Brazil. Though of indescribable elegance and easily accommodated, they are extremely rare in our gardens. Mostly stemless or developing only short ringed trunks, they can be easily protected in severe weather. They all revel in sunshine, needing about the same treatment as the hardy species of Cocos. The late Mr. Edmund H. Hart was very fond of these palms and had fine specimens of about three species in cultivation. Of the four known species, two inhabit the coast regions of Brazil, the other two, the dry campos. These latter thrive well on high pine land, while the former need more water and richer soil.

Diplothemium cámpestre, Mart, is a common palm in the region of Blumenau, South Brazil, and is the best known species of the genus in Florida. In Mr. Hart's garden at Federal Point, there is a fine large specimen which has proved entirely hardy and has never suffered from cold. It is almost stemless and consists of a number of short-stems flowering and fruiting regularly.

Diplothemuum littorale, Mart., is also a species of the campos, like the former and would very likely prove equally hardy.

Diplothemium maritumum, Mart, is a low-growing, fine, plume-leaved palm of the coast regions of Brazil, but I am not aware whether or not this has ever been introduced.

Diplothemium caudescens, Mart., Ceroxylon), is the most striking of all the species of this genus, being a common plant of the burning coast regions of Southern Brazil. The fruit hangs in yellow bunches just below the silvery undersurfaces of the leaves and the natives can easily refresh themselves with its sweet pulp, as the trunks never attain any great height. There was a fine young specimen before the freeze in the garden now known as "Bishopstead" in Orlando. When I saw it in November, 1894, it was a picture of health and beauty—in fact, I have scarcely ever seen a more impressive and elegant palm. The arching pinnate leaves were about 8 to 10 feet long and 2 feet broad and looked very massive and perfect. The upperside showed a most distinct, deep glossy olive-green and the underside, a very conspicuous silvery-white. The entire plant was about 10 to 12 feet high, but the trunk was only short and quite thick. There were other palms in this fine garden, but in point of beauty this was second to none. It was shaded by a large specimen of Bambusa spinosa, and near by was a large and dense specimen of Arabia papyrifera, the Japanese rice paper plant,, in full bloom. When I again visited the spot, several years later, all these plants were gone—whether destroyed by the freeze or removed to other quarters, I was unable to ascertain. To me, this palm looked as robust and hardy as Cocos Datil and C. australis. As all these palms will undoubtedly thrive in the orange belt, their introduction should be the aim of all lovers of palms and sub-tropical plants. They never grow tall and are, therefore, easily protected. A situation in full sun is essential to all of them.

Jubaea spectabilis, Humboldt is the most southern of all palms, being found in Chili in latitude 40 degrees. This is the Coquito, or Monkey Cocoanut of the Chilians, and exceedingly massive and beautiful species in its young state, and one of the greatest ornaments of the gardens of California, Italy, Spain, Portugal and the Riviera, where it grows to perfection. When grown to its full size it is, according to Darwin, who studied it in the highlands of the Andes, an ugly tree on acount of the very thick central part of the trunk. This palm is easily raised from seeds. Years ago, I planted out quite a number of small plants with a lot of different species of Phoenix, Sabals and Cocos, but, while all the latter have assumed glorious proportions, the Jubeas are still very small, though healthy. Those in full sun pined away, but others in rather shady positions under trees have remained perfectly healthy. The largest specimen is only 2½ feet high. Perhaps, in richer and moister soils and in somewhat shady places, this palm, like the California Fan Palms, can be naturalized.

IV.

Tropical Palms.

In this connection I cannot refrain from quoting Charles Kingsley: "For it is a joy forever, a sight never to be forgotten, to have once seen palms breaking through, and, as it were, defying the soft, rounded forms of the broad-leaved vegetation by the stern grace of their simple lines; the immovable pillar-stems, looking the more immovable beneath the toss, and lash, and flicker of the long leaves, as they awake out of their sunlit sleep, and rage impatiently for awhile before the gusts, and fall asleep again. Like a Greek statute in a luxurious drawing room, sharp cut, cold, virginal, shaming, by the grandeur of mere form, the voluptuousness of mere color, however rich and harmonious; so stands the palm in the forest—to be worshipped rather than to be loved." All the large palms, even our native palmetto, show this grandeur. How I raved when I first saw the beautiful groves of palmettos on the far-famed St. John's—called by the Indians more appropriately "Welaka"! How I I longed to own such a grove or to plant one with many different species when I meditated, in the cold winter days, of my northern home! And, since I have cast my lot on this peninsula, I have been fully aware of the fact that it can be done that there are many of the most beautiful and noble palms at our disposal to form earthly paradises. But palms, like princes, demand our attention and devotion, if they are expected to unfold all their beauty, elegance, grandeur and nobility. Plant them in your gardens and parks; surround your homes, be with them, care for them in a proper way, and they will be a continuous source of the purest pleasure this life is able to give. They will be monuments to your memory long after you have gone and long after you have been forgotten.

There are quite a number of tropical kinds that can be planted successfully wherever the orange, pomelo and lemon grow. I have already alluded to several such species, like Cocos plumosa, C. nucifera and others. The genus *Acromia* comprises a few such species which grow as far north as Winter Park and Lake Charm. They are all imposing and elegant palms, and the stems, as well as the leaves, are provided with numerous spines. All are common in the American tropics and one species occurs as far South as Paraguay. This is *Acrocomia Totai,* Mart., a very fine and most elegant palm, being only sparingly found in a few of our best gardens. The first large specimens I saw in Mr. Theo. L. Mead's garden, "Wait-a-bit," at Lake Charm. The tallest and grandest are undoubtedly found in the grounds of the Royal Palm Nurseries at Oneco, Fla. They are not quite as tall, but fully as beautiful as the tall specimens of Cocos plumosa standing not far from them. They have much more massive stems, however; the leaf-crown is denser and the leaves are shorter. I think Mr. Reasoner's plants are about sixteen years old, having attained a height of about 25 feet. They have grayish trunks, covered with long, blackish, blunt spines, and the leaf-stalks, as well as the small leaflets, are covered on their underside with small, sharp, dark-brown thorns. This palm requires good, rich deep, hammock soil or flat-woods soil, but it will grow fairly well on high pine land if a rich compost and sufficient water is applied. In Mr. Mead's garden this species has endured a freeze of 18 degrees Fahrenheit, but it lost most of its fine, plume-like leaves, and, in my garden it has been subjected to almost the same cold without suffering much damage. It is one of the most common palms of Paraguay, where tons of its seeds are used in the manufacture of an excellent oil, and the meat of its nuts forms a favorite article of food among the Paraguayans. Mr. Mead deserves the thanks of all lovers of palms for the introduction of this fine species. Dr. Morong collected the seeds near Asuncion, and I think all our specimens were derived from these seeds. I do not think that the true A. Totai can be had in Florida today, but seeds could easily and in large quantities be imported from Asuncion, Paraguay.

Acrocomia sclerocarpa, Mart., the Groo-Groo Palm of the West Indies, is much more tropical and, therefore, very tender. Mr. Reasoner says that is is not hardy at Oneco, but it will unquestionably thrive in extreme South Florida. The same may be true of *A. lasiospatha, Mart.,* the great Macau Palm of Venezuela, Colombia and Jamiaca. *A. Mexicana, Karw.,* from the cooler regions of Mexico up to 3,000 feet, will likely prove almost as hardy as A. Totai. It is a prickly palm, reaching 20 feet in height, growing in company of splendid Chaemadora Palms in the shade of oak-forests. (This may be identical with Astrocaryum Mexicanum, which see.)

Attalea. This genus of American palms comprises about twenty different species, but only two can be mentioned here, as they will very likely prove hardy when having attained a certain size. These are large-leaved palms of noble aspect when fully grown and very ornamental when small. They are unarmed, with ringed stems and very long gigantic, plume-like leaves, the segments of which are regularly placed along the midrib and at right angles with it. There is a magnificent specimen of A. Cohune in Horticultural Hall, Philadelphia, which not yet has formed a trunk but with huge leaves fully 30 feet long, all pointing upwards. The Attaleas require very rich and deep soil and a constant supply of water and protection from frost.

Attalea Cohune Mart. Cohune. This is one of the most common as well as one of the most royal palms of the East Coast of Central America. The large seeds supply an oil of great purity and excellent flavor. Perhaps hardy from Palm Beach southward.

Attalea compta, Mart., Pindova Palm a very common species in Southern Brazil, particularly near Blumenau where it is held in high esteem. It is a glory of the landscape and is called the Queen of Palms by the German settlers. Growing in the same region as Cocos Blumenavia, C. Gaertneri, C. Yatay, Diplothemium campestre and others, all perfectly hardy in our gardens, it will undoubtedly prove a most valuable acquisition to the orange belt. This beautiful palm should be introduced and largely planted in properly prepared soil in the full sun. A. Cohune, which is one of Mr. Reasoner's stand-bys in his catalog, should also be experimented with more extensively. If well protected with moss and pine-boughs, particularly around the heart, it will endure an ordinary freeze of a few degrees unharmed. The stem should also be banked with dry soil. Older plants will very likely prove much hardier than small ones. Every effort should be made by our wide-awake nursery men to introduce the unrivalled A. compta.

Astrocaryum is another genus of exquisite American palms, with long feathery leaves. They are all exceedingly spiny, the foliage even of young plants being covered on both sides with sharp spines. When large, every portion—the trunk, the leaves, the fruit-stalk and the flower-spathes—shows a thick covering of formidable thorns. But they all are extremely beautiful in spite of their repulsive armor.

Astrocaryum Mexicanum, Liebm., is the only species that now and then can be bought in this country; all the others have to be raised from seed, which I usually receive in a fresh state from Hoage & Schmidt, Erfurt, Germany. In its young state this species is quite tender, but when well established and in vigorous growth it can stand a few degrees of frost under a shed. My plant was raised from seed which ripened in Horticultural Hall, Fairmount Park, Philadelphia. It is a dwarf palm from Mexico, the trunk never growing taller than four to six feet. On account of its small size it is easily protected in a severe cold. I hope that further experiments will show its adaptability to our soil and climate. It may also prove hardy in dense hammock woods.

In extreme South Florida the beautiful Muru-Muru Palm, *Astrocaryum murumuru, Mart.,* very likely will prove hardy in rich, half-shady spots. Like the Mexican species, it is a marvel of elegance, being of medium size—its ultimate height being about 12 to 15 feet—and therefore easily protected. The trunk is densely covered with stout black spines about six inches long. The fruit ripens in large bunches and the seed is enclosed in fleshy mass which is edible. In the different species this fruit varies from the size of a hickory nut to a hen's egg. I had a few small plants, but they were killed outright in the big freeze of February, 1895.

Acanthorhiza. Another genus of American palms with fan-shaped leaves. Only *A. aculeata, Wendl.* can be considered here. It is a native of Mexico and is quite hardy under ordinary circumstances and with slight protection during the winter months. It is easier lost during our dry season than during the cold spells. The most conspicuous point in the character of this palm is the spine-like air-roots which are developed around the base of the trunk and which grow in an upward direction along the stem. Old trunks are entirely surrounded by a network of these spines which are of a blackish color. It will only grow in a moist soil, rich in leaf-mold, and in a rather shady position. This species is so interesting and unique in a collection that it should be introduced wherever choice palms are grown.

Howeas. This genus is represented in our gardens by two species, usually known as Kentias, all from Lord Howe's Island, namely *Howea Balmoreana, Becc.* and *H. Forsteriana, Becc.* These two species beyond doubt are the most popular and satisfactory palms in the trade, being used largely for house-decoration in the north. Mr. J. D. Eisele, of the firm of H. A. Dreer, told me that they sow annually 75 bushels of seeds of these two species. They seem to do very well in South California near the coast in shady positions, but I have not been able to establish them in my garden. They grew for a while in my plant-shed, came unharmed through the winter, but were affected later with a fungus disease, and were pining away slowly. They are smooth-stemmed, pinnate palms of exceptional beauty. The same applies to *Hedyscepe Canterburyana, Wendl.* and *Clinostigma, Mooreanum,* F. von Muller, coming from the same island. Mr. Theo. L. Mead tried to establish them in the shade of his hammock woods, but without success.

Ptychosperma. The palms of this genus were formerly known as Seaforthias. They remind somewhat of the Kentias or Howeas but are taller and more massive, and they do exceedingly well in South Florida, at least the two species which are here only considered. Years ago they were cultivated to a greater extent than any other palms, but they have been superseded by the Howeas. They have beautiful, smooth trunks and magnificent crowns of long, feathery leaves.

Tall growing and fast growing species, they soon assume magnificent proportions. No other palms are used so much in pot and tub culture in Florida as are the Seaforthias, and they are entirely free of the fungus disease which makes the cultivation of the Howeas well-nigh impossible in our state. They need rich, moist soil and shady positions.

Ptychosperma Cunninghami, Wendl., the real *Seaforthia elegans,* the Australian Feather Palm, is perhaps more grown for ornamental purposes in Florida than any other palm—mostly in tubs. It is a native of East Australia, as far south as Illawarra, thus being one of the most Southern of all palms. The beauty and grandeur of tall specimens is indescribable. The experiments with exotic palms are still in their infancy in our state and, for this reason, specimen plants of Seaforthia elegans are very rare in the open air It is believed that it will not grow in Central Florida. There is a fine, tall specimen at Bradentown, south of the Manatee River. The Manatee at this point is about a mile broad and affords excellent water protection for a host of tropical plants. Mr. Reasoner has hundreds of most beautiful plants of this species—all pot-grown—in his nursery at Oneco, many of them having stems six to ten feet high. He informed me that it is not quite hardy at Oneco, about six miles south of Bradentown.

Ptychosperma Alexandrae, Ferd. von Muller, the Alexandra palm of Queensland, the tallest of the Australian palms, and one of the noblest forms in the whole plant world. It attains to a height of 100 feet "and is likely destined to grace many shady, moist groves yet outside the tropics, so long as they are free from frost, as this palm seems less tender than most others." This is undoubtedly a gem for such places as Palm Beach, Miami and other places in extreme South Florida.

Elacis. This genus of tropical, feathery palms is entirely thornless. It consists of about six or seven species, one from Western Africa, and the rest from tropical America.

Elacis Guineensis, Jacq., the Oil Palm of Western Africa, one of the most useful of all plants, has been ascertained to be hardy in South Florida, where it has withstood several degrees of cold unharmed. It does not attain any great height, not more than 20 or 30 feet. The trunks are thick and are covered with the remains of the stalks of the dead leaves. Below the large tuft of prickly-stalked leaves are to be seen the dense heads of vermilion or yellowish fruits. The palm oil is obtained from the outer fleshy coating—not from the kernels—of the fruit, by boiling in water and skimming off the oil. It is of bright orange-red color, with the consistence of butter, and when quite fresh has a pleasant odor like violets. It is used in the manufacture of soap and candles and is exported in immense quantities. The very elegant, rather upright or slightly recurved, deep green leaves are 10 to 15 feet long. In all its stages the Oil Palm is one of the most ornamental and lovely.

Mr. Charles T. Simpson of Little River, near Miami, writes me under date of June 27, 1909, as follows: "Elaeis Guineensis, nine feet high and 12 feet across, is now in bloom, male flowers in one head, females in another, as large as a child's head. It is said to bear lovely red fruits."

This is very important news, showing that this exquisite palm is hardy and can be grown in the southern part of our state. Further investigation may prove that it can possibly be grown much further north.

Copernicia. This is a small genus of fan-leaved palms allied to the Thrinaxes, all natives of Southern Brazil and Paraguay. They need for their culture a rich, moist soil in the full sun.

Corpernicia cerifera, Mart., the Caranda of Brazil, and the Palma negra of Paraguay, is a fine fan-palm, growing 30 to 45 feet high with a full crown of distinct leaves. This species, known also as the Wax Palm, is hardy in the Riviera and will undoubtedly prove a valuable garden palm for the orange-belt, if seeds are imported from its southernmost habitat, Paraguay. It abounds there in great numbers along the banks of the Pilcomayo River, and throughout the Gran Chaco. When young the stem is covered below with the bases of the petioles, but these fall off at maturity, leaving the trunk bare and smooth. Wood dense, hard and black, forming a valuable timber which is used all over Paraguay for rafters and fence posts. The leaves are covered with a white waxy substance, which is scraped or shaken off, and made into the well-known carnauba-wax. "This species," says Dr. Morong, "is considered, with good reason, one of the most valuable trees in Paraguay. Not only does it furnish strong, durable timber and wax, but its berries are eaten by the Indians, the tender vertex of the caudex makes an admirable cabbage and its leaves are employed for various purposes, such as thatching, making fans, strawbraid, thread, fishing lines, cordage and the like."

I am not aware that this species is in cultivation in Florida at present, and the only specimen I ever saw grew in my own garden for about ten years. It was an exceedingly slow grower on high pine land, but would undoubtedly have grown much faster in rich, moist soil. To such a position I removed it in April—just at a time when the dry season held full sway—but I lost it.

Dr. Morong describes two new and entirely distinct species from the same region—*Capernicia alba, Morong* and *C. rubra, Morong.* Both are beautiful and both will very likely do well in South Florida. The first one is a rather low palm, frequently not over 10 feet high and seldom reaching a height of 30 feet. The crown is much larger than in C. cerifera, containing many more leaves. The wood is nearly worthless. In C rubra the trunk is clothed nearly to the top with the old leaf-stalks, never smooth as in C. cerifera, and always much thicker. The leaf-crown is large and round and very beautiful. For ornamental purposes these two new species will be great acquisitions to our gardens and should be introduced.

Thrinax. Allied to the former. All beautiful and exceedingly elegant American fan-leaved palms of rather small size and slow growth, succeeding finely in South Florida, particularly along the East Coast from Palm Beach southward. Of this genus about 10 species are known to science, six of them occuring wild in Florida.

Thrinax Floridana, Sargent, a slender palm, becoming about 30 feet tall and the trunk about six inches in diameter. The leaves are beautiful yellowish-green and lustrous above, silvery-white beneath. The flowers are pungent aromatic. It naturally grows on the sandy shores and coral-ridges of South Florida and the Keys.

Thrinax microcarpa, Sargent, also in dry coral soil of the same region, has leaves about three feet in diameter, pale green above and glaucous underneath. It grows about 35 feet high. Also a very elegant palm.

Thrinax Keyensis, Sargent. In its native haunts, the Florida Keys, this fine species attains a height of about 30 feet, "raised on a base of matted roots sometimes about one meter high.'" Leaves longer than broad, about three feet in diameter, glossy yellowish-green above, and bluish-green and more or less covered with silvery-white hairs beneath. Flowers faintly aromatic.

Thrinax Garberi, Chapm. (Coccothrinax Garberi Sargent) common on dry coral ridges along Biscayne Bay. Almost stemless, with yellowish-green leaves, silvery underneath.

Thrinax argentea Chapm. (Cocothri nax jucunda, Sargent). Also occurring on dry coral ridges of South Florida. Stem from 10 to 25 feet high. The crown consists of numerous yellowish-green, glossy leaves, glaucous on the underside. One of the most beautiful species of the genus, being also common in the West Indies. These are all hardy in South Florida and are easily grown. There are very fine West Indian species which will do equally well where the others find soil and climate congenial. The following are offered by Mr. E. N. Reasoner, of Oneco, Fla.: *Thrinax Barbadensis, Lodd.* from Barbadoes, "one of the handsomest of all small fan palms. Each specimen carries a full head of fine leaves and is always a fine object." Never seems to grow tall. *Thrinax excelsa, Lodd.* from Jamaica and *Thr. parviflora Swz.,* from the Bahamas. Both are very elegant species, the last named attaining a height of 10 to 20 feet. *Thrinax Morrisii Wendl.,* a native of Anguilla, is a dwarf, never over two and one-half feet tall in its native state. Very beautiful. Mr. C. T. Simpson, of Little River on Biscayne Bay, has all these species in cultivation and he writes that they are doing finely.

Oreodoxa. The Royal Palms. "The American Palms," writes Dr. Berthold Seemann, alluding to the Oredoxas, "may be said to have been anxious to appear to the best advantage, when they were about to form the acquaintance of those who were about to seek a new world in the west. They placed on the very threshold of their native country several representatives, which, in elegance and majesty of form are equalled by few and surpassed by scarcely any of the whole order of palms. Even ere the anxious voyager has set his foot on shore, he has already perceived their graceful foliage fluttering in the breeze, and waving, as it were, a hearty welcome to the newly-arriving steamer. Since the time when Columbus first discovered the West Indian Isles to the present day, these palms have been seen and admired by all who possess an eye for the beautiful."

Oreodoxa regia, Kunth., the true Royal Palm, the Palma real of Cuba, is regarded the most beautiful, most imposing and noblest of all palms for ornamental planting in the tropics. The grand avenue of these palms at Botofago, the Botanical garden near Rio de Janeiro, has a world-wide fame. It is the avenue palm of Honolulu and other places in Hawaii, and figures in almost all photographs of the sceneries of these islands. It is likewise largely planted at Paradenyia, Ceylon, and at Buitenzorg, Java—two of the world's most famous botanical gardens. The Royal Palm is a native of Florida, being found quite abundantly in the Everglades, where it forms trunks 50 to 60 feet high, bearing magnificent crowns of very long feathery leaves. It is found sparingly along the lower Kissimmee and on the Caloosahatchee, and is said to have grown as far north as the Manatee River. In fact the Royal Palm Nurseries at Oneco were named by the lamented Mr. P. W. Reasoner after these magnificent and beautiful palms. It is much planted around Biscayne Bay, at Fort Myers, Punta Gorda and Bradentown, and it invariably forms imposing specimens in a few years if planted on hammock and low land. It will not grow on high, dry pine land. Mr. E. N. Reasoner says "that it has immense, plumy, feathery leaves and a straight, white trunk." "It is a good tree," he continues, "for extreme South Florida for avenue planting, and is valuable in all sizes, but especially when four feet or over in height." The late Mr. P. W. Reasoner mentions in one of his articles a place which was known as Palma Sola, where two very tall and noble specimens grew which could be seen far out in the gulf. One winter a few vandals cut down these trees wantonly, which had been landmarks for centuries—the most northern of its habitat. In Orlando, where so many northern plant and flower-lovers have their winter homes, I have never seen the Royal Palm in the gardens, and I do not think that it will be entirely hardy so far north. It can, however, stand a few degrees of cold unharmed, suffering less than the Cocoanut Palm, It is entirely smooth all over, being not provided with spines or thorns as many other palms. It also occurs abundantly in Cuba, Antigua, etc.

Oredoxa oleracea Mart., the Royal Cabbage Palm, the Palmiste of Jamaica, is one of the most common palms of the West Indies with trunks 100 to 120 feet high.

Oredoxa Borinquena, the Porto Rico Royal Palm, differs from the Florida species in being still more vigorous and more stocky. Mr. C. T. Simpson informs me that all these species do well on Biscayne Bay, requiring hammock and lowland soil.

Pritchardia. Most beautiful, medium-sized fan-leaved palms from the islands of the South Pacific. They are very tender and will not be hardy north of the most southernmost point of Florida. Mr. Chas. T. Simpson writes me that he has lost his small specimens so often that he is not much encouraged. Perhaps they will endure such a freeze as may occur on Biscayne Bay without much harm, when they are larger. As far as I know, only the following three species have been or are still in cultivation in South Florida:

Pritchardia Pacifica, Seem, and Wendl., from Samoa and Fiji. Trunk grows about 30 feet high. *Pritchardia Gaudichaudii, Wendl,* and *P. Martii,* both from the Hawaiian Islands, are rather small species, the first reaching ultimately a height of 20 feet, the second having a trunk not exceeding five to six feet; all are exceedingly elegant and are well worth a little extra care to protect them from cold when necessary. They need rich, moist soil and some shade. The fierce rays of the sun are as obectionable to them as a cold spell.

Licuala. An allied genus of most exquisite fan-leaved palms from the tropical islands of the Pacific, requiring the same care as the Pritchardias.

Licuala grandis, Wendl., from New Britain, is one of the most beautiful palms in the world and without doubt the most royal of all fan-leaved species. It is not so long ago that a well developed speciman was sold in England for $1,000. At present, seeds of this species, as well as of many other tropical palms, can be easily obtained from Trinidad. Mr. Eugene Andre, the celebrated naturalist and explorer, grows quite a number of the grandest tropical palms in his garden near Port of Spain. From him I received a few years ago, a number of seeds which all sprouted. The young seedlings have endured the cold of the two last winters without harm, and are now growing finely. They were protected during cold weather with pine boughs. This seems to indicate that this species and *L. peltata, Roxb..* of India may grow out of doors in extreme South Florida. They evidently are small or medium-sized palms and the leaves are rather delicate and are easily injured.

Brahea. Allied to the two former genera, but with much more rigid, fan-leaves and short, massive trunks. *Brahea dulcis, Mart.,* Palma dulce of Mexico, where it ascends mountains up to 4,500 feet, is perfectly hardy in the orange-belt of Flarida, and a very noble and distinct species. The stem in full-grown specimens is about 10 to 20 feet high, and the leaves are from 4 to 5 feet long. It demands a rich soil, mixed with some clay. I had a fine specimen about 5 or 6 feet high which grew in full sun in a rather dry place. It withstood the severe cold of 1899, but was destroyed by a forest fire. I have not been able since to replace it or to obtain any other of the three remaining species. In its growth and entire aspect the Brahea I grew reminded me very much of Erythea armata.

Bactris. Very thorny American palms —in fact, covered with such an armor of spines that we have to handle them with care in order to avoid the serious injury that may be inflicted by them. Often they grow in tufts or big clumps, making it impossible to penetrate the forest. The genus consists of about a hundred species. Though many of them are ornamental and would form interesting objects in our sub-tropical gardens, they are little grown on account of their spines. They all have plume-like leaves. Many of the species are coarse in appearance and not worth growing, others are extremely beautiful. They are found in all kinds of situations, wet and dry. Most of the species have their whip-like stems, as well as the leaves and flower-spathes, covered with spines. They are the terror of the naturalist who has to enter the undergrowth of the forest. I have only grown *Bactris Binoti,* from South Brazil, and *B. baculifera,* both seemingly horticultural names without botanical foundation. The most common species is *B. horrida, Oerst.,* from Nicaragua, a rather beautiful, small palm, growing in tufts about 6 to 8 feet high. They have extremely spiny leaves, leaf-stalks, trunks and flower-spathes, and would make impenetrable live fences if it would prove hardy.

I will close this chapter with one of the most beautiful and noble of palms, *Areca Catechu Linn.,* the Areca or Betel-nut Palm, which has a lofty, straight and very slender stem. For this reason the Hindoo poets speak of it as "an arrow shot from Heaven."

"The flowers are deliciously fragrant; they are in request for all festive occasions and are also considered a necessary ingredient in the medicines and charms employed in the healing of the sick; their delightful perfume, together with a graceful, feathery foliage, borne on a slender and elegantly tapered stem, renders this tree the universal favorite among the palm tribe." (Hugh Low, "Sarawak").

The fruit is about the size of a small hen's egg, of an orange color, and hangs in large bunches below the dark green leaves. The outer part of the fruit is hard and fibrous, then comes the shell, enclosing the kernel of the betel-nut. It is for this that the palm is so extensively cultivated in the Malay Archipelago, and the practice of chewing it is universal amongst the natives. The nut is cut into narrow strips and rolled up with a little lime in the leaves of the betel pepper. The pellet, though acid to the taste, is aromatic and astringent and the mastication is considered wholesome. The natives would rather forego meat and drink than their favorite Areca-nut. The commerce in the nut is enormous.

I can only say that this glorious and celebrated palm may do well in extreme South Florida where the Royal Palm flourishes. I do not know whether or not an attempt has ever been made to introduce it to Florida, but is should be done. If it will succeed, it is an acquisition of the greatest value, on account of its nobility and its extremely fragrant flowers.

By Henry S. Pennock.

Mr. President, Ladies and Gentlemen:

Most of the ornamentals used about Palm Beach are more or less of a tropical nature and so they suffer more or less when we have a freeze. The cocoanut palm which is used a great deal for avenue work and is a magnificent thing for such, suffers badly and so some people are planting the date palm in its stead, the particular variety being the canariensis. And another thing in favor of the date palm is, it is a slower grower and so does not have the long spindly trunk the cocoanut would have in fifteen or twenty years. The royal palm is used for single specimens and among the smaller the sago palm holds first place and I do not think there is anything finer than a large, handsome one placed by itself on a well kept lawn. The borbonica is used somewhat.

Among the trees that are used are the Australian pines and oaks, the latter were planted along most of the streets of West Palm Beach a few years ago, they are doing quite well. I am trying a few trees of the California beefwood, in the description I read of them it said they would make a good growth in the poorest kind of soil, I thought they ought to suit me pretty well and also they would grow where the salt spray was blown on them. I got them last summer and so far they are doing all right. The two varieties I have are Casuarina Stricta and C. Equisetifolia. The sapodilla, rose apple, rubber tree, banyan, mango, avocado, umbrella tree and royal poinciana are all used singly and they all make a very nice lawn tree. Some consider the royal poinciana the handsomest tree that grows, it certainly is fine when it is in bloom with its bunches of scarlet flowers.

Of the bushes the oleander and hibiscus are seen the most, they are both such fine bloomers, the hibiscus is especially so, blooming all year. The oleander is used a good deal for windbreaks, it growing fifteen feet or more high. The phylanthus or snow bush is the prettiest shrub that we have and it is used a great deal for walk borders, its red and white variegated and green and white leaves make a very dainty, delicate effect. The red variegated acalypha is liked very well too, it grows higher getting six and eight feet high. Crape myrtle, bamboos, dwarf hydrangea, cattley guava, sisil, pandanus utilis and veitchii, auricaria and carissa arduina are used singly and in groups. We have a few plants of the carissa arduina and we like it very well for a hedge plant, it grows well in poor dry sand and its glossy green leaves look well all the year, at this time of the year it bears a star shaped white flower. I think if it was planted close enough it would turn cattle as it is quite thorny.

There is nothing that quite equals the bougainvilla among the climbers, with its masses of purple flowers it makes a magnificent sight. I was told by a gentleman living in Eau Gallie that he had one outside and that it was doing very well, everybody should have one. A bougainvilla on one side of a pergola or an arbor with an allamanda on the other makes an effect that is hard to excel, the yellow flowers of the alamanda and the purple of the bougainvilla go so well together. The rosa de Montana makes a very pretty thing with its pink flowers most all the year. The clerodendron balfouri, I don't know any other name for it, is another very nice vine, it is a strong grower and has red and white flowers.

Of the bedding plants the crotons are the most important, and what a handsome bed you can make with them, there is such a great variety of shapes and colors. A bed of crotons not planted too close together with some thing green between, something that does not grow too high, like sprengerii or the Boston ferns makes a very pretty bed and one that will almost take care of itself. The sprengerii and ferns are used a great deal for house plants, for jardinieres, there is nothing better though for this purpose than the pandanus veitchii with its long striped green and white leaves. I have heard it stated that a pandanus will stand more tough treatment than a mule. The New Zealand wax, wandering jew, poinsettia, dwarf hydrangea and crinum are some more very nice small plants. Prof. Rolfs told me he had seen the crinum as far north as Melbourne on the East Coast. It certainly is a thing everyone should have, it is a bulbous plant and is not particular as to soil, it is fine when in flower, the flowers are large and white of an umbel formation and the leaves are long and green usually drooping to the ground.

I want to say a few words about something that can hardly be called an ornamental and that is the Florida packing-house. I have often wondered of the hundreds of packing-houses in Florida how many of them are a pleasure to look at, and yet why not? Let us figure a little on how much more it would cost to make the packing-house look good instead of looking bum. The roof and floor would be about the same in any case, so what we have to consider are the sides and ends. The cheapest way of making the sides, by using upright boards with or without battens would cost three to four dollars per square, next, using siding would make it four to five dollars per square and if it is to last more than ten or twelve years it will have to be painted every three years which will be a dollar and a half per square more each time. Now if shingles are used, number threes will last about fifty years on the side of the building, the cost would be with a little extras, like better fixed windows, about six to seven dollars per square or the difference between a bum looking packing-house and a good looking packing-house would be about three dollars and a half per square; in a house 25x50 where there are about thirteen squares the total difference would be fifty dollars. But if you want to really make it in keeping with the orange grove make it of cement, this would cost from about fifteen to twenty dollars per square.

Prof. Rolfs—We have to be chary about planting the sago palm because it is quite susceptible to a certain fungus which attacks it and causes what is known as "sun scald" to the leaves. This has happened quite frequently and you must go very slow unless you have close and compact soil in which to plant the sago palm. Of course, we all know it is not really a sago palm, as it belongs to an entirely different family. For this fungus disease there is no remedy.

Report of Officers.

SECRETARY'S REPORT.

Mr. President, Ladies and Gentlemen:

Your secretary regrets to report that the number of renewals of membership has not been as great at the present time as in previous years. Owing to the fact that last year there were not sufficient funds raised to meet the expenses and a deficiency of $264.67 was carried over, which, taken from the amount already received leaves only a small amount in the treasury.

Donations:			
G. W. Adams	$ 3.00		
B. F. Chilton	10.00		
B. F. Blount	1.00		
C. O. McLoughlin	1.00		
		$ 15.00	
Life members	3	30.00	
1905 reports sold	1	1.00	
1906 reports sold	2	2.00	
1907 reports sold	5	5.00	
1908 reports sold	157	157.00	
1909 members	372	372.00	
			$482.00
DR.			
Postage		$ 19.87	
Draft of W. S. Hart on E. O. Painter		264.67	
Postage		23.00	
Salary of Secretary		100.00	
			$407.54
Amount paid to Treasurer			$ 74.46

Since the meeting in 1908 the Society is greatly indebted to Mr. E. H. Mote of Leesburg, who took special interest in the society and sent in over one hundred new names from Leesburg and vicinity and is still showing his interest in getting many to renew this season.

Mr. Howard Y. Stillman, chairman of the local committee in Daytona, has also done splendid work and has turned in seventy-one new names, and I understand there are still more to come. If he keeps up his present good work he will soon be on a par with Mr. Mote.

Your Secretary also wishes to report that the newspapers have as a rule, been very liberal in publishing notices of meeting and I wish to especially mention the Times-Union, The Florida Fruit and Produce News and the Daytona Halifax Journal.

We have also received donations towards expenses from Mrs. Jane Cadliff, $1; John Kendig, $2; C. M. Griffin, $5. All of which is respectfully submitted.

E. O. PAINTER, *Secretary*.

Note: Since the meeting at Daytona, 131 members have been added to our list and one life member, so that at the time of going to press our membership is as follows:

Honorary members, 5; life members, 82; annual members, 503.

TREASURER'S REPORT FOR 1909.

Mr. President, Ladies and Gentlemen:

I have the honor to submit to you the following report for 1909:

1908.	
May 14—To balance on hand	$357.76
May 16—Membership fee	1.00
May 21—Membership fee	1.00
July 11—Membership fee	1.00
Nov. 3—Draft on Sec. Painter	264.67
May 20—Cash of Sec. Painter	74.46
	$699.89

CR.	
June 1—By R. D. Algee	$ 11.00
July 20—Inez M. Ford	44.00
Oct. 26—E. O. Painter Pub. Co.	570.43
May 20—Balance in Treasury	74.46
	$699.89

W. S. HART, Treasurer.

REPORT OF EXECUTIVE COMMITTEE.

Mr. President, Ladies and Gentlemen:

The Executive Committee met in the Secretary's office on July 8. Messrs. Rolfs, Tabor, Hubbard, Stevens and Painter were present. The Secretary reported a collection of $179 since the last meeting. Moved that the proceedings of the meeting held in Gainesville last May be printed in the usual form. Bills for stenographer, printing, etc., were audited and ordered paid. Moved that the making up of the standing committees be referred to the president and secretary with power to act. Meeting adjourned.

The Executive Committee meeting of the Florida State Horticultural Society was held at the Secretary's office on March 5, 1909. Members present were Messrs. Stevens, Tabor, Hubbard and Secretary Painter. It was moved and seconded that Mr. H. Y. Stillman, of Daytona, be appointed chairman of local committee with three local members to assist him. He was requested to secure special rates for members to attend the meeting at Daytona.

It was moved that the committee on legislation be notified of the desire of the society to have a bill presented before the legislature to have sufficient funds appropriated to print the proceedings and bear some of the expenses that will burden the usefulness of the society. The meeting adjourned.

The Executive Committee met in session at Daytona, May 20, 1909; present Messrs. Hubbard, Stevens, Hart and Painter. The treasurer's and secretary's accounts were audited and found correct.

The committee appointed Mr. W. S. Hart a committee of one to telegraph Hon. F. W. Sams and Mr. Thos. Palmer at Tallahassee to use their best efforts in securing an appropriation of one thousand dollars instead of six hundred dollars as had been reported by the senate committee.

As shown by the treasurer's and secretary's reports, the amount of cash on hand is small and inadequate to print and distribute our proceedings, but it is not thought best to ask members to make donations towards the printing until it is ascertained what is done with the bill that is now before the senate. If the bill does not appropriate sufficient funds to take care of the publication, it will be necessary for the members to increase their contributions in order to furnish funds for publication.

All of which is respectfully submitted,

E. S. HUBBARD,
H. B. STEVENS,
G. L. TABOR.

Necrology.

Mr. President, Ladies and Gentlemen:

Your committee upon whom devolves the painful duty herewith furnished condensed data in relation to esteemed members who have passed away since last we met. There have been three deaths as follows: William H. Rankin, of Punta Gorda; Herman Lubrecht, of Island Grove, and W. T. Hildrup, of Welaka.

WM. H. RANKIN.

Wm. H. Rankin was born in Springfield, Ill., January 22, 1836. His early home was next door to that of the Lincolns. He lived there until 1845 when his family moved to Monmouth, Ill., where he gained his early education and later engaged in business, which he continued until 1898, when he sold out and moved to Punta Gorda, Fla., where he made his home until a few months prior to his death. He died in Chicago, on February 20, 1909, and was laid to rest in the cemetery at Monmouth, Ill. His wife, Mary T. Rankin, and four children survive him and this society joins with them in the sense of loss of an honorable, upright man.

HERMAN LUBRECHT.

Herman Lubrecht was born in Germany, 1847, and died at Island Grove, Fla., in April, 1909. He came to America in 1882 and was engaged in business in New York City. About 1890 he came to Island Grove, and with some New York parties started in the nursery business. He was much interested in citrus and other tropical fruits and carried out many experiments. He had started a fine citrus grove which was killed back by the cold during the winter of 1894 and 1895. As a means of protecting citrus trees against cold, he was the first to erect a shed over his grove. This shed covered four and one-half acres.

Mr. Lubrecht was a fine type of German-American citizen and was highly esteemed by all who knew him. He had never married.

WILLIAM THOMAS HILDRUP.

William Thomas Hildrup was born January 6, 1822, at Middletown, Conn., where he spent the first 19 years of his life, and received his education. He started out in life as a carpenter, studied mechanics and rose rapidly from one position to another. While still comparatively young, he was made superintendent of the Bradley & Rice car works at Cape Cincent, N. Y. In 1852, he established a car wheel factory at Elmira, N. Y., and a year later, moved to Harrisburg, Pa., and organized a Harrisburg Car Manufacturing Company. During the war, he aided in supplying the government with horses. He also ran the first train over the Baltimore and Ohio Railroad, after the battle of Antietam. He was active in the organization of the First National Bank and The Commonwealth Trust Company, of Harrisburg, and was a director in each of them. He was, for many years, a warden and vestryman of St. Stevens Episcopal Church, of Harrisburg.

Mr. Hildrup had for some years past, a winter residence at Welaka, Fla., at which place he passed away on January 21, 1909, at the ripe age of 87 years, and was interred in the family vault in Harrisburg, Pa. His wife Emma J. Hildrup survives him. He was a man of unusual ability and will be missed by a host of friends.

All of which is respectfully submitted,

G. L. Tabor,
J. A. Stevens,
Committee.

RESOLUTIONS—LEGISLATIVE.

Whereas, It was deemed necessary for the good of our Society to ask for State aid in printing our minutes, and

Whereas, a Legislative Committee was appointed and presented a bill to the Legislature; therefore be it

Resolved by the Florida State Horticultural Society in convention assembled, That we thank our Legislative Committee for their efforts in getting an appropriation for the publishing of our annual reports and trust that they will be successful; and be it further

Resolved, That we acknowledge and appreciate the service of Capt. Rose in getting the bill presented.

S. H. Gaitskill, Chairman;
W. S. Hart,
M. C. Gillette.

(The Secretary regrets to report that the bill died on the calendar.)

By E. H. Mote.

Hon. ——————

Washington, D. C.:

Dear Sir—As our representative in the councils of our government, we wish to call your serious attention to the following preambles and resolutions, assuring you it is a matter of the utmost importance to all growers of the Citrus fruits in Florida, which is one, if not the most important industries in the district you represent in Congress:

WHEREAS, The orange growers of Florida are annually suffering the loss of many thousands of dollars in the reduction of their fruit crop and still more in the market value of their groves through a disease knows as orange tree blight, which usually selects the largest and most productive tree for the attack; and

WHEREAS, Though the disease has been carefully studied for many years by very able department experts, it is not yet well enough known to allow of its positive identification, in many cases, before the second or third year after its appearance, while investigations pretty surely prove that the disease is contagious, which makes each diseased tree a nucleus from which it is carried to others when caring for or working the grove; and

WHEREAS, Progress has been made that encourages the belief that if additional help with special fitness can be sent here and allowed to devote their whole time assisting in this select work, we have reason to hope that the cause may be found for it; therefore be it

RESOLVED, That the secretary of this society be instructed to correspond with the Florida representatives in Washington and earnestly request them to call upon the Secretary of Agriculture, Hon. Wilson, and urge upon him the importance of this work and the pressing need that we feel for further assistance from his department be it further

RESOLVED, That each member of this society exert his or her influence as an individual to secure increased appropriation for this work and its more vigorous prosecution."

We wish to say further, relative to above actions of the Florida State Horticultural Society that this society, being composed largely of people who are exclusively engaged in cultivating the citrus fruits, have become alarmed at the persistence with which this new menace to our groves, defies our individual efforts to find a remedy that will check its further spread into new territory, and finally eradicate it entirely. We are of the belief that this cannot be done by individual effort, owing primarily, to the lack of authority of the individuals to push inquiry on the premises of those whose groves are affected, which is apt to be resented as a probable loss of value in grove property. We feel that we should move cautiously in the matter, so as not to bring unnecessary hardship on the unfortunate grower, unless it be absolutely necessary to do so in the interest of the State at large. This action should properly be taken up by the department of agriculture, competent experts should be sent here with authority to investigate exhaustively, the origin of this disease, whether it is curable where it already exists, and preventable in groves not yet attacked and especially to determine authoritatively, if it is contagious.

When this preliminary work is done so as to give definite and authoritative basis to work upon, we will then invoke, through this State to carry into effect any precautionary or suppressive measures that the Department of Agriculture may suggest for the extermination of this disease.

It may be possible the Department of Agriculture cannot take up this much needed work without a specific appropriation for the purpose. If this is true, we urge you to use every legitimate effort to have such appropriation placed in some of the pending bills now before this Congress, so that this work may start at the earliest possible date.

In urging the consideration of our appeal for aid in this difficulty; we respectfully call attention to the fact that some fifteen years ago the orange industry sustained a crushing calamity that for the time amounted to the total destruction, when it was generally believed that the orange industry in Florida was permanently destroyed and would never again become a paying enterprise. While this calamity was State-wide, falling on the rich and poor alike, and deserved to be classed with other "visitations of God," as floods, conflagrations and earthquakes, that invariably call forth the sympathy and bounteous contributions not only of the charitable individuals and societies, but the generous and substantial finance aid of the Government at Washington, it is a matter of pride to the people of Florida that they never appealed to the citizens nor the Government for anything but sympathy, and even that appeal was silent and unspoken. Thousands of men, who had been reduced from moderate financial independence to beggary in a single night, by an overwhelming disaster that no effort or foresight on their part could avert or alleviate patiently and uncomplainingly went to work to renew again their groves and bring prosperity again to an industry that is rapidly building up the waste places and adding several millions of dollars, as well as many thousands of settlers to the State; which is rapidly taking rank and influence among the States in the production of world-wide necessities, as well as the luxuries of life.

Such moderate aid as we now ask has been generously extended to California in the propagation of the fig and orange industry and other States in the protection of peach orchards from destruction through contagious diseases that could not be controlled by individual effort, which, when backed by the police power these industries and added immensely to the taxable values, and also to the peace of these States, has brought prosperity to and prosperity of the State.

FINAL RESOLUTIONS.

Mr. President, Ladies and Gentlemen:

Whereas, The members of the Florida State Horticultural Society in its twenty-second annual session have been so well entertained and so well cared for by the citizens of Daytona and in view of the courtesies extended to us by the people of Daytona,

Resolved, That we wish to thank the citizens of Daytona for our royal entertainment, for a very pleasant and entertaining morning and the best of dinners; also to the good people of New Smyrna who aided in making the "clam chowder" lunch at the Sams House so thoroughly enjoyable and otherwise helped to make the occasion a pleasant one.

Resolved Further, That we wish especially to thank the ladies of Daytona for their very thoughtful and unique afternoon's entertainment of our lady members, our sisters, daughters and wives at the charming home of the Palmetto Club.

Resolved, Further, That we wish to acknowledge the very efficient work for and interest in, our entertainment displayed by Mr. H. Y. Stillman, Mr. Wm. Moore, R. L. Smith and W. F. Holmes, and their energetic and thoughtful co-workers.

Resolved Further, That we feel under deep obligations to Prof. Rolfs and his associates for their ready and instructive response to our requests for papers and information, thereby greatly assisting in the interest of our program.

Resolved, That we appreciate the action of the Department of Agriculture in sending Prof. Swingle, Prof. Tenny and Prof. Williams to meet with us. Their addresses have been of much value and helpfulness.

We also wish to thank each of the gentlemen named for the interest they have taken and the able papers they have presented.

Resolved Further, That we also wish to thank the transportation companies for the courtesy of giving us good service and for reducing the railroad fare, thus enabling more of us to come to the meeting.

Signed,

H. B. Stevens,
W. C. Temple,
A. H. Brown,
Committee on Resolutions.

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OF THE

Proceedings

OF THE

FLORIDA STATE

Horticultural Society

From the Fifth Meeting in 1892, to the
Twenty-first Meeting in 1908

BY

JOHN BELLING

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PROCEEDINGS OF THE FLORIDA STATE HORTICULTURAL SOCIETY *for* 1910

PUBLISHED BY THE SOCIETY

H. HAROLD HUME, President.

PROCEEDINGS

OF THE

TWENTY-THIRD ANNUAL MEETING

OF THE

FLORIDA STATE HORTICULTURAL SOCIETY

HELD AT

ORLANDO, MAY 17, 18, 19, AND 20, 1910

COMPILED BY THE SECRETARY
PUBLISHED BY THE SOCIETY

CONSTITUTION.

ARTICLE 1. This organization shall be known as The Florida State Horticultural Society, and its object shall be the advancement of horticulture.

ARTICLE 2. Any person may become a member of the Society by subscribing to the Constitution and paying one dollar. Any person may become a Life Member of the Society by subscribing to the Constitution and paying ten dollars.

ARTICLE 3. Its Officers shall consist of a President, three Vice Presidents, Secretary, Treasurer, and Executive Committee of three, who shall be elected by ballot at each annual meeting. After the first election, their term of office shall begin on the first day of January following their election.

ARTICLE 4. The regular annual meeting of this Society shall be held on the second Tuesday in April, except when otherwise ordered by the Executive Committee.

ARTICLE 5. The duties of the President, Vice Presidents, Secretary and Treasurer shall be such as usually devolve on those officers. The President, Secretary and Treasurer shall be, ex-officio, members of the Executive Committee.

ARTICLE 6. The Executive Committee shall have authority to act for the Society between annual meetings.

ARTICLE 7. The Constitution may be amended by a vote of two-thirds of the members present.

BY-LAWS.

1. The Society year shall be co-extensive with the calendar year, and the annual dues of Members shall be one dollar.

2. All bills authorized by the Society or its Executive Committee, for its legitimate expenses, shall be paid by the Secretary's draft on the Treasurer, O. K.'d by the President.

3. The meetings of the Society shall be devoted only to Horticultural topics from scientific and practical standpoints, and the Presiding Officer shall rule out of order all motions, resolutions and discussions tending to commit the Society to partisan politics or mercantile ventures.

Florida State Horticultural Society.

OFFICERS ELECT FOR 1910:

PRESIDENT:

H. HAROLD HUME, Glen St. Mary.

VICE PRESIDENTS:

W. C. TEMPLE, Winter Park; H. B. STEVENS, DeLand; B. F. CHILTON, New Smyrna.

SECRETARY:

E. O. PAINTER, Jacksonville.

TREASURER:

W. S. HART, Hawks Park.

EXECUTIVE COMMITTEE:

P. H. ROLFS, Gainesville; E. S. HUBBARD, Federal Point; G. L. TABER, Glen St. Mary.

President, Secretary and Treasurer, ex-officio.

Standing Committees.

Method of Packing and Shipping Citrus Fruits.—E. P. Porcher, Cocoa, Fla.; E. S. Williams, Fort Pierce, Fla; James S. Crutchfield, Jacksonville, Fla.

Method of Handling Citrus Groves.—H. G. Nicherson, Winter Haven, Fla.; G. M. Wakelin, Tavares, Fla.; David Scott, Arcadia, Fla.; Chas. Bemenderfer, White City, Fla.; Fred S. Dewey, Boynton, Fla.

Ornamentals.—C. D. Mills, Jacksonville, Fla.; J. C. Bates, Lake City, Fla.; Henry S. Pennock, Jupiter, Fla.

Irrigation—Walter Drenner, Orlando, Fla.; T. F. Holbrook, Lakeland, Fla.; Dr. H. E. Stockbridge, Atlanta, Ga.

Vegetables.—C. K. McQuarrie, Gainesville, Fla.; S. Littlefield, Little River, Fla.; J. A. Gladden, Hastings.

Peaches and Deciduous Fruits.—W. L. Floyd, Gainesville, Fla.; A. C. Haynes, DeLand, Fla.; J. E. Futch, Alachua, Fla.

Pineapples.—C. G. White, Haiku, Maui Island, Hawaii; J. B. Leatherman, Delray, Fla.; E. V. Blackman, Miami, Fla.

Fertilizer.—A. W. Blair, Gainesville, Fla.; B. von Herft, New York City, N. Y.; R. E. Rose, Tallahassee, Fla.

Tropical Fruits.—E. N. Reasoner, Oneco, Fla.; Mrs. P. H. Rolfs, Gainesville, Fla.; John B. Beach, W. Palm Beach, Fla.

Insects and Diseases.—E. W. Berger, Gainesville, Fla.; H. S. Fawcett, Gainesville, Fla.; J. Schnarr, Orlando, Fla.

Nuts.—W. W. Carroll, Monticello, Fla.; C. M. Griffing, Macclenny, Fla.; Jas. A. Bear, Palatka, Fla.

List of Members.

HONORARY MEMBERS.

Berckmans, P. J., Augusta, Ga.
Flagler, H. M., St. Augustine, Fla.
Gaitskill, S. H., McIntosh, Fla.
Hart, W. S., Hawks Park, Fla.
Painter, E. O., Jacksonville.

LIFE MEMBERS.

Alderman, A. D., Bartow, Fla.
Allan, Wm., 136 W. 79th St., New York City.
Andrews, C. W., Chicago, Ill., John Crerat Library.

Baltram, Francisco, Monterey, N. L., Mexico.
Barber, C. F., Macclenny, Fla.
Bartlett, A. F., St. Petersburg, Fla.
Bell, J. D., St. Petersburg, Fla.

Carpenter, G. F., 56 Beck St., Attleboro, Mass.
Chidester, D. D., Philadelphia, Pa., 2321 Madison Square.
Cook, R. F. E., Leesburg, Fla.
Conner, O. W., Tangerine, Fla.
Conner, W. E., New York City, 532 Madison Avenue.
Cresson, W. H., City Point, Fla.
Crutchfield & Woolfolk, Penn. Produce Bldg., 21st St., Pittsburg, Pa.
Crockett, Mrs. C. B., 124 11th St., Miami, Fla.
Crosby, J. A., San Mateo, Fla.
Cunliff, L. H., East Douglass, Mass.
Cunningham, A. D., St. Louis, Mo., 421 Olive St.

Drew, Prof. Wm. L. 13 East Ave., Ithaca, N. Y.

Ellsworth, W. J., Blanton, Fla.

Felt, J. P., Emporia, Fla.
Francis, Chas., Jr., Interlachen, Fla.
Frink, Aubrey, Winchester, Tenn.

Gossard, Prof. H. A., Ohio Ex. Sta., Wooster, O.
Gushee, E. G., Philadelphia, Pa., 2830 W. Lehigh Avenue.
Griffing, C. M., Jacksonville, Fla.

Haden, Mrs. Florence P., Cocoanut Grove, Fla.
Harris, E. K., East Palatka, Fla.
Harris, Mrs. A. C., East Palatka, Fla.
Harvey, S. S., 99 Prado, Havana, Cuba.
Hastings, H. G., Atlanta, Ga., 35 Marietta St.
Hempel, H. A., Gotha, Fla.
Henricksen, H. C. Havana, Cuba.
Hentz, W. B., City Point, Fla.
Herff, B. von, New York City, 93 Nassau St., N. Y.
Hernandez, Pedro M., San Fernando, 108 Cienfuegos, Cuba.
Hopper, I. A., Orlando, Fla.
Hume, H. Harold, Glen St. Mary, Fla.
Hubbard, E. S., Federal Point, Fla.

Johnston, S. W., DeLand, Fla.

Kerr, Dr. George, 325 Armstead Ave., Hampton, Va.
Krome, W. J., Marathon, Fla.

Lauman, G. N., Ithaca, N. Y.
Lewis, Dr. Fred D., Buffalo, N. Y., 188 Franklin St.
Livingston, Dr. Alfred, Jamestown, N. Y.
Loehr, F. C., Hull, Fla.
Love, Ozor T., 6239 Fairview St., Germanton, Pa.

Manville, Mrs. A. H., Orange City, Fla.
Martin, Wm. A., Sebastine, Fla.
Merritt, Dr. J. C., Orlando, Fla.
Milligan, J. W., Apopka, Fla.
Mills, C. D., Jacksonville, Fla.
Miller, H. K., Monticello, Fla.
Mote, E. H., Leesburg, Fla.
McCarty, Mrs. C. T., Eldred, Fla.
McCarty, B. K., Eldred, Fla.
McCarty, D. T., Ft. Pierce, Fla.

Norvenland Fruit Co., San Juan, P. R.
Nehrling, H., Gotha, Fla.

Olsen, Olaf, White City, Fla.

Painter, Mrs. E. O., Jacksonville, Fla.
Pike, W. N., Floral Park, N. Y.
Prang, Mrs. Nettie M. G.
Porcher, Mr. E. P., Cocoa, Fla.
Porcher, Mrs. E. P., Cocoa, Fla.

Racey, C. H., Waveland, Fla.
Raulerson, J. Ed., Lily, Fla.
Rickeston, Mrs. M. C., Grayfield, Cumberland Island, Fernandina, Fla.
Robinson, M. F., Sanford, Fla.
Rolfs, Prof. P. H., Gainesville, Fla.
Rolfs, Mrs. P. H., Gainesville Fla.

Smith, C. E., Bogwalk, Jamaica.
Sneden, W. C., Waveland, Fla.
Sparvath, R. M., Englandsgade 37, Esbjerg, Denmark
Stanton, F. W., Philadelphia, Pa., 14 Vine St.
Stevens, Edmund, Verga Alta, P. R.
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Proceedings of the Twenty-third Annual Meeting of the Florida State Horticultural Society

For the Twenty-third time, The Florida State Horticultural Society assembled in annual convention, at the Gem City of Orlando, with headquarters at the San Juan Hotel.

Orlando has entertained the Horticultural Society on two other occasions and this time the good people showed themselves no less hospitable and endeavored to make the Horticulturalists feel thoroughly at home and gave them such entertainment as the program and time allotted would allow. The special feature of the entertainment was the automobile ride in and around Orlando through the country to Winter Park and Maitland.

The drive on the hard surfaced road between magnificent oaks and alongside of large orange groves was a very enjoyable one.

The party surprised Mr. W. C. Temple at his Alabama Grove, but he was equal to the occasion and had the pleasure of showing some of the leading Horticulturists in the country a growth on Trifoliate stock that was even a surprise to the nurserymen who furnished it. The visit to the Winter Park packing house, which is said to be the largest in the world was of special interest in view of the fact that some of the methods for handling and washing fruit were entirely new in Florida.

The visit to Rollins college where the members were heartily received by Prof. Blackman and his good wife was among the bright spots of the day. After a long ride and a walk through the packing house the cooling refreshments handed out by the young ladies of the college were very acceptable and heartily enjoyed by all. Many of the members had heard of Rollins college, but never knew before of the extent of its grounds, its numerous beautiful buildings and splendid equipment. All the members joined in hearty thanks to the president, faculty and the students for the very enjoyable hour spent within the walls of the college grounds.

The regular routine of the meeting was carried through without very much change from the program. One of the very important things that took place at the meeting was the naming of the place where the American Pomological Society would hold its next meeting. It will be remembered that at the Daytona meeting a committee was appointed to invite the American Pomological Society to hold its next bi-ennial meeting in Florida. The committee was successful in presenting their invitation and it was left to the Horticultural Society to state where the next meeting should be held.

Jacksonville and Tampa both put in bids, but Tampa won out as she had three delegates on the floor and they made promises that could not be overlooked and the Society voted on Tampa, knowing that she has never failed to keep her word. The meeting will convene on January 31, 1911.

The next place of meeting for the Florida State Horticultural Society will be in Jacksonville, where it will hold its regular annual session. The Horticultural Society, however, is expected to participate in the Tampa meeting and to be on hand to see that the American Pomological Society members are well taken care of and are shown what Florida can produce.

It is hoped and believed that the meeting at Tampa will be the largest and best attended and most interesting of any meeting previously held by the American Pomological Society, but whether it is or not is going to depend in a great measure on how our Florida members turn out and help.

All of the members when leaving Orlando did so with grateful hearts to the good people there for the kind hospitality and entertainment extended to them.

Minutes

FIRST DAY.

Evening Session.

1. Call to order. President H. Harold Hume.
2. Opening prayer.
3. Address of welcome—Gen. Wm. H. Jewell.
4. Response—W. C. Temple.
5. President's annual address—H. Harold Hume.
6. Introduction of question box.
7. Social hour.

SECOND DAY.

Morning Session.

1. Address, "Horticultural and Agricultural Education in Florida."—Prof. P. H. Rolfs, Gainesville.
2. Methods of Handling Citrus Groves —Mr. E. S. Williams, Ft. Pierce; Mr. C. H. Thompson, Winter Haven.
3. Discussion.
4. Hardy Citrus Fruits—Prof. Walter T. Swingle.
5. Discussion.

Afternoon Session.

1. Transportation and Storage of Citrus Fruits—Prof. A. V. Stubenrauch, Department of Pomology, Washington, D. C.
2. Discussion.
3. Address by Prof. Waite—Some Fungicides.
4. Discussion.
5. Irrigation—Mr. M. E. Gillette, Tampa; Mr. J. P. Campbell, Jacksonville.
6. Appointment of Committee on Final Resolutions: Mr. H. E. Stockbridge, Atlanta, Ga.; Mr. L. B. Skinner, Dunedin, Fla.; Mr. H. Fleming, Kissimmee, Fla.

Evening Session.

1. Whitefly Investigation, with stereopticon views—Dr. E. A. Back, Orlando.
2. Discussion.
3. Appointment of Auditing Committee: Mr. E. N. Reasoner, Oneco; Mr. H. Guy Nickerson, Florence Villa; Mr. M. E. Gillette, Tampa.
4. Whitefly Investigation—Prof. E. W. Berger, Gainesville.
5. Discussion.
6. Controlling Whitefly—Mr. James E. Kilgore, Largo.

Morning Session.

1. Ornamentals—Mr. W. J. Ellsworth, Jessamine; Mr. T. L. Mead, Oviedo; Dr. H. Nehrling, Gotha.
2. Stem End Rot of Citrus Fruits—Prof. H. S. Fawcett, Gainesville.
3. Discussion.
4. Studies—Mrs. N. M. G. Prange, Jacksonville.
5. Blue Stone in Citrus Culture—Prof. B. F. Floyd, Gainesville.
6. Discussion.
7. Report of Auditing Committee.
8. Report of Secretary.
9. Report of Treasurer.
10. Report of Executive Committee.
11. Method of Packing and Shipping Citrus Fruits—Mr. L. B. Skinner, Dunedin.
12. Discussion.
13. Address by Mr. R. P. Burton—Florida Citrus Exchange, Tampa, Fla.
14. Discussion.
15. Appointment of Committee on Legislation—Mr. W. C. Temple, Winter Park; Capt. R. E. Rose, Tallahassee; Dr. F. W. Inman, Winter Haven; Mr. R. P. Burton, Tampa.
16. Resolution presented by Prof. P. H. Rolfs that the word "advisory" be struck out of Article 5 of the Constitution.
17. Election of officers.
18. Selection of next place of meeting.
19. Visit to Temple Packing House and lunch at Rollins' College.

Evening Session.

1. Observations on Pecan Culture—Mr. H. K. Miller, President Ga. Fla Pecan Growers Association.
2. How Shall we Market Pecans —Prof. H. Harold Hume, Glen St. Mary.
3. Combinations Adapted to Pecan Production—Mr. W. W. Carroll, Monticello.
4. Discussion.
5. Report of Committee on Statistics.
6. General Discussion.
7. Final Resolutions.

Address of Welcome.

Gen. Wm. H. Jewell.

Mr. President, Ladies and Gentlemen, Members of the Horticultural Society of Florida and of the Nut Growers' Association of Georgia and Florida:

Orlando is proud and glad to welcome you here. We open to you the gates of our city and the doors of our homes and of our hearts. We hope that your stay with us will be profitable and pleasant. We are sure it will be profitable, and we sincerely hope that it will be pleasant.

We remember that you were with us some years ago when we were barely emerging from that great disaster that almost seemed to mean ruin to us, when the chief source of our income and prosperity was swept away in a night, and we suffered great loss of property as well as of our prosperity and of many of our people who were forced to go elsewhere to seek a livelihood, but we present to you a new and transformed Orlando and Orange county today; we present to you one of the most beautiful, pleasant and healthful cities in one of the most beautiful and healthful states of this Union. We show you our improved streets almost throughout the whole extent of our city and our principal streets, as you have noted, paved with the best modern material now known, vitrified brick, with many miles of sidewalks that seem like walking upon the mosaic floors of baronial halls or princely palaces, with our residential streets lined with umbrageous oaks. We show you one of the finest school buildings in the State, only recently erected but now too small for our necessities. We show you the lots and fields, once vacant and barren, now filled with homes; comfortable, pleasant and many of them even handsome, and we hope to show you something of the improved country roads that we have built, and to take you to see our suburb, Winter Park, and that magnificent model packing house built by that noble-spirited gentleman, Mr. W. C. Temple, your vice president, and we hope to show you that splendid institution for educational purposes known as Rollins College. We hope to show you these things and many more, which will add to your pleasure and be profitable as well.

We are proud and glad to have with us such a body of men and women as compose your organization; people who are devoting themselves largely to the promotion of the material interests of this great State.

While the great disaster to which I referred swept away our orange groves, we show you today that Orange county is raising more oranges than ever before; that it is the largest orange growing county in the State of Florida; that it has more orange trees than any other county in the State; but that we do not depend today as we did of yore upon any one thing for our living and prosperity, for we can show you some of the finest truck gardens you ever saw, not only in Sanford but in Orlando and Orange county. We hope and expect, by aid of the labors of your organization, to double and treble and vastly increase the product of those groves and of those gardens.

Again we welcome you to Orlando, and I am sure, although Orlando is not a town of "gush," although we do not boast nor claim that we have a boom, we make no great promises, but what we say, we mean, and what we do, we do with all our hearts, and in that spirit we welcome you to the city of Orlando.

Response to Address of Welcome.

W. C. Temple.

Mr. President, Ladies and Gentlemen of Orlando:

We have listened with pride and appreciation to the very eloquent remarks of the mayor of this beautiful city, and we thank you for the cordial welcome.

The mayor said we had met at Orlando before. That is true; we heard that remark last year when we were selecting a meeting place for this year's convention. There were other cities anxious to have us come to them, and we were accused of getting the Orlando habit.

We are glad Orlando is not tired of having us nor that we are acquiring the Orlando habit. We feel when we come to Orlando that we meet the cordial spirit and warm heart of the true southern welcome. Other cities make us welcome, to be sure, and do everything in their power to make our stay with them pleasant, but Orlando is different, somehow. The people here are so truly glad to have us; they seem "home-folks" like, and make us feel like "home-folks."

And, members of the Florida Horticultural Society, you must know that we are going to be entertained by the most cordial people of the most beautiful city of the gem county of the finest State of the most glorious nation under the sun.

President's Annual Address

H. Harold Hume.

Mr. President, Ladies and Gentlemen:

Upon this, the occasion of our third meeting to be held in Orlando, it may be interesting to take a general survey of our fruit plantings, their nature and extent. That our present position in the world's horticulture has been reached only after great efforts on the part of many workers, led on by hope, encouraged by example and backed up by dogged determination, is apparent, even to the most casual observer, and from their work, and the heritage which is ours, we may learn some lessons of lasting worth.

When we pause to carefully consider the status of the fruit-growing industries in this country, we cannot but be impressed both with their diversity and their magnitude. Owing to the extent of our territory north and south, east and west, the variations in altitude from sea-level to the tops of our highest mountains, our diverse soil-types and climatic peculiarities, a larger number of different fruits can be and are grown on the mainland of the United States than are usually found within the confines of any other single country.

Not only have our native fruits, in many important instances, been improved and brought into cultivation, but tribute has been laid upon every land which could add to the riches of our pomology.

Grapes and apples from Europe, plums from Japan and Europe, pineapples from South America, figs from Smyrna, oranges from the shores of the Mediterranean, China and Japan, mangoes from India, avocadoes from Mexico and the West Indies, pears from France, England and the Orient, Kaki persimmons from China, Japan and Korea, the chestnut from Europe and Japan, the peach from China and elsewhere, bush fruits (raspberry, gooseberry and others) from Europe, the banana from southern Asia, and many more from many, many different places. Every nook and corner of the earth from the land of the rising to the land of the midnight sun has given us of its fruits; the bleak, wind-swept steppes of Siberia and the steaming jungles of India have added to our lists. We have laid toll upon the islands beyond the seas and the oases of the desert. From barren hillsides and fertile valleys, from dense forest and open prairie, from tiny island and vast continent have come these strangers to our shores to become a part of our national wealth.

So nearly have we been able to meet the requirements of these immigrants that most of them have found a congenial home in some part of our land. In addition to this, the larger and more important fact that these importations of foreign varieties have had and are having a value far beyond this direct and immediate use, must not be overlooked. They have served and are serving as the basis for further improvements, and when blended with other strains by crossing, the resulting fruits have, in many cases, far surpassed in value the varieties imported. These new fruits are adapted to conditions of soil, climate and use into which the foreign varieties would not fit. Hence, we have at this time, varieties of direct foreign introduction, varieties of straight domestic origin and varieties combining the parental characteristics of the two. Sectional differences, peculiarities and adaptabilities have been worked out until we can say with reasonable certainty what strains of fruits will succeed in given areas. The peach orchards of New York and other northern states are planted with trees of the Persian and northern Chinese races, while the Florida peach grower now plants his ground with Peen-to and Honey types. The vineyardist of the Chautauqua grape belt will be found growing northern American grapes, such as Concord, or Niagara, or Delaware. The grape grower of the eastern Carolinas plants Muscadines and the California grower gives his attention to the wine and raisin grapes of Europe. The nut grower of the Pacific slope plants English or Persian walnuts and almonds, if in the cotton belt he plants pecans, and in the northern states, chestnuts and shell-barks. The California fig growers have at length succeeded with the Smyrna fig; while the grower of the Gulf coast will probably have to content himself, as he does now, with figs of an entirely different class. The date palm has been introduced and has found a congenial home in Arizona and southern California. Pineapples have thus far succeeded only in Florida. Japan plums have succeeded over a considerable area but probably reach their greatest perfection on the Pacific coast. There too, in Oregon and California, is the land of the prune. In the central northwestern states, the native American plum has supplied the standard sorts for planting, and the Russian apple seedlings have opened up a new apple field. Orange culture has reached its greatest development in our own State, in California and is now coming into prominence around the Gulf coast country. Of the newer fruits, the mango and avocado have great possibilities and open up interesting fields for further development. And we might go on calling attention to the different kinds of fruit which now engage the attention of our horticulturists. Truly our pomology is diversified.

But turning from this side of the question to another, let us note that no other land produces fruit in such abundance, and I dare say, that in no other country outside the tropics does it enter into the everyday sustenance of the people to such an extent. Our vineyards and orchards are planted over immense areas. Fruit trees are set out by hundreds and by thousands. Vast areas of plain and valley and mountain slope are given over to the culture of single fruits, and as our population increases, greater efforts must necessarily be put forth to supply the increasing demand, for our people are a fruit-consuming people. Our products are marketed by carloads and trainloads. Think of our out-put of 45 or 50 thousand carloads of citrus fruits from the Gulf and the Pacific, trainloads of peaches from the orchards of Georgia, Texas, Michigan and Ohio, of strawberries from the Atlantic seaboard, of apples from Colorado, New York and Oregon, of grapes from California, of pecans from the south and walnuts from the west. Truly these many strangers from many lands, the offspring of world-old races have amply repaid the care and attention they have received at our hands.

Millions are invested in this branch of culture, vast auxiliary industries have sprung up and are dependent upon the fruit crops of the country. Think of the immense amount of labor employed in healthful occupation, of the great revenues gained by transportation companies, of the large amounts of wood, iron and paper used in packing and preparation for market; and we gain some slight idea of what fruit growing means to the country as a whole.

In no other land is fruit so abundant, in no other is it so cheap. Here it is within reach of even the very poor. More and more our domestic output has supplied our needs, and in proportion to the amount consumed, our imports in many directions have fallen off materially. We have been able to build up an export trade of no mean proportions and our resources of soil and brain and brawn are by no means exhausted. There are greater developments yet to come, and looking down the dim vistas of the future, who can say to what proportions the pomology of America may yet attain?

How has all of this been attained? By what paths have we reached our present state? What forces have been at work, and who have been the workers? It is not our purpose to attempt to answer these questions in detail, but I do desire to direct your attention to one particular individual, the amateur fruit grower. To him belongs a measure of honor, a meed of praise so full that had his work been performed in other avenues of life, history would have told of his achievements, and monuments would have been raised to his memory,—but since his tasks have been performed in what we have miscalled the lowlier walks of life, there has been no poet to sing his praise. But, who is he? What is he? What has he done? When some day the history of American fruit growing is written as I hope it may be, we shall learn more of him, and of what we owe to his efforts.

If I were to define the amateur fruit grower, I could not do better than to paraphrase the words of Prof. Hale: "An amateur is a man who works in the field of horticulture because he cannot help it. Because he would rather do such work than anything else in the world. And, therefore, cares little for hampering traditions or for difficulties of any kind."

The impelling force is sheer love of his work. No thought of largess is his, love of plants to him is his reward.

To him we owe the major portion of our finest fruits. Interested in his chosen field, he has been ever quick to note variations in the plants grown under his watchful eye. The superiority of one over another, or maybe over all others, has not passed unnoticed. When plants were brought from foreign lands, his was the hand which received them and gave them kindly care, and when new fruits were brought to his notice, whether in our own country or in another, he has always been anxious to secure and test them.

The tendency in our country is to limit our plantings to a comparatively small number of varieties, and this small number is woefully small, when we compare it with the thousands of varieties which from the beginning have appeared in various catalogues and lists. It is also small when we compare it with the number of varieties planted by the old world culturist. At the present time, as in every other period of our pomology, new varieties are being constantly introduced, and so well are these placed before the public with illustrated and descriptive matter, that many might be led to plant largely without sufficient knowledge of their merits. Moreover while one variety may be good in a certain given locality, its range of adaptability may be limited, and no one can say over what territory a variety will succeed, until it has actually been tested on the soil. Herein the amateur has performed an invaluable service. New things attract his attention, he purchases them, or secures them, plants and cares for them. After a number of years' trial, under the vicissitudes of climate, of cold and heat, of rainfall and dry weather, he, more than any one else, is capable of passing upon the merits of the newer things. Not his, the attitude of the cold commercialist, whose only thought is of the gains he makes on his trees; and yet, the amateur oft-times prevents this same commercialist from falling into errors which would be disastrous to the successful outcome of his business operations.

Among our amateur growers, we may count not only our most worthy plant introducers and testers but also our most noted plant breeders and improvers. The service which such men as Prince, Downing, Rogers, Bull, Budd and Stuart have rendered American horticulture in their several fields of activity cannot well be over estimated. Who can count the value of the work done by Sandford, Edmund H. Hart, Phelps, Richards, Brown and Adams in the development of the fruit industries in this State? Their names will live long in the annals of Florida horticulture.

It has, however, not been along these lines alone that they have rendered valuable service. The fruit grower, to be successful, must wage war successfully against all the forces which oppose him. His is no one-sided study; and the amateur has played his part and played it well, in the control of plant diseases and insects. When new lines of fruit were introduced, their propagation, cultivation and general care require attention. These details have been mastered. Again when the fruits were ready to place upon the markets he has done his part in bringing them before the public. No phase of his work has been left untouched. He has given of himself and of his time without stint. All honor to the work he has done in the development of the enormous fruit industries of our country. Florida has had her full quota of amateur fruit-growers, and their combined ability has not been surpassed by the combined ability of the fruit growers of any other region in our country. And today, the same spirit is abroad in the State. May it long remain. With it, our fruit trees and plants are living vital objects to draw forth from their caretakers the best that is in them. Without it, our occupation has become dead and inert, it has lost its best, vital uplifting force for man and plant. Not only does man cultivate his fruit trees, but if he approaches his work in the right spirit and in the spirit with which the amateur fruit-grower has always approached his work, his fruit trees cultivate him. Thus we live for the best that is in our work, and in so living, win from it a reward far above the monetary gain it brings us. And when we fold our cloaks about us, to lie down to our repose, may it be with the feeling that we have lived not unto ourselves but for the betterment of an occupation that means so much to our State, and which has meant so much to us.

Horticultural and Agricultural Education in Florida

Prof. P. H. Rolfs.

Mr. President, Ladies and Gentlemen:

Once in a while, we like to take a general survey; to get on the housetop, as it were, and look around over the country and see what is to be seen. We want to spend a few minutes this morning in this kind of general survey, then we will get down to details and study the details more closely than this paper deals with them.

EDUCATION NECESSARY FOR A STABLE DEMOCRACY.

Our present system of education had its origin in an aristocratic form of government. It, therefore, partook much of the form of government under which it was fostered. In an aristocratic government it mattered not how many toiled incessantly, so long as the chosen few were privileged to follow the bent of their own inclinations to the fullest extent. Under such a form of government, a few extremely talented individuals arose, especially along those lines of study that did not displease the rulers. The great masses of humanity, however, were not thought worthy of attention. It was really considered dangerous for them to obtain the rudiments of an education. The very foundations of a democracy rest on the assumption that each one of the electorate body has at least a reasonable understanding of those questions of government necessary to the fullest development of the individuals who make up the democracy.

Our own government is only a limited democracy, and in some of the "machine-ridden" districts it is extremely limited. We are, in fact, to a large extent, governed by an office-holding oligarchy, which differs from a monarchy only in that the electorate may at irregular intervals remove the reigning oligarch, and replace him by another. These conditions will continue to exist as long as the electorate body remains incapable of knowing its needs and expressing them at the polls. Great holdings of property are not, to my mind, incompatible with a perfect democracy; nor are great variations in intellectual attainments antagonistic to a democracy. But it is impossible for a pure democracy to exist unsullied unless the majority of the electorate is capable of understanding and voting intelligently on both local and national questions. As long as we have an uneducated electorate, either one "boss" or another will rule; but, as the electorate becomes more educated, the boss retreats, and finally quits the field. Our own government has given us a striking illustration of how an almost perfect organization may be perverted to selfish ends. But, by the education of the masses, first one redoubt and then another has been taken from the office-holding aristocracy. Formerly, the electorate was not allowed the right to select the President of the United States, but now this is practically conceded, although the constitution of the United States reserves the right to an electoral college, and we still go through the empty form of voting for the members of this electoral college. In many of our States, the U. S. Senators are voted for in the primaries or at the general election, and the State Legislatures then go through the form of electing these Senators.

THE DIFFICULTY A FUNDAMENTAL ONE.

The difficulty of education is a deeper one than mere dollars and cents. You can't drive an American—some can be bought, but many more may be led. Our ideals, however, are toward a democracy.

Naturally, we should say that since the rural population is unable to send its children to school, then by increasing the earning capacity of the rural adult, the difficulty will be removed, and all of our children will be put into the schools. Let us examine the public school statistics of a State in which the earning capacity of the average adult is sufficient for comparative ease, and where children are not permitted to labor in factories. Massachusetts will furnish us with a good illustration.

In Massachusetts, according to the 69th census, there were:

513,000 children of school age;
498,000 children attending school;
404,000, or 78 per cent., in average attendance;

45,000, or 8 per cent., attending high school (about one-fourth of those that shoud be there).

These figures show us that the difficulty is a fundamental one, and not a practical one (the want of wealth).

In the whole United States, only 13 per cent. of our school population have reached the last grade in the high school, or a little more than a third of those that should be there.

The absence of wealth is a potent factor for non-attendance on schools, but it is not the fundamental difficulty. This difficulty lies in the fact that our present school curriculum is faulty. We are not educating for the efficiency of the individual. The whole common school course, beginning in the primary grades, through the grammar school, and especially in the high school, educates the individual for professional life, which comprises only 3 per cent. of our population. To the other 97 per cent. of our population the studies are purely non-vocational.

Think of it, ladies and gentlemen; 97 per cent. of our people (including 44 per cent. rural population) are required to accept a purely non-vocational course, or none at all, simply that 3 per cent may be fitted for their vocation. It is really a compliment to our present system that so large a percentage of our children are taking the studies in the higher grades at all. Our present graded and high schools have shaped their courses in such a way as to enable their graduates to enter a college or university without examination. They are given a direct through ticket, on a limited express train, which makes no stops at flag or way stations; while the through passengers number only one-tenth of one per cent. of the whole. We have built splendid terminal facilities, but those who wish to stop at way stations have to roll off like chunks of coal from a flat-car. In other words our present curriculum forces the teachers to bend all their energies toward making college or university candidates; while their efforts toward making common men and women, the great mass of our population, have to be purely incidental. Our present grammar and high schools are fashioned after the old academy, whose legitimate successor they can in no wise claim to be. (In passing, I may be permitted to say that our University has broadened its course during the last five years, so as to include instruction along the vocational lines that include about three-fourths of our population. It will take time, however, for the graded schools to fit boys for entering the University.)

THE WORLD-WIDE ADVANCE.

It is not so many years ago that all education, science, and other advancement of the human race were circumscribed and localized in more or less restricted communities. Some communities advanced far ahead of their times along certain lines. As an illustration of this, we have the civilization of Greece, which had its philosophers, poets, and to some extent scientists, before the Christian era. Much of the good work was lost by the subsequent subjugation of these people. The great valley of the Euphrates, and the valley of the Nile, and other places may be called to mind where engineering feats of wonderful proportions were carried on six to ten thousand years ago, the results of which are still apparent. In later times, however, the science and the art of this work were completely lost. It has been only in recent centuries that the science of engineering has again reached the height attained by these old and almost prehistoric nations. So long as these communities or nations remained isolated, they were able to develop along certain lines, frequently to the neglect of all other lines of education and upbuilding. Their advance only lasted until the opportune time came for a more barbarous or more fierce and warlike nation to conquer them and destroy utterly their literature and their art. A striking and very similar illustration may be taken from America. The great pyramids erected by the Aztecs to the sun and the moon, are still wonders of the continent. These Aztecs had a high civilization, and must have also developed in science to a high grade, from the fact that they have shown an accurate knowledge of engineering work, and an accurate knowledge of the calendar as we know it today. Their literature, science and agriculture was swept away by the Spanish conquerors. The Aztecs themselves were subjugated and compelled to become servants of an alien race whose civilization, science, and literature, they were forced to adopt, whether it suited them or not.

At the present time we are living in an age when time in the past is practically annihilated, making it possible by means of books for us in a single hour to traverse the whole vast extent of time from the beginning of recorded data to the present. The telephone and telegraph are annihilating distance. By means of the telegraph, we are today closer to the Philippine Islands and more intimately connected with them than we were seventy-five years ago with New York or Chicago.

WORLD-WIDE COMPETITION.

We are likewise much more affected both morally and financially by what is done even in remote parts of the earth, than ever before. To be a successful cabbage grower in Florida, the horticulturist must know the extent of the Nova Scotia crop, the extent of the Danish crop, and the extent of the German crop, and of course must have full information as to the extent of the cabbage product of the whole United States. This is one illustration of the many that might be cited.

We are today vitally affected in citrus growing by the output from distant parts of the world. We look upon California as our competitor, and one with whom we have to reckon. Too many of us, however, forget that Arizona, Mexico, Texas, Jamaica, Porto Rico, and the Mediterranean region are also competitors. While we have developed the art of producing citrus fruit to such an extent that, with the aid of the tariff, we need not fear the introduction of fruit from the Mediterranean growers, we still find them competitors when we wish to ship fruit to Europe, to Canada, or to other places outside the United States. I might mention that our nursery men are finding Japanese nurseries competing seriously for the market of citrus trees.

As pineapple growers in Florida, we consider Cuba and Porto Rico as our strong competitors, and think of them as being alone in the field. This, however, is not entirely correct. Hawaii ships a large amount of fruit to the Pacific Coast States. The Malayan Peninsula competes strenuously for the market in canned pineapples. Yet the Malayan Peninsula is located on the other side of the world.

The Florida potato grower must take into consideration the crop that is produced in practically all of the United States, and Europe, and the competition of Bermuda. Nearly ten years ago the overproduction of the crop for the fancy market resulted in two very bad years for the Florida potato growers. Since that time the demand has grown rapidly, and now it appears as though it would be almost impossible to produce enough potatoes to satisfy the market. But this is only apparent, since the production of only a few carloads more than the market will quickly absorb would result in a serious slump of prices. I found, for example, that the Hastings market was around $3.00 f. o. b. per barrel, and the Chicago market was 25 cents per bushel. The Chicago buyers were buying Florida potatoes because they had a fancy market. I might illustrate with the avocado crop. We can sell a certain amount of avocados in the market at quite a fancy figure. It really does not make much difference what we charge. The higher the price the more people seem to be anxious to get them, but if we have half a crate more than the market demands, that extra half crate will not bring ten cents. As it is, we have learned not to over supply the avocado market, but keep the supply just even with the demand.

The younger generation of us will have to compete strenuously with the fruit output of South America and Africa. Already these countries are sending their product into the markets of Europe, and thereby curtailing the source of consumption for our products. The United States has already seriously felt the inroads in the European market made by the Australian meats and other animal products. Argentina now stands second in the acreage of corn. The report for 1908 gives her nearly seven million acres. Capital from the United States is flowing in a torrent into Mexico. A few years ago the United States consul at Mexico City told me that there was upwards of $500,000,000 of United States capital invested in Mexico. Most of this, however, was going to develop the mines, though agriculture was following rapidly in the amount of United States capital that was being absorbed. Large areas in Mexico have been and are being planted to citrus fruits. By tariff legislation it may be possible to keep these fruits out of the markets of the United States, but such an artificial barrier cannot keep them from going into Canada and other places where our fruits now find a good market. In certain sections of Central America large areas are being planted to citrus orchards, and it is purely a question of developing transportation facilities to bring these into active competition with our fruits. The transportation facilities are being rapidly developed, and will be greatly stimulated as the time for the opening of the Panama canal approaches. (Of course we raise a superior article, but to millions of consumers an orange is an orange and nothing more.)

All of this brings us face to face with the fact that we are only a small part of the world movement. A moment ago I called your attention to the fact that in the past these upward movements took place in isolated centers. By means of our literature we have annihilated the past, and by means of electricity we are annihilating distance. Now, in the place of progressive movement being localized, it is present in all nations. Even static Turkey and Persia are being affected by the educational movement of today. The leaders in scientific thought today must know what the results are of the investigations in other laboratories, whether located at Ceylon, Tokyo, San Francisco, Chicago, New York, Edinburgh, Berlin, St. Petersburg, or any other place on the globe. Should Dr Koch make an important discovery in connection with the sleeping sickness of interior Africa, on the next day all the newspapers around the earth would announce the fact. While the earth is no smaller than it was ten thousand years ago, man's power over matter has increased so immeasurably that he is in reality brought into daily and almost hourly connection with even the remotest portions of the world.

At first it might seem as though this was a long distance from citrus growing. To understand our present situation, however, it is of the highest importance for us to understand the world movements. We are in such immediate communication with all of our competitors, and our competitors are in so close touch with us, that unless we understand the whole situation and take advantage of the opportunities as they occur, we shall be hopelessly outclassed in the competition. The serious question with us today is, what are *we doing* and are we doing all we can to better our conditions, to increase our power of producing crops and to reduce the cost of production of the same. We all know that the cost of production has increased greatly in the last fifteen years. Fertilizers have increased in cost, labor nearly doubled in price, transportation has been but slightly reduced, and the purchasing power of the money we receive in return for our products has decreased nearly 50 per cent. We are in a decade of high prices but cheap money.

We are now face to face with a situation that demands the most earnest and energetic study of our problems, both from a technical and a practical standpoint.

INCREASE OF POPULATION.

Florida was the first place in what are now the United States to receive colonists from Europe. For various reasons that need not be enumerated at this time, the development of Florida has been extremely slow. At the present time our area is probably the most sparsely settled of any State east of the Mississippi. Various causes have contributed to bring this about. We are now, however, receiving immigrants from almost all parts of the United States, the main reason for this being the fact that good, available farm lands in other parts of the United States have been practically all taken up. The last West has been conquered. Consequently the pioneers who have no more West in which to locate, must turn in another direction to secure cheap and suitable lands. A large number of the people from the overcrowded sections of the Middle West and West, are pouring into the immense unsettled portions of the Northwest Territory of Canada. Enough of our citizens have already moved across the border to make a population equal to that contained in Florida. In other words, the United States has already contributed at least one State to the development of Canada. Many of our citizens are not satisfied, however, to leave the protection of the flag under which they were born and raised, but prefer to seek employment and a livelihood even in far-off Florida, which has been represented to them as a place where it is almost impossible to live. This movement and unrest has its basis in some fundamental condition. The fundamental condition that is confronting these people is the same one that we have to meet here. The population of the United States is now increasing at the rate of a million a year. At first thought this would appear to be very encouraging, since it means a million people more every year to eat oranges; but oranges are not absolute necessities, and bread comes first. With this more fierce struggle for subsistence comes a corresponding decrease in opportunity for buying those things that are absolutely necessary.

EDUCATIONAL MOVEMENT IN FLORIDA.

We are vitally interested today in knowing what factors are at work for the improvement of Florida conditions. We must improve our conditions, or be left far behind in this world-wide movement. If our methods of handling our citrus groves are not better next year than they are this year, we will find ourselves hopelessly outclassed by this severe and serious competition. In our democratic form of government, we cannot expect a dictator to arise and drive us forward to proper handling and to proper thinking. The upward movement must be through the upward movement of at least a large proportion of the agricultural people. Our leaders may legislate and prescribe laws for our guidance, but unless these laws receive an intelligent support, they will be practically dead letters on the statute books. This may be strikingly illustrated by the laws on our statute books pertaining to the organization of a county horticultural commission. These commissions when properly organized have all the power necessary to carry out any reasonable line of work in any county. Yet so far as we know, not a single county has taken effective advantage of this law.

AGRICULTURE IN RURAL SCHOOLS.

Some lines of work are being carried out which will in time give us much better agricultural and horticultural conditions in the State. One of these movements is the teaching of the basic principles of agriculture and horticulture in all the rural schools of the State. Naturally, the introduction of agriculture has met with the same opposition that the introduction of grammar and physiology met with in our common school curriculum. It is no more likely that the teaching of agriculture from an elementary text-book in the country school will make a trained agriculturist, than that the teaching of grammar in the country school would produce a finished poet or prose writer, or that the teaching of physiology in country schools would produce an accomplished family physician. The teaching of the grammar has, however, added immensely to the accuracy of speaking and writing English; and the study of physiology has done much toward preserving health and discounting quackery.

CORN INSTITUTES.

Institutes for young people have been held in a number of the counties of the State this year. This brings practical farming education to the youth who will soon be the bread earner. To enumerate all of these would require more time than would seem practicable in a short speech today. In Alachua county, as an illustration, we held to March 26th, 14 of these institutes, with a total attendance of 955 persons. (Since the above summary was made, several more institutes have been held, carrying the total number over a thousand.) Of this 955 above mentioned, 626 were school pupils, 189 were men, and 140 women. This shows a lively interest in agricultural education in the State. Not only do the young people attend, but interest in the work is aroused among the older people. At these institutes the lectures of the day were introductory to the final object. The object of the lecturers was to instruct the pupils in agricultural work and at the same time distribute packages of selected seed corn. This corn was intended for planting by the pupils, and in the fall contests for the best corn produced will be held, and later there will be a contest in corn judging.

FARMERS' INSTITUTES PROPER.

The Farmers' Institute work during the present fiscal year has been carried on rather more vigorously than in any previous year. Up to May 8, we had held 114 sessions, scattered from Pensacola on the west, to Miami on the south. We have not visited every county in the State, from the fact that certain counties are more wide awake than others, and as a rule, those which make their wants known are the ones which are likely to have them supplied. The total attendance on these institutes will run somewhere in the neighborhood of seven thousand. In this connection I may say that the farmers of the State are probably more active and more insistent than the fruit growers. The citrus section which was formerly the progressive section has now become conservative and the farming section progressive.

COUNTY FAIRS.

County fairs are being held in many different counties of the State. They are not always known under the name of fairs, though in substance they amount to the same thing. Santa Rosa, Walton, Washington, Holmes, Jackson, Gadsden, Leon, Jefferson, Madison, Suwanee, Marion, Polk and Dade are all confidently looking forward to an exhibition of agricultural and horticultural products next fall and winter. A number of these counties held fairs last year, and in almost all cases the institution was a financial success. From an educational standpoint they were much more successful, however, than from a financial standpoint. The total attendance upon these institutions would amount to hundreds of thousands. These gatherings are very important from the fact that they bring the city more closely in touch with the country.

THE INTERSTATE FAIR.

During November of this year will be held the interstate fair at Pensacola. A dozen or fourteen counties of Florida and Alabama will be represented. At the interstate fair there will be offered a silver cup trophy for the corn-judging contest and other prizes of magnitude.

THE UNIVERSITY OF FLORIDA.

The county and State fairs are potent factors in the upbuilding of the agricultural and horticultural interests of the State. They come more, however, as an expression of the existing conditions than as a direct effort toward the formulation and carrying forward of definite ideals. This work of leadership and presenting of ideals is to a large extent the mission of the University of Florida. Necessarily this institution, since it belongs to the people, must adapt itself to the conditions as they are found. It would be a practical folly to attempt to copy or model our institution after that existing in any other State whose conditions were entirely different from those found in Florida. Consequently, this institution must blaze its own way. While the experience in other states will be of much service, it can only be used in the way of suggestions.

THE CORRESPONDENCE COURSE.

To carry out the ideals of progressive educational work, the University has offered a course of agriculture by correspondence. This has proven to be extremely popular. Last year the registration in the course was over 400. This year the registration is about 600, and nine different courses were offered in place of the one that was offered last year. It is intended to continue to offer these correspondence courses.

THE CITRUS SEMINAR.

As an expression of the fact that the institution is attempting to meet the needs of the State, we may cite the case of the Citrus Seminar. This gathering was held, not with a view of giving information of an elementary character in connection with citrus culture, but to present the latest scientific discoveries in connection with this great industry. As the name indicates, no attempt was made to make this Citrus Seminar in any way a formal matter. The lectures were delivered in an informal way, and constant questions and interruptions were invited. The speakers for the most part were from the experiment station staff. The citrus growers themselves, however, aided very greatly in making the effort a thorough success, in that certain of them volunteered to give short talks on specific subjects about which they knew probably more than anyone else. The character of the work of the Seminar was such as would have made it of little value to one who was not thoroughly versed in practical citrus culture. The average attendance on the meetings was 34.7 per session. Twenty-eight persons directly interested in citrus growing in Florida attended the meetings.

CONCLUSION.

The conditions under which we find ourselves existing today are very different from those that have been experienced heretofore. We are in the midst of a world wide movement,—educational, financial, scientific, and political. If its effects are worldwide, competition is likewise worldwide. Our sources of information are not limited only by the climate in which citrus fruits will grow. We must know what is happening in every land, not only of the citrus-growing regions, but of the agricultural regions as well. We are more and more interdependent than ever before. As our problems of production are being solved, our problems of distribution become more severe. Your attention has already been called to the fact that the prices received for our fruit at the present time are not as great as they were fifteen years ago, and yet the purchasing power of the dollar which we receive for our fruit has fallen very materially. It therefore becomes more and more necessary to curtail the expenses of production, to insure perfect and prompt delivery, and in every manner possible provide for a saving of the waste product. Every tree in the grove must be made to do its full share of work, and all deadbeats ruthlessly destroyed. We must by earnest study learn to take advantage of every particle of useful information that can be obtained.

We are here this week to test theories; and if they are not in accord with fact, to have them brushed ruthlessly away as chaff. We are here to be helpful to one another, that we may be the better able to see our own way clearly.

DISCUSSION.

Prof. Hume: I believe I voice the sentiment of those who are best informed in the matter when I say that never in the history of the State has there been a time when the Experiment Station of the University is so nearly filling the place that it should fill in the State. This Citrus Seminar was one of the most interesting meetings I have ever seen in the State of Florida, and while I do not know that it is the intention to make it an annual affair, I sincerely hope it is, and I am sure anyone would be much benefited by taking advantage of the opportunity that is offered them.

It is a strange thing to me that the mere act of putting a man on the program is to ensure his staying away. If we were at all superstitious, we would say that putting a man on the program is a sure sign that he won't be at the meeting. However, on the subject "Methods of Handling Citrus Groves" we are luckier than usual, for we have two members on the committee present, Mr. Williams and Mr. Thompson.

New Types of Citrus Fruits for Florida

Walter T. Swingle.

Mr. President, Ladies and Gentlemen:

I had the pleasure of presenting to the members of this society at the meeting at Daytona last year some of the results of the recent work in the breeding of new types of citrus fruits. I spent the months from March to June last spring in Florida making hybrids with a view to securing new types of citrus fruits, some of which I shall discuss in this paper.

The work heretofore done in connection with the breeding of hardy citrus fruits has not been of a character to interest directly the orange growers of central and southern peninsular Florida. The hybrids between the *trifoliata* and the common orange (citranges, as we call them) are not of a type likely to prove a success for commercial culture, although excellent for home use throughout the cotton states, and are of comparatively little interest in regions where oranges, lemons and limes can be grown.

I have had the feeling that many of my Florida friends, although somewhat interested in the work, have considered that it did not directly concern them. I believe that the results which I shall discuss today will convince you that there is a side of this work which has a direct personal interest to every orange grower in Florida.

THREE-QUARTER HYBRIDS.

Last year I showed the members of this society photographs of some of the hybrids obtained by Mr. E. M. Savage the year before by crossing the citrange back with one of its parents, thereby securing hybrids containing 3-4 orange and 1-4 *trifoliata.* These citrangors, as we call them, show considerable variation, some having distinctly trifoliate and others entire leaves like the orange. The studies made during the past year have convinced me that the pollen grains of the citrange have a great range of diversity; some being practically of the orange type and others partly *trifoliata,* consequently the Citrangors show almost every type from half-blood orange to trifoliate and from citrange to practically pure orange, showing only minute traces of trifoliate blood. It is obvious that in this way we secure hybrids showing all variations of *trifoliata* blood and there can be but little doubt that a slight touch of the *trifoliata* would be likely to add an agreeable zest to the fruit and besides give additional hardiness to the tree. I have secured photographs of three or four of the more diverse types of Citrangors so that members can see something of the extent of variation in this type of hybrid.

SECOND GENERATION CITRANGES.

When the citranges (*trifoliata* by common orange) were first made it was not expected that the first generation hybrids grown from seed secured by such cross pollination would be of any value, while it was confidently expected that the second generation hybrids grown from seeds of the citranges themselves would show occasional combinations of the qualities of the two parents which would make them valuable. The unexpected is said always to happen, however, and it certainly did in this case. Many of the first generation citranges proved distinctly of value for home use in the Cotton States. Some of them were nearly seedless so that it was difficult to try the experiment of securing second generation seedlings. Others, however, seeded very freely and upon growing the seedlings they were seen to be monotonously uniform, reproducing almost exactly the parental type.

Among the 14 or 15 citranges now in fruit, 2 have been found that occasionally give rise to true second generation hybrids, and 2 more the seeds from which all give rise to second generation hybrids. These citranges, it is true, are not among the best varieties, but one of them is of fair quality and the other is of large size and handsome appearance though of unusually bitter flavor. The seedlings of these citranges show the most extraordinary diversity, ranging all the way from practically pure orange to practically pure *trifoliata,* with every conceivable intermediate stage. It is almost impossible to find duplicates among the scores of plants now under observation. They show much the same variation as the Citrangors already referred to but have vastly wider range, the Citrangors having as their two extremes the citrange on one side and the orange on the other, while the second generation seedlings range from orange to trifoliate, a much wider field. Then, too, the second generation seedlings are secured without any further trouble than the mere planting of the citrange seeds; all that is necessary is to propagate the two varieties of citrange mentioned and then plant the seed. In this way a wealth of new citrus fruits can be obtained and, what is of interest to the Florida citrus growers, many of these new fruits approach the orange very closely in character of leaf and in growth and will doubtless bear fruits distinctly of the orange type although at least some of them may be expected to show something of the hardiness of the *trifoliata* in the tree and perhaps some of the earliness of this parent in the ripening of the fruit. Photographs are attached showing something of the amount of variation seen among the seedlings of these two varieties of citranges; also photograph showing a few older seedlings of the rustic citrange planted in the fall of 1908, and giving some idea of the appearance of these second generation citranges as they get older.

It should be stated, in this connection, that long experience has shown conclusively that much can be judged as to the character of the fruit of a citrus plant from the appearance of the leaves. Of course, the Citrangors and these second generation seedlings will be forced into fruit as soon as possible, and I hope within a couple of years to give the first actual demonstration of the truth of what is here announced.

COMPLEX CITRUS HYBRIDS.

Besides the two classes of citrus hybrids mentioned above there is a third containing a small proportion of *trifoliata* blood, which is likely to be of decided interest in Florida. These hybrids have been secured by crossing citranges with other citrus fruits not entering into the parentage of the original hybrid; that is, citranges have been crossed with the grapefruit on one hand, with the hope of securing new types of citrus fruits suitable to be eaten from the hand but still having some of the hardiness of the *trifoliata*; and with the kumquat on the other hand in the hope of securing hardy forms of acid fruits suitable for making ade. The kumquat has one important type of hardiness, ability to resist spells of hot weather in winter without starting into growth; while the *trifoliata* is able to withstand very severe cold when in a completely dormant condition.

VIGOR OF GROWTH OF CITRUS HYBRIDS REMARKABLE.

An interesting thing has developed in connection with these hybrids: Citranges are more vigorous than either the orange or the trifoliate parent, often growing as rapidly as the combined growth of both parents. The Citrangors and second generation citranges do not show this excessive vigor, most of them being about as vigorous as the parent they most resemble; that is, second generation citranges that look like oranges grow about as rapidly as the orange.

When citranges are crossed with a third species, especially if it is very different, such as the grapefruit or kumquat, then the hybrids which really represent a commingling of three species, show extraordinary vigor, in some cases nearly equaling in growth the combined growth of all three parents. For example: A kumquat flower crossed June 6, 1909, with pollen of the Rusk citrange, the fruit being picked the latter part of October, 1909. The seeds were planted in the greenhouse of the Department of Agriculture on October 28th, sprouted within a week and in six weeks the young plants were strong enough to be inarched on two-year-old grapefruit stock. From the moment these seedlings appeared above the ground they have not ceased growing and are now from 2 1-2 to 3 feet high, as large as most citrus seedlings two years old, although they are barely six months old from the time of germination.

Some of the hybrids made between the citrange and the Satsuma show something of this unusual vigor, which is to be expected since the Satsuma is rather different from any of the other citrus fruits.

At any rate, here we find a method of securing extraordinarily vigorous hybrids combining the qualities of three parental species.

It should be stated, as mentioned in connection with the Citrangors, that the pollen of the citrange shows a wide range of character. If crossed on the grapefruit, for example, some of the plants look much as if they were crosses between the orange and the grapefruit, while others are much like crosses between the trifoliate and grapefruit, with all conceivable intermediates. The same is true of the kumquat and Satsuma crosses.

In order to secure the great energy of growth just referred to it is necessary that a distinctly different species of citrus fruit be used in the cross. If asked if it is possible to go a step farther in this, the answer is that this depends upon our ability to find still more diverse types of citrus fruits than we now have. This I am glad to say has been done. Within the past year the investigations conducted by the Department of Agriculture has brought to light the existence of at least two or three entirely unsuspected types of citrus fruits. One is a hardy kumquat growing in the deserts of Australia and able to stand temperatures but slightly above zero. It bears small, edible fruits of the type of the round kumquat. As we have found the kumquat to be extremely useful in complex hybrids there is much to be expected from this desert kumquat.

A giant kumquat, or at least a species of fruit more closely allied to the kumquat than anything else we know of, has been found to grow in Burma, the Malayan Archipelago and the Andaman Islands. This tree grows to a height of from 25-30 feet and bears a fruit from 1 1-2 to 2 inches in diameter.

There has also been brought to light in tropical Africa a whole group of edible citrus fruits of a new type. The trees have compound leaves with from three to seven leaflets. The leaves themselves are of gigantic size, sometimes 1 1-2 feet long and 1 foot wide, the individual leaflets being much larger than any ordinary citrus leaf. The fruits are small but sweet and of good flavor.

Here, then, are three new types of citrus fruits which, when secured, can be used in complex hybrids with strong probability of securing great vigor among their descendants. The kumquat, though a dwarf plant, has yielded extraordinarily vigorous seedlings when crossed with the citrange—very much more vigorous than would be secured by crossing the citrange with even the largest and most vigorous type of orange.

TANGELOS.

One of the first crosses made by the writer some twelve years ago was that between the tangerine orange and the grapefruit. This was a lucky strike since it gave rise to the Sampson Tangelo which represents another valuable new type of citrus fruit. When oranges of the loose skin type are crossed with grapefruit the hybrids often produce fruits almost entirely destitute of the bitterness of the grapefruit but still containing much of the agreeable sprightliness of the latter. Some of the Tangelos are thin-skinned and almost all are of good flavor.

In this connection, the experience of Mr. A. Aaronsohn, Director of the Jewish Agricultural Experiment Station at Haifa, Palestine, is of interest. Himself a grower of the Jaffa orange and coming to this country unfamiliar with the grapefruit, he told me that after becoming accustomed to the latter he had practically lost his taste for the orange which seemed insipid after once he had tasted the delicious sprightliness of the grapefruit.

Experiences of this nature make it seem probable that the Tangelos will be found to be the orange of the future. It should be said that they are much more like a good sweet orange than anything else but are distinctly different in having more zest and sprightliness. Very few people, seeing a good tangelo for the first time, would guess correctly its parentage. In view of the great promise of this hybrid a large number of crosses have been made between all available types of kid glove oranges and the best of our grapefruits. Hybrids are also being made with the Chinese grapefruit which, although it is thick-skinned and less handsome than our own, has in the opinion of some persons a distinctly better flavor.

Certain comparatively unknown small hardy oranges of the Satsuma (kid glove) type from Japan are also being used in these crosses, since it has been found that small-fruited parents do not necessarily make small-fruited hybrids. This Tangelo breeding is, perhaps, the most promising field of all from the standpoint of the Florida orange grower.

BREEDING GRAPEFRUITS.

The grapefruit is perhaps the greatest of the Florida fruits, but as everybody knows it has by no means reached the high state of perfection attained by the orange. Most varieties are very seedy, and even if not, have some drawback or other. There is every reason to believe that radical improvements will be made in the grapefruit when once its breeding is taken up in a systematic manner.

Mr. David G. Fairchild of the U. S. Department of Agriculture, has given much attention to the securing of new types of grapefruit from all parts of the Old World, particularly from China, Siam and India. Many of these varieties are now fruiting, and although most of them are distinctly inferior to our own grapefruit, some possess certain desirable qualities. It is believed that the hybridizing of these with our own grapefruit will be likely to yield extremely valuable new varieties. At the same time crosses are being made with the *trifoliata* in the hope of securing second generation *trifoliata*-grapefruit crosses resembling the grapefruit in general characters but partaking somewhat of the hardiness of the *trifoliata*. Such hybrids would very likely be less seedy than the fullblood grapefruit.

TESTING NEW STOCKS FOR CITRUS FRUITS.

A botanical survey has been made of the relatives of the Genus *Citrus*. Some 80 species of plants, belonging to 19 different genera, may be considered as close relatives of our common citrus fruits. These for the most part are closely enough related so that they can be grafted on each other, while many of them are so closely related that it will be possible to hybridize them with each other and with our ordinary citrus fruits.

Some of these are so unlike the orange that hybrids would not be of any value for their fruits even if they could be crossed successfully. Some, however, are very vigorous growing trees and have been found (at least in the greenhouse here) to be the best stocks upon which to graft our common citrus fruits.

Inasmuch as the orange blight is now strongly suspected to be a root disease, it is my hope that some of these very diverse types may prove resistant to the blight and at the same time be excellent stocks in every other respect. The accompanying photographs show all the ordinary citrus fruits growing on a remarkable citrus relative from the Philippines—the Tabog or Philippine Baelfruit. This has trifoliate leaves and bears a hard shelled fruit, utterly unlike the orange in that it is filled with a very aromatic and juicy pulp and has seed chambers filled with gum. Nevertheless, as can be seen from the photographs, this promises to be a most excellent stock and is among the most rapid growing of all the many citrus relatives that we have tested in our greenhouse.

TESTING OUT NEW CITRUS HYBRIDS IN FLORIDA.

In order to successfully carry on the work outlined above it will be necessary to have the co-operation of Florida citrus growers in the testing out of these new fruits. It is out of the question for the Department of Agriculture to establish and maintain orange groves over a sufficiently wide range of soil and climate to give them a fair test. All we can do is to make the hybrids, propagate them and distribute budwood to co-operators who are willing to test out these promising new fruits.

I take this opportunity of requesting all Florida orange growers who are interested in the trial of such new fruits to communicate with me, care of U. S. Department of Agriculture at Washington, D. C.

In this way the work will be carried on in the most efficient manner. The making of hybrids will be largely done by experts who have acquired great skill in the work; the propagation will be undertaken by other experts who, thanks to the greenhouse facilities at Washington, can push such seedlings much more rapidly than is possible out of doors in Florida; while the testing of the fruits will be put in the hands of expert growers who are best able to look after this phase of the work.

DISCUSSION.

Mr. Thompson: How many of the growers have gotten these citranges and what has been the result from their growth?

I would say that I secured four from the government and we planted them as we did the ordinary stock, and results have been far from satisfactory. They have not made a very good growth. The soil is the same as for trees that have outstripped them four times.

Mr. Skinner: I received some citranges, and the Sampson Tangelo has done very well. The trees look thrifty, but have not made as much growth as our trees generally make, but they seem to be doing fairly well and have a good, thrifty appearance. However, the soil is very poor high pine land.

Dr. Inman: I received from the Agricultural Department some years ago, ten hybrids. They are of the grapefruit family, but what they are hybridized with, I cannot say nor have I had report from the Agricultural Department. Prof. Galloway, visiting Winter Haven, was very favorably impressed with the fruit from these trees. One tree is full of fruit that has changed but very little. We expect it to carry its fruit until late in July this season.

Mr. Temple: I understood the gentleman to ask what experience any of the growers had had with the trifoliate base on high pine land. If that was the question, I have had some experience with it and am perfectly willing to give it to you.

About six years ago, I bought one thousand buds of trifoliata stock—kumquats, grapefruit, King oranges and half a dozen other. While the King did fairly well, the kumquats did exceptionally well, but above all things the successful one was the grapefruit. I have over 200 grapefruit trees on trifoliata stock that we set out close together because we were given to understand that they would not make very large trees. I have already had to take out every other tree, and will have to take out every other tree again.

Last year, which was five years from the planting of these buds, we picked and marketed four and one-half boxes of grapefruit to the tree from every one of the grapefruit budded on trifoliata.

Prof. Hume: I think we must concede that Prof. Swingle is bound to win out. Some of us have had our doubts about it, but I must say that I believe if he lives long enough and works hard enough, he is going to succeed. Those of us who know Prof. Swingle, are sure that he will work hard enough, and we all hope he will live long enough to bring about this result—and then some.

I believe one of these days he will present us with an orange tree that will stand temperatures we have not dreamed of.

Dr. Inman: I would like to ask Mr. Temple how his trees have withstood the recent cold we have had.

Mr. Temple: Not only the recent cold does not seem to have affected that grapefruit, either the tree or the fruit, any more than it has the orange trees on the place, but in truth the trifoliata grapefruit shows less effect from the frost than the grapefruit we have there which were seedlings, or budded on the lemon or sour stock.

Mr. ——: What soil is it?

Mr. Temple: What you would call high hammock—that is, pine with some oak growth interspersed through it.

PLATE I.

1. Orange-like Plant.

2. Orange-like Plant With Narrow Leaves and Long Petioles.

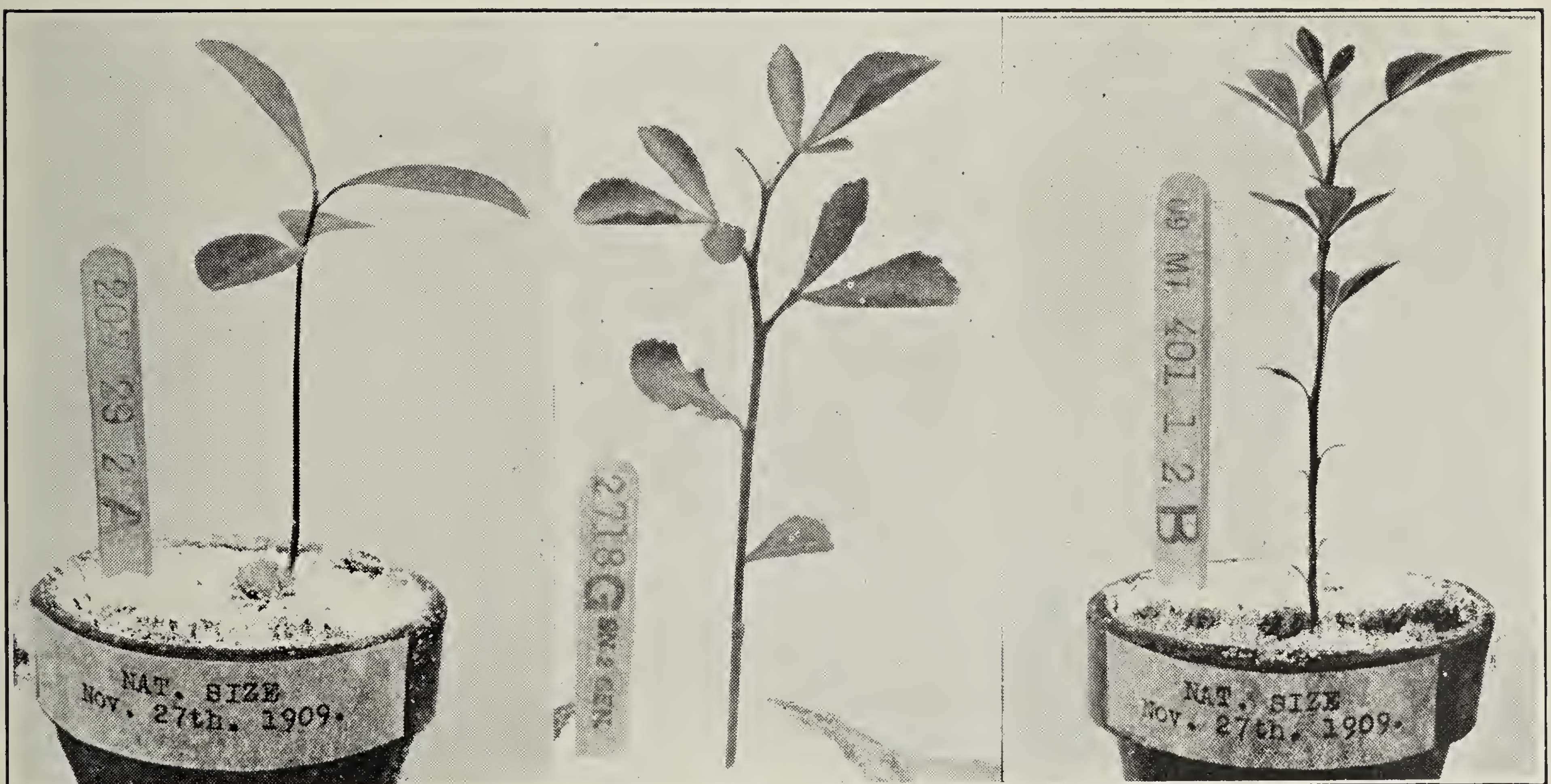
3. Citrangor-like Plant, Showing Small Side Leaflets.

PLATE II.

4. Broad Leaved Citrange-like Plant.

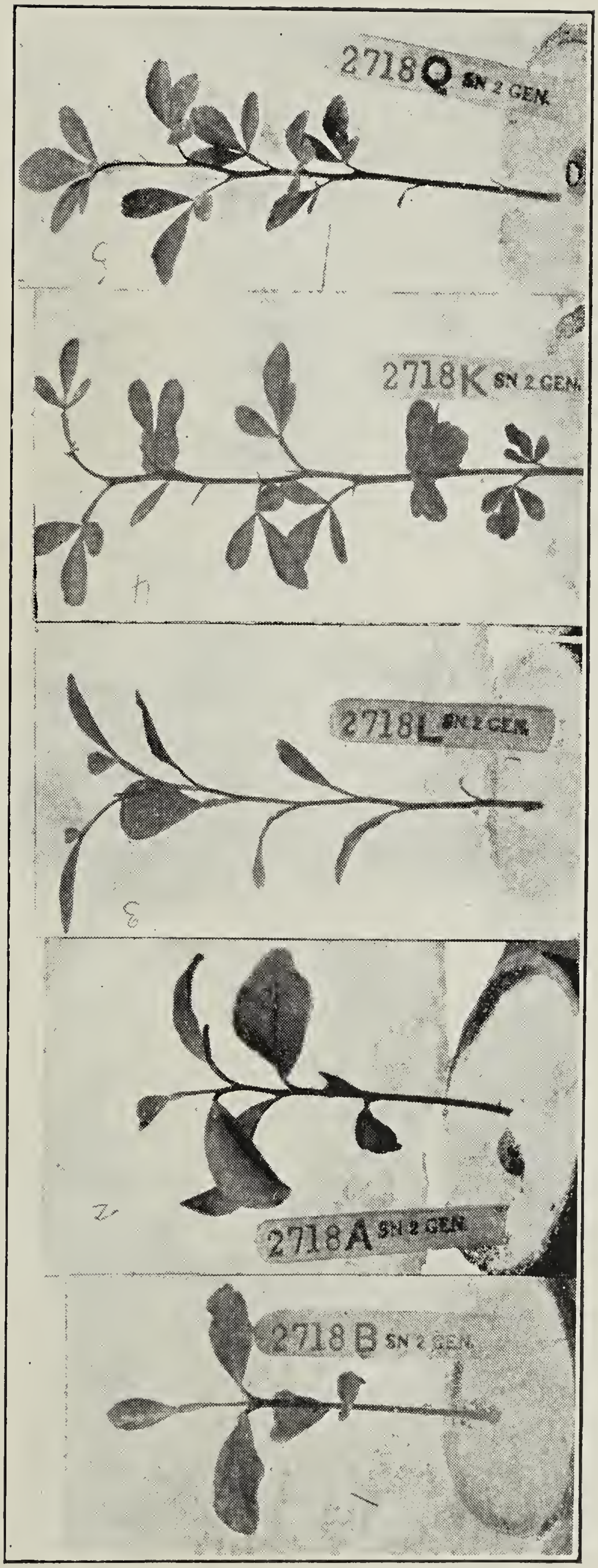
5. Normal Rustic Seedling, Showing Parent Type of Foliage.

PLATE III.



Showing Variation in Second Generation Citranges. (1) Seedling Orange; (2) Seedling Trifoliatas; (3) Seedling Citrange, Intermediate Type, About Like the Parent Citrange.

PLATE IV.



Figs. 1-5 Show Second Generation Citranges, Varying From Orange-like to Trifoliata-like.

Six-Months-Old Seedling Citrangequats. Obtained by crossing the Oval Kumquat With the Rusk Citrange; Plant Inarched on Two-Year-Old Grapefruit Stock When about 6 Weeks Old. Photograph Taken Six Months From Time Seed Was Planted.

PLATE VI.

Various Citrus Fruits Grafted on the Tabog. Beginning on the left—Trifoliata, Oval Kumquat, Calamondin (To-Kumquat), Washington Navel, Lemon, Mexican Lime. To the Extreme Right Ungrafted Plant of the Tabog. One-quarter Natural Size.

PLATE VII.

Fig. 14. Citrangors Produced by Mr. E. M. Savage at Glen St. Mary, Florida in the Spring of 1908 by Crossing Citrange No. 746 (See Plate 7) With Pollen Taken from a St. Michael Orange Tree. Some of the Seedlings Are Simply False Hybrids; Others Show Leaves Almost Exactly Like Those of the Common Orange Although They Certainly Contain One-Quarter Trifoliate Orange Blood and Will Probably Prove Hardier Than Any Existing Varieties of the Orange.

PLATE VIII.

Tabog (Philippine Bael Fruit), a Very Promising Stock. One-Half Natural Size.

Fig. 16. Citrangor (3-4 Common Orange, 1-4 Trifoliate) Obtained by E. M. Savage in 1908 by Crossing Citrange No. 75 With Parson Brown Orange. Next to Top Leaf on Right Shows Trifoliate Influence. Note the Orange-like Leaves.

Causes of Decay of Florida Oranges in Transit to Market

A Review of the Work of the U. S. Department of Agriculture in Florida 1907-1910.

A. V. Stubenrauch.

In Charge of Fruit Transportation and Storage Investigations, U. S. Department of Agriculture.

Mr. President, Ladies and Gentlemen:

I regret that my former associate, Mr. Lloyd S. Tenny, is not able to attend this meeting and give an account of the investigations of the causes of decay of oranges in transit from Florida. Mr. Tenny had charge of this work since it was started four years ago, and is fully conversant with every part of it. He it was who planned the experiments and demonstrations and it is largely due to his efforts that the work owes its progress. I am not as familiar with the work of the Bureau of Plant Industry in Florida as was Mr. Tenny. I have therefore to rely upon the data and information accumulated by others, and this paper, then, will have to be mostly in the nature of a review of what has been done and an account of what is planned for the future.

The citrus transportation investigations of the Bureau of Plant Industry were begun seven years ago in California. For some time prior to that time the orange growers of California urged the bureau to begin an investigation of the causes of the decay of their fruit in transit. It was estimated that an average of 5 per cent. of the entire crop shipped out decayed en route, thus entailing an enormous loss to the growers. The progress and results of these California investigations are perhaps familiar to most of the members of the Florida Society. The work was published as Bulletin No. 123 of the Bureau of Plant Industry.

The success of the California investigations led to requests for a similar line of work in Florida. In response to these requests Mr. Tenny was delegated to carry out the investigations in the Florida citrus districts and he and a number of associates have been at work and have given accounts of the progress of the work in papers read before the annual meetings of this society.

The ultimate aim of fruit growing is profit—to sell the crop at a profit. It follows that any investigations which have for their object the improvement of the crop must also have the dollars-and-cents end in view. The utilitarian object cannot be neglected and the improvements which may follow the investigations must be made profitable to the growers. We have endeavored in the work which has been done never to lose sight of this fact.

It is useless to raise a crop of fruit, no matter how fine it may be, unless it can be marketed or sold at a profit. This selling or marketing end of the fruit industry is a special business of itself, requiring special talents and training. Especially is this true in an industry like the citrus fruit industry which has now reached such large proportions that the marketing problems are becoming more complex every day. Fruit growers are recognizing this fact and now employ specially trained and competent managers and salesmen to attend to the selling end of the business.

The basis of all succesful marketing of fruit products is good fruit put up in attractive shape and gotten to market in sound condition. The problems of handling a fruit crop of the extent of the citrus crop are problems of wide distribution, the solution of which depends largely upon the possibility of getting the product to market in sound condition.

The fruit growers have mastered many of the problems of production. These have to deal with the various orchard practices of planting, cultivating, fertilizing, pruning, control of insect pests and fungus diseases. Most attention has been directed toward these factors in the past. But it has frequently happened that growers who do their utmost to produce fine fruit, and who succeed in producing fine fruit, nullify all these efforts by the way in which they prepare their product for market. It has not uncommonly happened that the bureau workers have observed fine fruit which the growers have spared no expense to produce, utterly ruined in its preparation for shipment, as a result of the attempt to save a few cents per box in the cost of handling it. In a general way, most fruit growers realize that fruit must be handled carefully. But few realize what careful handling really means, and still fewer appreciate or realize the amount of injury which is actually due to careless methods of handling.

Decay affects the grower in two ways:

First: Decay is a direct loss to the buyer of the fruit and is always charged to the grower. He always has to pay for it.

Second: Decay affects the market reputation of the grower's pack.

The first loss is relatively easy to calculate. It is estimated that the loss to the California growers was from 1 to 1 1-2 millions of dollars annually. The loss to the Florida growers has equaled a half or three-quarters of a million annually.

The second loss is perhaps the more important, but cannot be easily estimated.

The actual money value of the reputation of brands arriving consistently sound and in good, attractive condition cannot be stated. It means not only a premium above ordinary market prices, but a more ready sale and active demand. In times of low market conditions such brands will find sale at fair profit while those with poor reputations can hardly be given away.

At one time it was thought that a certain percentage of decay was inevitable and unavoidable. And this is true; but to a much more limited extent than was formerly recognized. Buyers take these losses into account in paying the producer for his crop, and they also take decay into account when they retail the fruit to the consumer.

The producer is affected both ways: He not only receives less for his product, but the demand is decreased and fewer people can afford to buy. Buyers can naturally pay more for sound fruit which will hold up in the market, and they do not have to charge so great a margin of profit to the consumer.

The bureau investigations were undertaken to determine the causes of decay and to make a study of the relation of handling the fruit for market to the occurrence of decay, if there is such a relation.

The cause of most of the decay is the growth of the blue mold fungus, one of the commonest forms of mold or decay. A thorough study of the behavior of the fungus on citrus fruits was made both in the laboratory and in the packing houses. What is here stated may be familiar to almost everybody present, but the point is so important that it is well worthy of repetition.

Blue mold is not a true parasite, i. e., it does not live on healthy living tissue. It lives and grows on dead tissue just as the higher plants live in the soil and draw their nourishment from it. The fungus must have dead tissue on which to start. It must have moisture and warmth. It has not the power to penetrate the sound healthy skin of fruits. The fruit as it leaves the tree is a living organism. The rind is a complete covering of living, active cells which protect the fruit from the attacks of the fungus. But let some of these cells be killed by a bruise, or a scratch, or a cut—an abrasion of any kind—the fungus spores will germinate and grow at the injured places when the proper conditions of moisture and heat are present. These conditions usually exist in the packed box of fruit.

These facts were worked out in California on a large scale in both packing houses and laboratory. Sound fruit covered with spores held in rooms where both the temperature and humidity were kept very high for two weeks showed practically no decay. Injured fruit under the same conditions always rotted.

The same principles were worked out in packed fruit and fruit in transit.

This general principle—that the blue mold has not the power to penetrate the sound healthy skin of the fruit—was the only thing in the nature of "a theory" brought into the Florida work at the start. Will the principle of the relation of handling to decay hold true in Florida as it did in California? There were no previous theories other than this, and the workers set out to ascertain the actual facts by careful investigation and experiments. A close study of the conditions of handling oranges from the tree to the packing house, into the box and then through to the markets was made. A large amount of data have been accumulated. Fruit from different sections, and grown under different conditions was studied and the work was extended through several seasons. All effort was made to have the work done under conditions as practical and as nearly commercial as possible. This has been no simple "laboratory" experiment.

In brief: It has been found to our full satisfaction that the general principles relating to the behavior of the blue mold and the relation of handling to the occurrence of decay are as true for Florida as they are for California. There is a definite relation between the handling of the fruit and resulting injury, and the decay caused by blue mold.

It was found further that the Florida orange is more tender and more easily injured; yet sound uninjured Florida oranges do not rot any more than sound California oranges, all conditions being the same. Conversely, injured California oranges are just as susceptible to rot as injured Floridas under like conditions.

This is a very important point and is really the crux of the whole matter. There are sufficient facts and data to prove to our full satisfaction the application of this general principle for Florida conditions.

What remains now to be done is to demonstrate the application to the Florida growers. Our work, then, in the future will be in the nature of an educational and demonstrational campaign using the data we have obtained as the basis of the work. The work of the past two seasons has been in the nature of such a campaign and next season, at least, it is planned to extend the work along these lines. The work has not been as extensive in the past as we would have liked to have it, owing to the lack of men and money. Last season the frost cut the work far short of what was originally planned.

In order to make our educational campaign effective and of real value we must have the active and hearty co-operation of all the growers. We have had excellent co-operation in the past. We need more of it. It is not sufficient to give us respectful attention or tolerance. We need active support and interest.

The application of the principles worked out are more difficult in Florida than in California. Industrial conditions are different. Weather, climate and seasonal conditions are different.

We have found the California Fruit Growers' Exchange a great help in disseminating the results of our work in California. The Florida Citrus Exchange organized this year has been of great assistance in extending and using the work and its results. More growers can be reached and with less effort than without the organization. The establishment of new packing houses with improved equipment has helped. The taking over of picking and handling to be done by gangs working under trained foremen has materially assisted in making our work more effective. This is not said with any lack of appreciation of the valuable co-operation which has been given by individuals and independent shippers and handlers, and we hope to continue to receive their active support.

I had a trip through many of the Florida citrus districts last winter. From what I saw it is apparent to me that more careful and better methods are being sought and the desire to improve handling conditions is general.

Four years ago, Tenny stated before this society that a conservative estimate placed the loss from decay of oranges in transit from Florida at from 10 to 15 per cent. We do not know what the average loss was last season. But *now we do know that by far the greater part of any such loss is preventable if care is used in the preparation of the fruit for market.*

Last season the work of gathering picking and handling data was continued. This actually became an inspection of the work being done in different groves and packing houses. In several instances the inspection of the work of particular gangs of pickers was continued throughout the season, the results being used to demonstrate the necessity of doing more careful work. In this way, also, the careful and careless workmen were discovered.

Last season's investigations also included a series of washing experiments. These were carried on to determine the effect of washing Florida oranges.

A series of shipping experiments was also started. These included a comparison of sound fruit carefully handled and packed with the same fruit handled and packed under ordinary commercial conditions. Part of each lot was packed and shipped the same day it was picked, and parts two and four days after picking.

PICKING AND HANDLING INVESTIGATIONS

This work was done at Arcadia, Bartow, Bradentown, Florence Villa, Clearwater, Largo, Dunedin, Sutherland, Palmetto, Wauchula, Winter Haven and Winter Park.

The first year of our work, 1906-7, the total average of injuries for all the fruit examined was 12.4 per cent., including clipper cuts and other types of mechanical injuries (scratches, punctures, etc.), and 6.7 per cent. long stems.

The accompanying table shows the results of these inspection records during the past four years.

Table 1.

	1906-7 P. ct.	1907-8 P. ct.	1908-9 P. ct.	1909-10 P. ct.
Clipper cuts	5.7	5.5	3.4	3.25
All other injuries	6.7	8.8	3.3	9.9
Long stems	6.7	9.2	9.3	7.3
Total injured	12.4	14.3	6.7	13.15

The averages of clipper cuts are about the same for the first two years. There was a material reduction of this type of injury during the last two years. It can be reduced still lower under actual commercial conditions.

There was a material increase in the percentage of mechanical injuries other than clipper cuts found during 1909-10. It is probable that this figure is too high to represent average conditions of the entire State. Owing to the cold weather the data are not as complete as we would like to have them. The figures show, however, that there is room for much improvement before the standard found possible under large commercial conditions is reached.

The table shows a high percentage of long stems. It is important that this percentage be materially reduced. A prominent grower of California has said that he fears long stems more than clipper cuts. "A clipper cut orange," said he, "is finished and the injury is only to itself, but a long stem is like a murderer turned loose." One long stemmed orange may injure several others in the course of handling and packing.

Is it possible to handle oranges carefully enough on a commercial scale to eliminate injury? I find that there was considerable discussion on this point after the reading of Mr. Tenny's first paper before this society. Many of the growers seemed to doubt that it would be practicable under Florida conditions to handle without injury. The best answer to the question is the fact that it is being done, not only in California, but in Florida also.

The accompanying table shows the records obtained last season in different packing houses.

Table II. Percentages of Clipper Cut Oranges and Long Stems in Different Packing Houses, 1909-10.

		Clipper Cuts Per cent.	Other Injuries Per cent.	Long Stems Per cent.
General average		3.25	9.9	7.3
Houses separately	1.	1.1	...	1.0
	2.	2.7	6.6	2.7
	3.	4.2	1.1	3.5
	4.	4.5	...	4.2
	5.	5.0	7.4	3.6
	6.	5.0	...	4.3
	7.	4.8	2.0	7.4
	8.	1.3	...	8.7
	9.	3.9	...	2.0
	10.	4.0	...	19.2

The figures show a very wide range. Some are very low and below the average. The range is from 1 per cent. clipper cuts to 5 per cent. The range of long stem percentages is still greater running from 1 per cent to 19 per cent. In two instances both the clipper cut and long stem percentages are very low, showing very good work being done. In a number of cases, however, the reduction of clipper cutting seems to have been obtained at the expense of making long stems. This must be avoided. In California the rule of making two cuts to every orange not in plain sight has been adopted. This results both in the reduction of long stems and clipper cuts and also does away with the picker dropping the fruit directly from the tree into the bag or basket.

The following table shows the records of a picking gang at the beginning of the season and later after the inspections and instruction of the government workers had their effect. The table also shows the results obtained in the same district by a grower who insisted on doing his own picking and another record of fruit picked by a gang working under the box-payment plan.

Table III. Orange Picking in One Locality in Florida, 1909-10.

	Clipper cuts. Per cent.	Long stems. Per cent.
Commercial picking, before instruction, careless	5.5	4.0
Same gang as above, after instruction, careful	1.3	1.0
Picked by owner	7.0	20.0
Picking by the box	9.8	23.7

The figures hardly require explanation. They show that it is possible to get good work done. Everything depends on the foreman. The plan of inspecting each picker's work during the day's run is the one adopted to hold injuries and long stems in check. In this way the pickers who are doing rough and careless work are discovered and can be reprimanded or eliminated. The man who habitually handles roughly and cannot or will not be careful must be discharged. He is an expensive workman at any price.

Naturally, it will cost more to handle in this way. But there are ample examples to show that it pays well to do this. I am more familiar with conditions in California, but I dare say there are examples in Florida sufficient to prove this. If the saving in the fruit alone is taken into consideration, there is ample saving to pay for careful work. If we add to this the value of the reputation for soundness and holding quality on the market, the extra cost will be returned many times over. In California frequently differences of from 25 to 50 cents and even more per box above the ordinary market prices are given for brands which have a reputation for soundness. It is impossible to estimate the money value of a good reputation.

In California it has required the reorganization of the business of handling the crop in order to insure careful handling. The insistence of quality of work instead of quantity has necessitated a close supervision of the handling both in the groves and in the packing houses. More and more, associations are taking over the picking, putting in gangs working under efficient foremen. Some associations accomplish good results by having a rigid system of inspection, insisting that the grower do careful work.

With the number of new associations which are being organized in Florida, it will be possible to introduce better methods. Good work must be made the basis of the business and it will be necessary for the association to exercise close supervision and possibly control of all operations of handling the fruit from the tree to market.

WASHING EXPERIMENTS.

These experiments were made in order to determine the amount of injury and decay resulting from washing. Washing is necessary where the fruit has been blackened by smut following white fly scale. It seems to be a mistake to wash simply because it is supposed to improve the appearance of the fruit. In California our investigations demonstrated that decay bore a direct relation to the amount and character of the handling to which the fruit was subjected. As a result, all unnecessary handling was eliminated. Many houses discontinued dry brushing when it was shown that brushing might be responsible for heavy decay.

When the California work was begun, it was commonly supposed that fruit produced near the coast was weaker and had poorer carrying quality than fruit produced inland away from coastal influences. Unquestionably there was heavier decay in the coast fruit. It was found that this was not an inherent quality of the fruit itself. It was due to the extra handling necessary to put the coast fruit in condition for shipment. Washing was found to be largely responsible for the heavier decay in the coast fruit. Owing to scale, fully 90 per cent. of the coast fruit had to be washed, while little if any of the inland fruit required washing. By subjecting the inland fruit to the same conditions of washing it was shown that decay was nearly as heavy as in the coast fruit, and that if the coast fruit did not require washing it had practically as good holding quality as the inland fruit.

The result also showed that in the operation of washing considerable improvement could be made. For example, much greater decay followed washing in dirty water than when clean water was used.

There was also considerable difference resulting from the use of different machines and the speed and manner of operating the machines.

The experiments made last season in Florida were designed to show the effect following washing of Florida oranges. The chart and table show the averages of all the washing experiments made in Florida.

Table IV. Average Percentages of Blue Mold Decay Following Washing of Florida Oranges, 1909-10

Not Washed. Per cent.		Washed. Per cent.
1.2	Careful picking	4.2
2.6	Ordinary commercial picking	6.9
	Long stems	9.8

The figures show that there is an increase of decay following washing. The washed carefully picked fruit shows more decay than the not washed commercially picked fruit. There is also more increase of decay following washing of the commercially picked lots.

The high percentage of decay following the washing of long-stemmed fruit is significant. The picking data presented show that long stems are common in Florida picking. When such fruit has to be washed it is important to have both the picking and the actual washing work done as carefully as possible.

SHIPPING EXPERIMENTS.

Our shipping experiments last season were not satisfactory in that the work was seriously curtailed by the frost and the continuity of the experiments was destroyed. It is felt that the data are too meagre to justify any definite conclusions. We need much more data and it is hoped that the experiments can be extended next season.

The plan last season was to ship experimental series consisting of sound fruit handled and packed very carefully under the supervision of the bureau workers, in comparison with the same fruit picked and packed under ordinary commercial packing house conditions. Along with these, lots made up of selected injured fruit were to have been included. The plan also included the holding of the fruit after arrival to study its market holding qualities for three weeks, inspections being made on arrival and one, two and three weeks after arrival.

A study of the delay in packing and shipping was also attempted. For this, part of the lots were packed and shipped the same day they were picked, part held two days and part held four days before packing and shipping. Only a small part of this work outlined was carried out owing to the cold weather.

While the data are too meagre to be definitely conclusive, they show, (1) That the least decay follows immediate packing and shipping; (2) That there is least decay in the carefully handled fruit and most in the injured; (3) That there is less decay following delayed carefully picked fruit than delayed commercially handled or injured fruit.

Sound fruit stands the delay without serious loss, but where there are considerable amounts of injuries present, the quicker the fruit is packed and shipped the less the decay shown on arrival.

In the holding tests after arrival, the carefully handled fruit showed a very great advantage. The average of the few shipments we were able to make was 5.2 per cent. decay after three weeks holding of the carefully handled lots, while the commercial packs showed an average of 10.8 per cent. after the same length of time. The same relation is shown by the delayed lots. The carefully handled lots delayed 2 days before packing showed 5.1 per cent. after 3 weeks in market, and that delayed four days showed 7.3 per cent. after the same time.

The delayed commercial pack after three weeks showed 15 per cent. for the 2-day delay and 20.2 per cent. for the 4-day delay.

These results are consistent with the results of our California shipping work which was based on a large number of shipments. I have no doubt that similar results will follow the extension of the shipping investigations from Florida.

DISCUSSION.

Mr. Temple: May I ask the professor whether his figures of percentages of washed versus unwashed fruit are the sum total of all his washed experiments, or just a specified text? Is it not true, however, that under certain circumstances there was not only no greater decay but in some cases less decay on the washed than the unwashed fruit?

Mr. Stubenrauch: It sometimes happens, that there is practically no difference, and in some instances there is less decay in washed fruit; but it would be unsafe to infer from this, that washing prevents decay.

Mr. Temple: Now, of course, it is hard to go up against a proposition where the scientific men have carefully compiled statistics to prove their point to you. But in my experience, I am certainly led to believe that careful washing will remove some of the conditions which tend to cause decay, that may be present before washing. I do not believe that washing the fruit, when it is done as it should be, makes it more liable to decay, nor, of course, do I believe that mechanically injured fruit will not decay even if carefully washed.

It really does seem to me that there are some cases where the washing of fruit seems to remove something that causes the decay.

Mr. Stubenrauch: Please understand that I am not prepared to state positively that washing will or will not injure the fruit. I have simply described our tests and the results which have caused us to form the conclusions we have.

Mr.—I would like to ask if any success has been met with where antiseptics are used in the wash.

Mr—I tried one experiment. I washed the oranges with water in which there was a small percentage of salicylic acid. After several days the oranges were carefully examined and the decay was found to be practically zero.

Mr. Stubenrauch: We tried a number of these experiments in California, and had a man there one season working on that alone, but we did not get any results that were worth noting.

Mr. Young: Has it been found that there was any different percentage of decayed fruit caused by the different washing machines?

Mr. Stubenrauch: I have no doubt that some machines do more injury than others. It usually goes back, however, to the man who runs the machine. One man can get good work done by a machine, where another can do a whole lot of injury. The same is true of clippers. One man can take a rather undesirable pair of clippers and bring in his fruit in good condition, while another man with a much better clipper brings in his fruit in poor shape.

Mr. Porcher: I would like to ask the professor—and I do not intend to criticize his investigation—if it would not be possible to get descriptions in detail of the machines and the methods, that we may have instructions and advice that will be beneficial. I am quite positive that oranges can be washed with benefit to the fruit and the growers' pocket, but I am also aware that unless the machine is properly handled, it will do great injury.

Now, if we could have plain statements from someone who knows as to the best machines, whether sponges are used, what number of sponges, the flow of water passing through the cylinder, and such information as this, I am confident that it would be of interest and profit. We take it that the professor knows all about the proper machine for washing fruit; how it should be run and how it should be maintained. There are many machines that are perfect in their way; on the other hand, I have seen machines where there is a lack of sponges, where the lining has been ripped or torn and the fruit jammed under the lining, and the odor from one of these machines was distinctly apparent. One of the best things we can have around the place, is a man with a good smeller. He can detect lots of things that way that might otherwise go unnoticed.

Mr. Stubenrauch: You can get the information you want from the Department of Agriculture, or from some of the society members who are washing their fruit successfully.

I agree with you as to the difference in washers. I went into a number of packing houses in Florida last winter, and, as you say, there were some houses I didn't want to go into without a handkerchief over my nose. Others were being run on very satisfactory lines and were turning out fruit in fine condition.

Mr. Porcher: I had a party of friends in the house and they wanted to see my machine in operation, so they went down to the washer just as they were dressed; they were in evening dress; my wife was one of them. They finally took charge of the washer; just pinned up their skirts so that they would not trip over them, and did all the work themselves, and I don't think there was a spot or a stain on any of their dresses.

Now, along the lines of injury where water touches fruit. I took a box of fruit and dumped the contents carefully into a ditch. I wanted to try a little experiment to know just what damage it would do. The fruit remained there several days. I removed the fruit and found one orange pretty badly decayed, but that particular orange we had noticed before putting it into the water and had remarked at that time that there was a sign of blue mold on it. The fruit was washed off very carefully, and then we examined it and found it absolutely uninjured, and we packed it and marked it and shipped it, and it carried in good order. The point is that moisture does not injure fruit that has been carefully handled and is not cut or bruised.

Mr. Stubenrauch: That takes you right back to careful handling. You get a machine that is all right with a careful man to run it, and you may get the fruit washed without injury, provided care has been taken with it all along the line, but if you have a lot of injured fruit coming in from the grove and put it through the washers, you will give it ten chances to one to be made more subject to decay.

Mr. Hart: Now, take the matter of clipper cutting or long stems. Don't you find a marked difference between different varieties of oranges in regard to that? Take the pineapple orange; there is no need of anyone clipper cutting a pineapple orange or of getting long stems.

In California, I noticed that the stem of the orange is in more of a pit; the orange is rough around the calyx and is very subject to clipper cutting, making it much more difficult to clip the stems close; therefore they do double clipping. The more careful growers and shippers have their fruit clipped twice. It seems to me that would be entirely useless with the Florida orange, as grown in most portions of the State.

A great many have told me it was impossible to get their fruit clipped properly. I work twelve to fifteen hands, but it isn't very often I have to discharge a man because he does not do his work right. I sometimes find good workers who are mentally weak and in two instances I decided that it was impossible to teach them to do good picking, but as a general thing I have no difficulty in training men so that there will not be more than one or two per cent. of long stem oranges.

When these go into the washer, every one of them is examined. Either the eye or the thumb or the finger gets into the calyx and if the stem is long it goes into a box to be gone over and clipped before being washed.

I think it is safe to say that if the fruit is picked properly and washed properly with a Warner washer, it does not do it any injury to be washed. I have tested it repeatedly in the years gone by, washing some and leaving some unwashed, and putting the two side by side, and in every instance so far, the washed fruit has stood up the best.

I am afraid of brush washers. They may be all right, but I am afraid of them. I am not advertising the Warner washer, but I have tested that more thoroughly than any other and I believe it is absolutely safe if properly handled, but it is not properly handled in many cases. Either the operators do not gauge the fruit so that there is the proper holding back or resistance to its going through, or it is overloaded; some rivet head or other roughness inside the cylinder is not looked after and done away with, long stems are overlooked or too little water is used. The principle is simply a lifting up and rolling down of both sponges and fruit, and with right conditions no harm can result.

I believe a great deal of the injury in the washers is in the improper handling of the washers themselves.

Mr. Stubenrauch: I do not doubt that you are right. I can cite an example that came under my own notice. Out in California we were able to compare the same machine being handled by two different parties. It happened that in one place a machine was causing considerable—that is, we were getting a large percentage of decayed fruit from the lot washed with that machine. The house had great faith in the machine itself, but we were almost ready to condemn it. We don't, as a rule, advocate or condemn any machine. However, we happened to run across a case of the same machine being used with practically no decay at all in another part of the State. This as you see, brings us back to the old question of the "man behind the gun."

Now, as to the matter of long stems; that is a very important matter. Your fruit is very tender; much more so than the California fruit; full of juice and thin skinned. In the washing, the oranges are knocking against each other; if there is a single orange with a long and jagged stem, it may do a whole lot of damage.

Another matter comes to my mind, and that is the clippers. You have to watch out very carefully to keep them in good condition. You will find that your work will be much more satisfactory if the clippers are kept sharp and close so that you do not have a jagged stem. We find a great deal of difference when the clipper is kept tight instead of loose and dull. When the clipper is in such bad shape that the stem is broken off instead of clean cut, it leaves a sharp point or points that will do a great deal of injury.

Mr. Hart: I think it makes a great difference as to the clippers you use. I have clippers which have been sent to me to test. I won't say that I have had samples of every kind of clipper, but I have had a good many. I have not reported on but one or two of them because I have found that they were not properly made. A great many of them have the bevel side on the side next the orange and it would be so long that you could not get close enough to the orange to cut it off properly. To get that bevel just right seems to be the most difficult thing for the manufacturers to do.

Mr. Stubenrauch: I don't think any of them get it just right, Mr. Hart. I have never seen one that was just right.

Mr. Hart: I attacked that problem and got results that were pretty satisfactory, but afterwards there was carelessness and the clippers were not kept in first class shape. To get the best results, the clippers must be given attention, but if the clippers are made right, you will escape getting the clipper cut fruit.

Mr. Temple: Mr. Hart stated that while he had had no experience with the brush washer, he does not like it. Now, I would not discuss the brush washer if I was not familiar with it and had not used it. I have used two all winter. On one occasion, when some tests were made, some fruit was packed, unwashed; other fruit was packed, washed through the brush washers. At the end of three weeks we opened the fruit and found three decayed oranges in the box of unwashed fruit and two in the box of washed fruit. After the fruit was opened and examined, it stood in the packing house for more than two weeks and finally they asked me what to do with the brush-washed fruit. I told them to repack it and send it to a hospital in Orlando. We didn't want to ship re-packed fruit. They repacked the fruit, sent it to the hospital, but it seems they had just received a consignment of other fruit sent to them. It stayed around the hospital for awhile, and they finally turned it over to a grocery store to sell the fruit and turn the money over to them, as they needed the money more than the fruit.

When I discovered that a grocery store was selling some of our fruit at retail, I looked into the matter to see how they got hold of it, and traced back and found out that it was the self-same box of fruit. I watched very closely the sale of that fruit to find what percentage of decay showed up in it. The fruit was all sold at retail, taking probably two weeks in the sale, and while the unwashed fruit showed almost one-half decay, the repacked, washed fruit did not have a single sign of decay when it was sold here seven weeks after it was originally packed.

Mr. Kilgore: We had a washing experiment in our packing house which turned out practically the same. The company got in a new brush washer. We were afraid to use it, but to get it "broken in" we washed the fruit in a car which had been standing on our siding for some time. After the oranges were washed, the water was pretty greasy. To see how the experiment worked, we packed a few crates of the washed and of the unwashed fruit. The unwashed fruit rotted very badly and the washed fruit rotted very little.

Mr. Stubenrauch: Your washed fruit was probably selected fruit. Of course, in that case it would be hard to make a fair comparison.

Mr. Kilgore: There was no selection.

Mr. Stubenrauch: I think all of this discussion confirms the facts brought by our work regarding washing. All of the gentlemen who have shown that they are not getting decay following washing are in a class of handlers far above the general average, and the handling of the fruit in their houses is being very carefully done. Our results show, both here in Florida, and in California, that every extra process or handling that has to be given the fruit is a place where injury is liable to occur, and that where these processes are necessary to place the fruit in marketable condition, the necessity for extreme care becomes doubly important.

Mr. Stockbridge: Speaking about the additional care that has so much to do with results. The packing of fruit certainly has a great influence on the amount of decay. I would mention that I have always taken pretty good care of my fruit and yet in spite of ordinary precautions, the percentages of decay were quite large. My crop of 1908 showed that the average percentage of decay was between 15 per cent. and 20 per cent., and yet my fruit was pretty well put up, too, and I suppose that as the average man goes, I put my fruit up about as well as the best of them and took about the same precautions.

Now, after attending the meeting of the society at Daytona last year, and hearing the report of the committee on the investigation of the packing methods of California, I went to my grove and talked the matter over with my superintendent and when we came to ship the next crop, that is, the crop of 1909, I made a careful test of what I hoped were better methods. I shipped a carload to Atlanta and had it opened by three or four commission men. There were sixty-five boxes out of the car I opened myself personally, and out of the sixty-five boxes there was not a single decayed orange. I don't suppose out of the whole car there were forty decayed oranges. We did not wash the fruit, but we used the clippers distributed by the society last year and kept them sharp, and every man who went into the grove or packing house, wore gloves. Every man's finger nails were kept short and protected. The result was a saving of about 15 per cent. in decayed fruit.

It was my fruit that was chosen for the Taft banquet at Atlanta. They searched all over the city to get fruit they thought was good enough, and finally purchased twenty-eight boxes of my fruit for that occasion.

Methods of Citrus Culture

C. H. Thompson.

Mr. President, Ladies and Gentlemen:

While I have reason to question the good judgment of the committee in putting me on the program for a paper on this important subject, as there are others who are better qualified, yet as one who is vitally interested in the citrus industry, I shall not shirk my duty, and trust that what I may offer may be a help to some one engaged in the industry.

I have little that is new to offer, as the method here advocated to a greater or lesser degree is followed by a large number of the growers of the State.

Having been in the business for many years, and having met with a fair measure of success, I think I am justified in advising my fellow growers to seriously consider the method as here set forth.

What I may say applies to that character of soil known as the high pine land, and while it may apply successfully to other types of soil I am not advocating it for such, for my experience has been confined to the high pine land.

As you well know there is very little natural fertility in such soil, but it acts as a fine anchorage for the trees, and many of us prefer to give our trees just the food we wish them to assimilate. By so doing we think we make a superior quality of fruit. This superiority will be governed by the knowledge of the grower, and his practice in caring for his groves.

While the high pine land is deficient in plant food it has many fine qualities, among the most important being its resistance to drouth, as it is a well known fact that groves on such lands will not suffer nearly so much in a long continued drouth, as groves on heavier and lower lands. Such soil also is very easy of cultivation, and to keep in good mechanical condition.

We take it for granted some one may read these lines who has in mind the planting of a grove, so would advise the careful selecting of good ground and location. A soil with clay a few feet under the surface with good drainage is an ideal condition. If it is land that has never been cultivated, and I prefer such for a grove, there will likely be some native timber on it. The first important step is to completely clear the land of all trees, stumps and roots. If these are left in the grove to be removed later they will likely be for years an annoyance and a nuisance. Put the ground in thorough preparation by deep plowing and cultivation, then plant good strong thrifty trees in rows thirty feet apart, and twenty-five feet in the row. This may seem, while trees are small, like a waste of ground, but in a few years you will see the advantage of being able to get through your grove with wagon and other farm implements, without damage to the outhanging limbs.

You will not make much of a mistake if you confine your choice of varieties to the Pineapple and Valencia late oranges, and Silver Cluster, Walters or some other good sized and shaped grapefruit.

While an orange tree can be transplanted any month of the year, I prefer planting about the first to the fifteenth of January, always using a liberal quantity of water when planting; and unless you can water these young trees at intervals during the dry weeks that follow, until the rainy season opens, you had better not take the trouble to plant them, for you run the risk of losing some and stunting the balance.

When planting, incorporate a little fertilizer in the soil and use only a limited quantity the first year, increasing the quantity each year, using a good quality of orange tree fertilizer. For about three years keep the tree rows clean by frequent cultivation during the growing season, but avoid cultivating late in the fall and winter. Space between rows can be planted to any good cover crops to shade the ground and build up the soil.

For bearing groves I advise keeping the top soil from caking by frequent harrowing with Acme harrow. This, in the spring of the year while dry, should be constant, and after rains, harrow to conserve the moisture. By July or beginning of rainy season stop harrowing and let grass grow. Do not let the grass or weeds grow too rank under and near the trees, but keep it mowed down. If grove is in good condition and soil rich, you can cut and remove grass for hay; but if soil needs the vegetation, or is lacking in humus, better build the soil by leaving hay on the ground, and buy your hay or raise it from outside lands.

While one can raise trees for a few years and keep them in a fairly thrifty condition without fertilizer, by cultivation and raising leguminous crops to build up the soil, it is utterly impossible to make the trees fruit without a liberal application of a good fertilizer.

For young trees I prefer a fertilizer made up of from four to five per cent. ammonia, five to six per cent. phosphoric acid and six to eight per cent. potash, applied two or three times from spring up to September.

For bearing groves I prefer to give a fair application in February, before the swelling of the buds, of fertilizer made up of about 5 per cent. ammonia (half of which from nitrate of soda, the quicker acting, and half from sulphate of ammonia, the slower acting form), 6 per cent. phosphoric acid and 6 per cent. sulphate of potash.

In the latter part of May or first of June a liberal quantity of fertilizer with 2 per cent. sulphate of ammonia, 6 to 7 per cent. phosphoric acid and 10 to 12 per cent. sulphate of potash.

In the middle to last of November, my third and last application, a liberal quantity 2 to 4 per cent. sulphate of ammonia, 6 to 7 per cent. phosphoric acid and 10 to 12 per cent. sulphate of potash: the yearly quantity being about forty pounds to every 10 boxes of fruit.

The quantity of ammonia for each application will have to be governed by the condition and need of the trees.

While there is a growing tendency towards governing our insect enemies by introducing their natural enemies among them, yet this will not always accomplish the desired result.

I have kept the scale under good control by fungus and lady birds.

I have failed thus far to discover any natural enemy of the rust mite, and in order to have desirably bright fruit I spray three or four times during the season with sulphur solution.

Winter Haven, Fla.

E. S. Williams.

Mr. President, Ladies and Gentlemen:

If there ever was a case of "many men, many minds," I am sure it is in the handling of a citrus grove. In view of this fact, I'll merely treat the subject from my point of view, as I am sure we will have some discussions embodying views and methods vastly different from mine. In the handling of a citrus grove one must be governed by his own peculiar conditions as hardly the same conditions prevail in any two groves. Then, besides, we all have our little pet theories, which may possess more or less merit. The best place to start with this subject is with the raw land, which should be the best obtainable. Then be careful of each step in its development, to avoid, if possible, doing anything that it may cost you dearly to undo. The old adage of "an ounce of prevention" is equally applicable here. In clearing pine land, I clear off all the undergrowth, burn the saw palmetto roots, and save the ashes to be scattered over the ground later. Then I cut the pine trees, bore the stumps with an inch and a half augur, which has had the shank lengthened to about 3 1-2 feet over all, put in sufficient 60 per cent. dynamite to open up the stump well, then put fire in and burn the stump out, cutting up the logs and piling them on the burning stump, unless I have some other use for them. It pays to get the pine trees absolutely off the land, "lock, stock, and barrel." After burning the stump as best we can, men with grub hoes and axes take out the remaining roots down to a depth sufficient to allow a plow to run. I then line off the tree rows and windrow all remaining trash, such as pine tops, underbrush, palmetto leaves, etc., half way between the tree rows, and then break up the tree row with a turn plow having a good cutter on. I prefer a one-horse plow, as it cuts narrow furrows and consequently leaves ground in better shape. The best plow that I have ever found for this work is a Brinley No. 1, Prairie, with a "fine" cutter. It does fine work, is strong and light, and a good able bodied horse or mule can pull it very readily. Our land is rather low and compact, with clay subsoil, which holds water during the wet season, so we have to bed our trees, with water furrows between rows, leading to cross ditches; consequently I throw two furrows together for the tree row, and continue turning dirt towards the two furrows till I get a strip about ten feet wide. This leaves the trash undisturbed on the unplowed middle. Then I stake off for the trees and set them, move the trash in between the trees, and finish plowing out the middle. I use a two horse disc harrow on all the plowing to pulverize and smooth up the ground. I mulch the trees at time of planting, and always put about 1 1-2 inches more dirt to the tree than should be there permanently when trees are set in winter, this helps retain the moisture through the spring drought, and at time of first working after the drought is over and tree is established, this surplus dirt is worked away, leaving the tree with the crown roots just covered. In preparing hammock land, I modify the above methods to suit the growth on the land. I leave, on an average, four or five palmetto trees to each orange tree, and gradually thin these out as trees get larger, and original supply of trash has rotted away. Live oaks, water oaks, etc., I top and girdle. When plowing the first time, I keep two men, with grub hoes and axes, following the plow, to remove all roots, etc., that had not been previously removed. In this way, at the next plowing, it should plow like old land. I find that young trees grow off much better and are much less apt to become hide bound where they have partial shade. In case of a hide bound tree, the point of a knife blade run the length of the trunk, splitting the bark, and a little extra feed, will usually effect a cure. As regards leaving palmetto trees in a grove, to be removed later, some persons raise the objection that they are difficult to get down without damage to the orange tree, after the orange tree has attained much size. This can be easily done in the following way. Take a ladder say 16 or 18 feet long, place against trunk of palmetto tree to be removed, on side opposite to which you wish the tree to fall. Take a rope (about 3-8 or 1-2 inch) and tie in a slip noose around the trunk of the tree as high above top of ladder as is convenient; and push it up the trunk of the tree as far as you can, with a pole having a fork or similar contrivance on top end, then have a person on the ground tighten on the rope. Then, with a short, one-man cross-cut saw, saw the tree as nearly off as is safe at a point that is convenient above the top of the ladder; then get down and remove the ladder, and with the rope the top can be pulled just where wanted, and very seldom will an orange tree ever be injured. The snag left standing will do no harm, but it can be easily cut down if it is desirable to get it out of the way. In setting trees, I have had fine results by thoroughly mixing 1 or 2 lbs. of fine ground steamed bone in the soil before setting the tree. Other than this I give the trees no fertilizer for a year, depending upon plenty of mulch and trash to furnish what they need for that time. Then I give them about 1 lb. each early in the spring and another pound each in the summer, and continue plowing till I get the land shaped up to suit, when all plowing is cut out. After that our dependence is on hoe working the trees in circles and using mowing machines once or twice per year, as occasion demands, on the unworked part. When the trees get large enough to shade the ground sufficiently to keep weeds and grass from choking them, we depend on the mowing machine entirely, and put part of the price of the extra labor saved into extra fertilizer. By this method we get along with less labor, have healthy trees and fruit of fine quality, and are troubled very little with rust mite. No doubt we shall have some able discussions later on the subjects of fertilizing and spraying, so I'll not attempt to discuss them. Of course no iron clad rules can be laid down for the care of a grove, as soils and conditions are so varied, but my general rule would be, put land in best possible shape when trees are very young, and cultivate just as little as possible thereafter. I am a great believer in humus, and think that one should get something growing to shade the ground as quickly as possible and later be converted into humus. As the trees get older and original supply is being exhausted, haul in trash, woods grass, etc., to take its place. When I mention muck, no doubt our worthy president and some others will smile, as I recently heard one of them allude to it as "harmless amusement," but we are using muck with most excellent results, though I must say that we have a fair supply of exceptional muck. I have seen lots of muck which I think I might allude to as harmless amusement, unless it had maiden cane in it, when I'd omit the "harmless." I believe there is a growing tendency towards less cultivation, but fear that it is still being much overdone in many citrus groves People may criticise the apparent unkempt condition of your grove, but the knowledge of the extra size of your bank account will more than offset the stings of criticism, and after all, with citrus growers, as with all others, the money is what we are after. If, in starting a grove, one is seriously handicapped for lack of time or funds, good results can be secured by grubbing circles in which to set the tree, and then gradually breaking up the remaining ground, getting it all broken by the time the tree has been set two years. But, using what method you will, don't destroy any more humus-producing material than can possibly be helped,—the day will come when it will be sorely needed. If I were caring for a grove on very sandy soil, an Acme harrow would be the most severe tool that I'd put into it. As to varieties of citrus trees to set, confine yourself to few varieties, and those the very best suited to your locality.

We are confining our plantings almost entirely to Pineapple and Valencia Late oranges and a selected strain of common Florida grapefruit, budded on sour orange stock. I find that under usual conditions a good thrifty year old bud on a two year old stock gives the best satisfaction. Large trees suffer a much greater shock when transplanted, and may require more careful attention to get them well started off. Don't plant sour stocks in grove form, to be budded later. This is too slow and a stand of buds is too uncertain.

DISCUSSION.

Prof. Hume: We certainly ought to have a spirited discussion after this topic. Suppose you start the ball rolling, Mr. Hart. I think your ideas with regard to the use of ammonia are sufficient to get this discussion into full swing.

Mr. Hart: Mr. President, when you once get the convention to talking on this subject, I think there will be plenty said, because as a rule there is not time enough given to allow each one who wants to speak on it, time to do so.

I really haven't anything special in mind to say at this time. Just now, I would rather have a receptive mind and wait for some one else to say something about it.

Just a minute, though. One little matter I noticed in the papers that have just been presented, is to avoid cultivating in the spring. I cultivate early in the season pretty thoroughly with a Cutaway harrow, and later, when the drought is on, I use a weeder or what is practically a horse rake, running over the ground often.

When the rains begin, I let the grass and weeds grow, or plant legumes.

I apply my fertilizer in November and cultivate very lightly then, and so far as my experience goes, I have never seen any bad results. I believe that cultivation in the colder months will start the tree out sooner. I also think that the application of fertilizer at that time will retard it. When I put my fertilizer on in November, I like to have it worked into the soil a little; therefore I give it a slight cultivation; just enough to put it under the surface. I think that fertilization late in the season helps the root growth a great deal but does not materially hasten the top growth. Of course, it is not desirable to hasten the growth when there is danger of a cold spell.

Fertilizing in November, I think, counteracts the effect of the little cultivation necessary to work it into the surface, and there is no hastening of the growth or making the tree tender in the winter.

Mr. Brown: I do not quite understand Mr. Hart's theory that the fact of fertilizing will retard the growth of the tree.

Mr. Hart: You know that the root system of your trees grows freely in the winter. If you give them fertilizer in November, the root growth will be more vigorous. The top is not likely to start until the root growth about ceases. In that way, I think the fertilizing at that time rather retards than hastens the starting of the tops.

Mr. Brown: What is the composition of the fertilizer?

Mr. Hart: I give them my regular formula; that is, a first class orange tree fertilizer; about 4 per cent. ammonia, 6 per cent. available phosphoric acid and 10 to 12 per cent. potash.

Mr. Williams: What proportion of fertilizer do you give them in the fall as compared to the spring and summer application?

Mr. Hart: I don't fertilize in the spring until about the time the rains commence in the early summer. I do not think I fertilize as heavily as a great many do. The largest application that I ever made to any of my trees is twenty-four pounds in a year; twelve pounds at a time, two times a year. I give them pretty nearly the same each time. My land is good land and I do not think it requires as much fertilizer as pine land generally does. Mine is what is generally called gray hammock.

In addition to this, I give them an application of lime; and I have a man right now hauling in humus or leaf mold from the hammock. About every two years I give the grove a good coating of leaves and trash.

Mr. Temple: Mr. Thompson in his paper spoke of spraying with the sulphur solution two or three times a year. Now, I think we all know Mr. Hart's position on spraying. Not trying to drag in the question of spraying or any one spray, I want to say that I happen to know from visual observation that Mr. Hart has no rust in his grove. I also know that Mr. Hart does not spray. Will Mr. Hart tell us how he gets bright fruit without spraying; whether by cultivation, fertilization or what? I would also like to ask in addition whether Mr. Thompson has used the sulphur or the sulphur and soda or sulphur and lime solutions, how often, and the results obtained from one as compared with the other; in other words, what I am trying to get at is what precaution to take to insure getting the most bright fruit.

Mr. Hart: Replying to Mr. Temple's question with regard to rust mite. I today heard it said that "citrus culture is *not* an exact science." I wish I had less reason to realize this truth.

I cannot attempt to say positively what action on my part or what element in the soil or condition of the atmosphere causes the results. I will say, though, that to my knowledge I have not shipped a genuine rusty orange this year; haven't had it to ship. I shipped a few that I marked russet oranges, but that rust was merely a manifestation of melanose, which gives it a rusty appearance. But not one orange, that I know of, has shown the result of the work of rust mite.

Years ago, one of my groves produced all russets, and they were such vigorous russets, or, rather, the rust was so vigorous, that the fruit was very small and black to such an extent that quite a portion of the crop I did not ship at all, and was much ashamed to ship the rest of it; but I have noticed that on that grove this year not a rusty orange showed up from any cause.

I have noticed that there is less rust on the hammock than on the pine land, especially where clean culture has been practiced; therefore, my practice has been to try to turn the soil into that as much like hammock soil as possible, raising grass, weeds, etc., and not taking them away from the land after they are cut, putting much humus into the soil, cultivating early in the season while the drought is on, stopping it when the rains come, then using only the scythe until November.

The results in my groves are there, and anyone can see them, but I cannot say positively any more than the rest of you just what has brought them about. When results are right, I hold to the methods that bring them.

Mr. Thompson: In regard to sulphur, I would say that I use very successfully and have used for two or three seasons, a solution or mixture of sulphur. First, I make a paste like that the paper hangers use to put paper on the wall. I have a regular formula for making it in large quantities. Then I take three gallons of that paste and mix in it seven pounds of Flowers of Sulphur. I use the Flowers because that is the lighter form. Then this whole mixture is stirred in fifty gallons of water. It mixes very readily, and it is kept stirred up while it is being sprayed on the trees. It carries the sulphur for a long time. The paste makes it adhere to the foliage, and you can smell the sulphur after a rain on a warm day, long after you would think it had all washed off.

I have also used the lime and sulphur, the regular formula, but it is very disagreeable to handle. Then I have used the caustic soda, making up a stock solution of thirty pounds of sulphur and twenty of soda and using two quarts of this stock to fifty gallons of water.

However, the spray mixture I mentioned first is, in my opinion, just as good as any of the others, and much simpler to use.

I start to spray when the orange is very small; just about as big as the end of your finger, and I spray about three times during the season. I judge the time of spraying by the condition of rust on the orange. If the rust mite is increasing, I spray. Then I give a reasonable time to see what effect the spraying has had, and if I think the rust mite has not been checked enough, I spray again.

Mr. Mead: I am convinced that the treatment of the roots can have no effect whatever on the starting of the tree. Anyone who has noticed will find that the buds start earlier on the north side of an orange tree; the twigs and buds having been subjected to greater cold respond more quickly to the oncoming warmth of spring, but the ground and roots and cultivation have nothing to do with it, being alike for all sides of the tree.

Snow has been piled around fruit trees in the north, keeping the ground frozen for a month after the rest of the orchard had warmed up, but these trees blossomed with the rest; branches resting on or partly covered with snow, bloomed at both ends, while the cooled buds remained dormant.

I do not think that fertilizer or any other treatment of the ground that does not actually warm up the branches will have any effect on the time of starting in the spring.

Mr. Porcher: I have had quite considerable experience in spraying. I have put forth the most strenuous efforts in combating the rust mite. I have used all kinds of different sprays. I have used sulphur solution. I have used the dust application and have found that the application of the dust made absolutely no difference; the mites would crawl upwards dragging themselves by their four legs and dragging their tails behind them, so that they would leave a mark through the particles of sulphur. I have been seeking to do everything I could to exterminate the rust mite by natural enemies. I have seen some parts of the grove that seemed to be free from the rust mite without the aid of spraying, and a few feet away would be trees infested with the pest.

I have used humus in large quantities; over 1200 double horse loads were hauled this past season. I find that when you apply lime, as I do every three years, the rust mite is in excess. Where the ground is cultivated cleanly, it is absolutely impossible to control the rust mite with any spraying. Where we use the humus we find less of the rust mite. The only difficulty is that where you get a sufficient quantity of mulching and humus on the soil, you are apt to give your trees a little too much rich food. They are indulging in late suppers, lobster, champagne, and so forth. They are apt to get indigestion and get very sick, and you have trouble.

I have land that ranges from rich low hammock up to scrub and pine land, and some land that you gentlemen would turn your heads away from (if you didn't see the trees). Saw palmetto land, with hard pan. But on that same land I have grown some of the best trees I have. It is some of the most satisfactory land that I now have to handle.

I am today asking the question of this meeting, and want to bring out from Mr. Schnarr as to his spray, which he claims will control the rust mite. Scientifically, I think we can bring out from our professors that no oil spray has been known that will handle the rust mite. I have used the resin wash, whale oil soap, kerosene emulsion, etc., without effect. Sulphur seems to be the only thing that will control the rust mite at all.

We have also with us a gentleman representing an English firm which has made a big demonstration in supplying a sheep dip, and they have a spray which they call Cooper's V. I. which has done good work on the Mytilaspis citricola, or long scale and the red scale. It cleaned them out, and also the white fly in the larval and pupal stages were destroyed. Also, I could not find an egg that was not killed, although they do not claim that the spray will destroy the eggs. They go further, and say that the spray is a fungicide. I think it will *probably* handle the rust mite.

We begin to spray when the orange is the size of a small marble. We pay no attention to any regular time of spraying, but go ahead every three weeks and spray until we ship the fruit. We don't finish shipping, sometimes, until April, so you can see what that spraying means. Oftentimes the rust mite does not affect the fruit at all; it will seem to be thoroughly cleaned out; other times it will make its appearance early in the season and I hate to think about what a hard time we have to combat it.

Mr. Stevens: I would like to ask Mr. Thompson if he noticed any change in the texture of the rind of the orange in using the soda sulphur solution and the other sulphur solutions.

Mr. Thompson: I cannot say that I did.

Mr. Stevens: When the sulphur and soda solution was first put into general use, it was claimed that it improved the texture of the rind; made it thinner and of a finer texture. Possibly I deceived myself, but I thought it did, too. It seemed to make the rind smoother.

Mr. Thompson: I have never used so much of the lime and sulphur as the paste and sulphur. I cannot see any difference in the orange.

Mr. Tabor: I would like to ask Mr. Porcher what he has to sell his fruit for to cover the cost of spraying and of the sulphur.

Mr. Porcher: Mr. Tabor's question is bringing up a question that will come later. His point is well taken. The spraying when done ordinarily is much less expensive.

I have had to rig up two complete plants, and the expense is about $5.00 per acre. I have had to rig up two, so that when one is not working, the other one can be used. With us, we allow the trees to grow clear down to the ground and don't trim the lower branches off to leave a clear space underneath as you people generally do. Treating the groves as you do, it simplifies the matter of spraying very much.

I use a two-horse team and the spraying apparatus is mounted on a platform and the man on the platform sprays the trees as the team moves. The lower branches of the trees are more often affected than the higher, especially with scale.

As to price, I am not alone in having to bear the cost and meeting a successful market for carefully sprayed fruit.

Mr. Warner: I have two different spraying outfits, also. One is made at Elmira and has a regular 2 1-2 horse power engine; the other is a marine engine in which I utilize the same class of pump. The two outfits are practically interchangeable.

The wagon has the body made in such a way that the wheels will cut under. The wagon turns easily and pulls very easily. One animal can handle it without difficulty.

REPORT ON THE METHODS OF PICKING AND SHIPPING CITRUS FRUITS.

L. B. Skinner.

Mr. President and Fellow Members:

The fire this morning stopped me right in the midst of my paper. I thought I would go over it again, but I haven't had time. I am sorry Dr. Inman could not stay and give you the benefit of his experience and observation. He says he never packed an orange in his life; therefore he knows exacty how it ought to be done.

The first thing in the field is the equipment of the picker. What shall we give him to pick in and what shall we give him to pick with? Now, until the Government sent their experts here, I did not know the danger of clipper cuts. I didn't know what a clipper cut was until Mr. Tenney came into my grove about three years ago. We went through a box of the champion picker of the grove and we found about 40 per cent. of the fruit was clipper cut. When we came to realize the danger of clipper cut fruit, it did not take us long to cut it out as far as possible.

This year we started in with our picking gang; fifteen pickers, an inspector and a foreman. The foreman is a fellow of decision; he knows what he wants and he intends to get it. The inspector, too, is a conscientious man. . Mr. Ramsey, Mr. Tenney and one other man came to my grove and went through box after box of my picking and failed to find one clipper cut. I tell you, I felt a lot better this time than I did three years ago.

Now, in regard to the clippers: I show you here a little sketch of what I used altogether this year; probably Mr. Burton is familiar with the Kyle clipper. With this clipper, I believe it is almost imposible, with any care at all, for a picker to injure an orange. These clippers are made in California; everything good seems to come from California—that is, almost everything.

There is another that is equally as good; that is the Somner-Hart clipper.

Next is the question of what to pick in. I have used baskets, I have used picking shirts, I have used the California picking sacks and find them all, in a measure, unsatisfactory. We have a picking shirt at Dunedin that I think is the best thing of its kind. It has a pouch with an opening so arranged as to let the fruit down into the box very easily, but that was unsatisfactory. The latter part of this season I ran across a darky with a picking coat. I watched him picking with it and watched him empty the oranges out of it, and he said he liked it very well. All the men who could get them were using them. There is no receptacle in the front for the oranges at all, but they go around to the sides and the back. You know, a basket is often in the way in getting around the tree. Lots of times the men are often placed where it is impossible to keep the fruit from being injured. You can discharge men for careless picking, but it is a hard matter to get other men to take their places. It is a much simpler proposition to furnish them implements to do good work in the first place. If they have the proper facilities, nine men out of ten will do their work right, but to have your work done as you want it, you have to give them these facilities.

With this picking coat, the fruit is put into the side. It is just like a picking shirt except that this receptacle runs clear around the back. The man can move all around the ladder any way he pleases and the oranges are so placed that they are not in his way and it does not inconvenience him at all. Then, too, the opening is so placed that he cannot throw the fruit into the coat.

There is a hook underneath the lap of the coat, and when the coat is full, he unsnaps the ring and pours the fruit out one side; then he unsnaps the ring on the other side and lets the fruit on that side out. Then he buttons it up and goes back to work. The coat in the instance I spoke of was made out of bedticking.

A member: Can you buy them already made, or do you have to make them, and have you ever used them?

Mr. Skinner: No, I have not used them myself, but saw them used by one of my neighbors, a member of the citrus exchange.

LONG STEMS.

There is no necessity for my enlarging upon the subject of long stems. I mentioned long stems in the presence of Mr. Hart, and he looked perfectly shocked at the idea of anybody's mentioning long stems.

While we were out in California, M. Ramsey gave us a lecture at one of the most beautiful hotels in California, in which he spoke of the long stems as "murderers," and that is a pretty good name for them. They never cease to do their bad work until they are delivered to the market. Almost every orange they touch has to suffer. I think the Hart clipper is just as good as the Kyle clipper cutting short stems and not injuring the fruit on the opposite side from where you put the clippers. I don't know of any other clippers that I would call so satisfactory. I think those good points are confined to those two.

PICKING BOXES.

Another thing I have had in mind, is to speak of the picking boxes. They are usually altogether too large. I think the picking box should not hold over half what the one in general use at the present time, holds. The fruit could be so much easier and I think much cheaper, handled. Now, it takes two men to handle one of them, but if we had a box half the size, one man could pretty generally do the same amount of work that it now takes two.

WASHING.

When the fruit comes to the packing house, in most localities of the State we have to prepare to have it washed. I visited Mr. Temple's house when it was in operation and was very greatly impressed with the soaking tank. I watched Mr. Temple's sales gradually getting better and better, and I decided to go up to Winter Park and see if I could find out the reason why. I went into his packing house. Maybe some of you know that we had a frost last winter. Of course, very few places in the State were affected by this frost, but still we had a frost. Some of us knew that we had some light fruit, and we did our best to eliminate it. We would instruct our men to cull out the light fruit, and they would judge of the weight of oranges until finally from fatigue they could not tell a heavy orange from a light one, and we would find a good orange with the bad and a bad one with the good. The men tried to help us out, but it is simply an impossibility not to make mistakes. But at Mr. Temple's place, he was able to cull every light orange out of his pack. When the oranges were put up at market, the buyers knew that they are getting heavy fruit when they paid for heavy fruit.

The light fruit were eliminated in the soaking tank. The process is very interesting. A man stands by the tank with a long ladle, and if an orange is floating a little too high, he spoons it right out. If an orange was floating, but a light touch with the ladle would send it down, and it came up slowly it was all right, but if it came up like a cork, it was ladeled out.

We should select a washer that does the work thoroughly and carefully: that is the main thing. We simply have to wash out fruit and we have to do it carefully and thoroughly if we are going to please the trade. The washers in Mr. Temple's house certainly clean the fruit and the results have shown that no injury has been done to the fruit, apparently.

There are some washers that will wash grapefruit, some that will wash oranges, and I hope there will be some washers that will wash tangerine. Each grower has to settle the question for himself as to which washer he will use, and I think by choosing one which does the work according to his own satisfaction, the question is solved.

DRYERS.

After the fruit comes from the washer and before it goes to the sizer, it has to be dried. You are all familiar with the methods of Mr. Temple's work. He runs the fruit into the rack overhead and exhausts the air, forces it in and draws it out; there are so many thousand cubic feet of air passed through there per minute. Anything as elaborate as his process is not within the reach of all of us. In my house we have installed a dryer that has been working very successfully for two or three years. It is not a very large dryer and we are unable to run through over three hundred boxes a day. This dryer is about thirty feet long. The fruit comes into one side on to a conveyor which moves down very slowly; then it comes back to the brusher and sizer. During the time the fruit is passing, which occupies 20 minutes, there is a blast of air going over it. It is just the natural air taken from up near the roof of the house. This air is blown in there by a strong blower and there is a continuous stream of air going in and coming out all the time. In damp weather, we use a fire and blow the heated air in and over the fruit.

GRADING.

Now we come to the grading. It is unnecessary for me to describe to you the grading appliances as shown in Mr. Temple's house. It is a system which will soon be in general use. The old methods of doing things in Florida are fast passing away. If we are going to keep up with Mr. Temple (we know Mr. Temple is going to keep up with the best of them, anywhere) we are going to have to grade our fruit correctly.

Our custom has been to ship under a brand; there is my own brand, for example, the Dunedin brand. Suppose we pack a car of russets, goldens and brights. Suppose there are sixty per cent bright; it all goes as the Dunedin Brand. Now, Mr. Temple has adopted the method by which the brand under which it is shipped indicated the grade of his fruit. His brights are shipped under the "Angel" brand; his Angels are all bright; next comes the "Bull Dog" brand, which indicates another grade of fruit; then the "Camel" brand, I believe. Now, a man who quotes the camel brand does not have to say anything more; if he quotes out the Bull Dog brand, the buyer can tell to a certainty what he is getting and paying for.

I must admit that at first I did not like it, but the more I know of it, the more I am impressed with its value.

Another thing I must mention, is that we do not grade our fruit enough. We make two grades, and it would often be worth a great deal more to us to make three grades.

Out in California, they grade their fruit away up high. All their fruit isn't that way, by any means; only a small percentage of it. Their fancy brands sell high and the other grades try to climb up to it. A comparatively small percentage of their fruit grades up high and we hear a great deal about it and we judge that the greater part of their crop is classed under this grade. The commoner brands are put on the market, and we don't hear very much about them; they don't make much noise about their "camel" brands. Mr. Temple, on the contrary, puts his fruit out as just exactly what it is, and is not ashamed of any of it. It is just like having three houses to sell; one is a fine house for $10,000, the next is a smaller house for $5,000, and the third a cottage for $2,000. The owner is not at all ashamed of his cottage because his big, fine house sells for $10,000; it is just as much a part of his business to sell the small house for what it is worth as it is to sell the big one.

I think the brand ought to indicate the grade; it ought to be stamped upon the box; it ought to be stamped on every wrapper that goes on the fruit clear through the box to the bottom.

SHIPPING.

Now, about packing the fruit in the cars. The boxes should be stacked up in the California way. It is unnecessary to describe this here, as it has been taken up in several different meetings before. Packing the fruit in this way, there is complete ventilation through the whole car. There is a complete circulation of air through the car, and no matter how much the car is jolted about, the boxes remain stationary. I had a car of grapefruit packed this way, once, that was in a wreck. It was a pretty bad wreck; I think the train must have been going about forty miles an hour for the track was torn up for three hundred feet, but the fruit in the car was practically uninjured.

Prof. Hume: Mr. Skinner has brought out a great many good points, but I believe he knows something else that we haven't got from his yet. I think a few questions would bring it out.

A Member: I understand Mr. Skinner has a washing machine for oranges. I would like to have a description of it.

Mr. Skinner: I devoted a good deal of time on my trip to California to looking up washers. The California people were very much afraid to tell us that they needed washers. They didn't take us to the place where they did the washing. We went ourselves, however, and saw them doing it. At another place I saw a very good washing machine. They have there very black, muddy fruit. The fruit from that neighborhood was shipped a great many years with the understanding that it would always have 15 per cent to 18 per cent. decay. They changed their methods entirely, handled their fruit carefully, and last year at the time we were in California, their sales were as near the top as anybody else. Their fruit was carrying perfectly on account of the careful handling.

By the way, I want to mention right here, that the National Packing Company is not icing a single car of fruit from California. They are shipping the fruit packed so as to permit perfect ventilation, and are having perfect success.

Now about that washer; we have lots of smutty fruit, we washed some of the fruit and finally abandoned washing because the fruit was being so badly injured, and I didn't like to ship it, as dirty and smutty as it was. I came up and looked at Mr. Temple's packing house, but I did not find a washer that seemed to exactly meet my ideas. I made up my mind, after thinking it over, that I wanted to get as near the motion of one's hands in washing oranges, as possible; that is, I wanted a scrubbing motion and have the oranges turned at the same time. I think we have solved the problem and feel sure that we have a successful machine that will wash grapefruit and oranges and tangerines and handle them as carefully.

The weight of the orange resting on the brushes is the only pressure it gets. The fruit runs down a cylinder brush about eight inches in diameter; as it goes down there is no other pressure but its own weight. At the same time, it rolls back against a flat brush which is moved back and forth by an eccentric, three inches. That turns the orange every time it moves, and when the orange comes out it is perfectly clean except for live scale.

A Member: Does the fruit go through any water?

Mr. Skinner: The water is sprinkled on it.

Mr. Williams: We cannot put up anything as elaborate as that. We want something cheaper for our packing house where we pack our own fruit. I am satisfied with a machine that will clean the orange and take off any scale. We haven't the whitefly now, but we know we will have it in a short time.

I would like to ask Mr. Skinner if his dryer is a solid belt of canvas or duck.

Mr. Skinner: The one I have now is made with a sprocket chain on each side of a wide strip, say thirty inches. We rather think in the packing house that a cotton belt seems to absorb too much water; however, the cotton belt you saw at Mr. Temple's would give less trouble. The air that is forced through would keep the belt dry.

Now, the sprocket chain we have been using has been giving trouble, I am free to say that. If you get one sprocket more on one side of the chain than you do on the other, there certainly will be.

There is no patent on this dryer, and I think Mr. Chase, Dr. Inman and one or two others have sent men there to get data about one thing and another preparatory to putting it up in their houses. I think I might be able to get this data published.

Mr. Williams: When will the machine be put on the market?

Mr. Skinner: I am getting material for 25 of the washers together, and suppose they can be assembled this summer.

A Member: How many boxes can one of them run an hour?

Mr. Skinner: I can't tell you just now how many, but it will run a whole lot of them. My dryer was thirty feet long and three feet wide. There is a double run and it takes about twenty minutes for them to go through. Maybe you can figure that out.

Prof. Hume: I think the point brought out with regard to Mr. Skinner's washing machine is extremely interesting and important.

We have all heard of the great success of the California Fruit Exchange. All of their work has been attempted in Florida. It has met with a great deal of success, and we believe that it is doing great things for the State. The success of this exchange for the past winter has been, of course, largely dependent upon the men who have been handling it. It has passed through the most critical season of trial and the success of carrying it through is due, to a great extent, to Mr. Burton, and I am now pleased to introduce to you, ladies and gentlemen, Mr. R. P. Burton.

Prof. Hume: Three years ago, a number of men interested in the growing of pecans met and organized a small association known as the Georgia-Florida, Nut Growers Association. That association has grown to be one of considerable size and it has been doing a very important work in connection with the development of the nut growing industry. Those who are not intimately in touch with nut growing are not aware of the developments that are taking place, but one of these days we will awaken to the fact that a new industry of vast importance has taken its place in the south.

Now, we have with us tonight by special arrangement, the members of this Nut Growers' Association, and the joint program is in their hands, and I am pleased to introduce to you, to take charge of the Nut Growers' part of the program, Mr. Miller, president of the Nut Growers' Association of Georgia and Florida.

Mr. Miller: Ladies and Gentlemen: You will have to take Mr. Hume's word with regard to the size of our association, as the representatives we can produce tonight would not indicate that our numbers are very strong. Unfortunately, a combination of circumstances prevented quite a number who originally intended to come to this meeting, from attending. Our friends in Georgia found it inconvenient to come to this meeting at this time. I am glad, however, to see that we have a representative from the State of Georgia and am very sorry that we did not have more.

We have something more than fifty members in the State of Georgia, and a like number in the State of Florida.

What we lack in numbers, we will try to make up to you in interest tonight. If anyone is interested, we will be glad to have you ask any questions which may come to your mind, and we will answer them to the best of our ability.

Stem End Rot

Prof. H. S. Fawcett.

Mr. President, Ladies and Gentlemen:

Stem end rot of citrus fruits is perhaps one of the most serious diseases with which the orange growers have been called upon to contend. As if we did not already have our share of troubles to keep us in a humble condition of mind, this new plague sweeps down upon us and threatens the destruction of the sound fruit itself after we have brought it safely past all the other enemies that threaten it. A somewhat similar disease of lemons in California, called the Brown Rot, threatened the very existence of the lemon industry there. Preventive measures were worked out by the California Experiment Station after a good deal of study and the lemon growers have so learned to handle the crop that little trouble results. It is possibly along similar lines that prevention of the stem end rot will lie. We expect to carry out some extensive experiments for the control of this disease this next season and we will try out some of the best methods found by the California Station as well as other experiments suggested by the study of the fungus.

It is important to investigate this decay at once to see if there may be any means of preventing its spread or of keeping it out of a grove or locality where it is not already found. The decay has become most serious already in a number of localities in the State. It appears to be most prevalent in Volusia, Lake, and Orange counties. Our correspondence has shown that it is found in at least 20 towns scattered over the middle part of the State from east to west, but probably worst in the three counties mentioned. It is difficult to predict what it will do next year. It may be worse or there may be different conditions of seasons and weather so that very little trouble will result from it. (The conditions influencing the occurrence and spread of the disease is a feature needing our study and investigation. There are a number of things about it that are quite puzzling, but when we come to understand the life habits of the fungus causing it better, we will perhaps then be in a position to explain these things.)

The amount of loss from this disease during this year is rather difficult to estimate, since it varied a great deal between different localities and different groves. In one locality in Volusia County the loss from dropping of fruit was extensive. In one grove which I visited that had been well cared for and in which the trees looked in good condition, it was estimated that one-third of the grapefruit dropped, due largely to the stem end rot. One-fourth of the oranges were said to have been lost in the same grove. In another grove ten miles from this one, 10 to 50 per cent. of the fruit was on the ground by the first of December and a large percentage of this fruit developed the stem end rot, mostly after they had fallen from the trees.

HISTORY.

The first knowledge that I had of the existence of this disease was in November of last year when 4 specimens of grapefruit were sent from Volusia county. Two of these fruits showed a softening at the stem end, without at first any discoloration on the outside. On examining the interior of the rag and pulp cells under the microscope, large fungus threads were seen which appeared to be quite different from any that were known to occur in connection with other decay of fruits. Cultures of this fungus were obtained from these fruits by the ordinary laboratory methods.

The fungus when it grew up in the culture dishes was different from any I had before seen in connection with citrus fruits. In a day or two letters came from two or three other places indicating that the trouble was more general. We then began to realize the seriousness of the situation and I began some preliminary experiments to see if I could infect healthy oranges with this disease. I began first with grapefruit and then oranges, and found that almost invariably the fruit on which cultures of the fungus or on which pieces of diseased oranges were placed at the cut end of the stem, began to soften in from a week to three weeks' time.

DESCRIPTION.

The fruit begins to soften and sink a little round the stem end, without the rind changing color. There is no blackening or moulding at first, and the rind remains intact over the softened interior. The rot proceeds inward along the fibers of the rag, and then outward to the pulp cells. At first both the inside and the outside of the fruit remain almost unchanged in color; but, as the softening goes on, the rind turns dull brown. Finally the rag and the pulp cells are disintegrated, and the entire fruit becomes soft and mushy.

This rot usually occurs on full-sized fruits after they have colored. Though the softening may begin while the fruit is still hanging on the tree, it usually develops after the fruit has dropped or after it has been picked.

The stem end rot is mainly but not entirely a decay of fully mature fruit and is usually seen on fruit after they have dropped or have been picked. The characteristic softening does sometimes occur while the fruit is still hanging to the branches. This shows beyond doubt that the fruit may be attacked while yet on the tree, that in some way which we do not yet know, the fungus gets to the oranges on the tree. How early in the development of the oranges the fungus may attack them I do not know. One grower who has had some stem end rot for two or three years past said that he first noticed it a little in September. At that time he said the fruit as they hung on the tree showed circles around the stems which ripened up sooner than the other part of the fruit. This would indicate that the fungus may make its attack at least as early as the first or middle of September while the fruit is still somewhat immature. The same grower said that the rot was very noticeable by the middle of October and at its height by the first week in November. Long hot dry spells, rain, and cooler weather seemed to check it. As said before, the symptoms of the decay usually show most on dropped oranges after they have lain for some time upon the ground. In most of these cases it is reasonable to suppose that the infection with the fungus is the direct cause the dropping and that the signs of the decay develop later after the fruit has dropped to the ground. In several instances where suspected fruit was picked from the tree and laid out on the table in the laboratory, they afterward developed the decay. The fact, too, that it took from a week to three weeks for the softening to show after fruits were inoculated with the fungus shows that infection must take place one to three weeks before there are any outward signs of decay.

If the decay of fruit showed only on the trees and on the ground it would be serious enough, but this is not the end of the trouble. The decay develops on the way to market in spite of any of the known precautions used for preventing decay from the blue mold or other rots. This is the most serious phase of the trouble. As has been indicated, the investigations as to the cause brought out the fact that it could be started directly by inoculations of a species of fungus. A study of this fungus was made to find out what its nature was. At first we thought it might prove to be the same one that causes the Brown Rot of lemons in California, but after some study I decided it was a species of *Achlya*. The species of the genus *Achlya* are water moulds. They live normally in ponds and ditches, and fresh water streams. None of them as far as I know have before been known to be parasitic on plants, although some of the forms related to Achlya are parasites of insects and of plants.

Two questions will probably present themselves to your mind. Where did the fungus come from in the first place and how does it get up into the trees to infect the oranges? To both of these I will have to say I do not know, except that it evidently lives in the soil. I am trying to answer the latter question as to how it gets into the trees. The fact is that it gets to the tree and just how is only a conjecture. I find in some cases kinds of bunches or coils of fungus that develop when the fungus grows up into the air, out of liquid cultures. It is my theory that these act as a sort of spores to carry the fungus from the soil or from previously rotted fruit to the fruit on the trees, but this remains to be proved.

INOCULATION EXPERIMENTS.

I shall now confine myself to facts and leave theories and speculations. The decay is highly infectious as will be seen by examinations of the results of some inoculation experiments carried on at the Experiment Station laboratory. To find out just how the decay could be transmitted to sound fruit I started a number of different experiments.

First we placed pure cultures of the fungus on the stem end and on other parts of the surface of sound fruit. We also placed pieces of previously rotted fruit on the stem end of other fruits. We also wished to determine whether or not the fungus could get into the fruit through the attached stems. For this purpose we had oranges shipped in from a point where we had been unable to find a trace of the stem end rot, with stems of various lengths from 3 inches to 1-2 inch.

The accompanying table shows the result of these tests. We kept check in every case. This experiment shows that infection may be produced easily through the stem end, but with more difficulty through other parts of the surface. In most of these tests the oranges were kept at a temperature of 85 degrees F. in an incubator. In my last press bulletin I said that infection seemed to take place only through the cut end. This was based on some preliminary experiments at room temperature during the month of December. At the cooler temperature at that time no infection took place except at the stem end of the fruit. Since that time I have found that infection may take place through other parts of the orange. Infection also takes place easily under laboratory conditions through stems 3 inches and shorter.

Table No. 1.

Manner of Inoculation.	Percentage of Decay
Cultures on blossom end	43
Cultures on calyx, cut end waxed	60
Cultrues on end of stems, stem 3 inches long	45
Cultures on end of stems, stem 2 inches long	50
Cultures on end of stems, stem 1½ inches long	100
Cultures on end of stems, stem 1 inch long	100
Cultures on end of stems, stem ½ inch long	100
Cultures on end of stems, stem 0 inch long	100

This table shows the percentage of decay in oranges from inoculation with pure cultures of Stem-End Rot fungus. The figures are taken 3 weeks after inoculation. Small bits of fungus were placed on parts indicated and a piece of wet cotton placed over them. The oranges were then wrapped as for shipment and kept at 85 degrees Fahrenheit.

We also wished to determine whether infection took place from the fungus in water. Fruits were soaked in water containing cultures, for varying lengths of time, and others in water containing pieces of diseased fruit and still others in soil from under diseased trees.

As checks some test fruits were also soaked in pure water under identical conditions to those above. The second table shows the results of these experiments. These experiments show very clearly that infection may take place through the medium of water by means of pure cultures of the fungus, by means of pieces of previously rotted fruits, and by means of soil from under infected trees.

Table No. 2.

Oranges.

Manner of Inoculation.	Percentage of Decay.
With cultures in water, 4 hrs	25
With cultures in water, 7 hrs	50
With cultures in water, 24 hrs	40
With diseased fruit in water, 4 hrs	50
With diseased fruit in water, 7 hrs	100
With diseased fruit in water, 24 hrs	90
With soil from under infected tree, 3 lbs. in water 24 hrs	75
Soil, air dried 16 days, 3 lbs. in water, 24 hrs	12
Check. In water only—24 hrs	00

Lemons.

With cultures in water, 24 hrs	64
Check. In water only,—24 hrs.	00

This table shows the results of soaking oranges and lemons in water with pure cultures of fungus, or with pieces of diseased fruit, or with soil from under infected trees, as compared with soaking oranges in pure water. After soaking for stated time, each fruit was wrapped as for shipment and kept at about 85 degrees Fahrenheit. The figures show percentage of decay from Stem End Rot in 3 weeks after inoculation. Those soaked in pure water showed no decay from this cause.

Having found out something about the habits of the fungus, how it infected the fruit, etc., the next question was to try some experiments to see what would prevent infection. Since the disease was somewhat similar to the Brown Rot of lemons in California we planned an experiment similar to one that had been carried out for that disease. We placed cultures of the fungus in jars of water and at the same time put into it certain disinfectants. We used copper sulphate, formalin, potassium permanganate, iron sulphate and ammoniacal solution of copper carbonate. The experiment indicated that the copper sulphate, copper carbonate and potassium permanganate would prevent infection, but it was not at all conclusive since it was found that the oranges on which the experiment was tried proved afterwards to have been affected with stem end rot before being treated.

TREATMENT.

Treatment or preventive means that suggest themselves as a result of study of the fungus and our experiments in infecting oranges and in preventing infection are of two kinds: (1) Treatment in the grove to prevent the infection of fruit on the trees, and (2) in case oranges must be washed, treatment at the packing house to prevent oranges from infecting one another at the washer. Probably the most feasible treatment in the grove will be to use the ammoniacal solution of copper carbonate. This should probably begin as early as the first of September or sooner, judging from the reports we have of the time when the decay begins. Bordeaux mixture could be substituted for the ammoniacal solution at this time, and the ammoniacal solution used later when there was danger from staining the mature fruit. I tried some experiments with the ammoniacal solution of copper carbonate in December, but this was probably too late to get any marked results. However, the treatment did show some results, about 10 per cent. less stem end rot being found on sprayed than on unsprayed trees.

This next summer and fall I intend to take up some more extensive experiments in some orange groves. The second line of treatment will consist in treating the wash water with some disinfectant to prevent the fruits from infecting one another in the process of washing. It seems to me this may be done either by throwing into the tank a fungicide as is done for Brown Rot in California or perhaps better in allowing a spray of some fungicide to play over the oranges as they leave the washer.

To sum up, the facts about stem end rot are that it is caused by a fungus related to the water moulds. It attacks oranges, grapefruits, tangerines, lemons, and sour oranges. It attacks the fruits usually at the stem end but may under some circumstances enter at other places. It may be transmitted from diseased oranges to healthy ones by contact or by soaking them together in water. The fungus may infect oranges through a stem at least three inches long. Oranges may be infected by placing them in water with soil from under trees from which decayed fruit has fallen. It takes from one to three weeks after infection at ordinary temperatures for symptoms of the decay to appear.

The probabilities are that the fungus has spores or aggregations of hyphae by which it is carried to the oranges while on the tree. It is probable that the fungus infection may be easily prevented by spraying with some fungicide early in the season. It is quite probable that any new infections after packing can be prevented by a fungicide in the washer. It is also quite probable that we will find that it is influenced by some climatic or weather conditions or some weakened condition of the trees. This is about the sum of our information and probable theories at present. As we come to learn more about the habits of the fungus and the conditions that enable it to attack the fruit we will probably be in a position then to suggest an effective remedy.

DISCUSSION.

Prof. Hume: I have heard a good many discussions on the subject of diseases of plants, but I do not remember to have heard a clearer and more intelligent paper than that we have just listened to. I must say that the subject of stem end rot has been most admirably handled.

Mr. Hart: I would like to ask if, when you are treating oranges, it would not be best to do it before they go in the washer. It seems to me that the experiments would indicate that if there were any spores on the fruit, they would infect any of the fruit that goes through the washer.

Mr. Temple: I think I can give you a little information on that point, having had more experience probably than anyone in the State. It would be very well to treat this fruit before it goes through the washer or cull it from the sound fruit, if there was any way you could tell just what fruit was affected, but it comes into your packing houses seemingly perfectly sound. I have packed it and let it stand in the house, and in twenty-four hours the box would be a perfect mass of pulp.

One way you can tell is to cut the orange in half from the stem end down, but it would be pretty serious if you had to test all your oranges that way. If you cut the orange at right angles from the stem end to the blossom end, you will find a little mealy white speck which looks very much as though the fruit had been frosted; then there is a slight brownish discoloration, and the fruit has a decidedly spoiled odor, but from the outside of the orange you could not tell to save your life whether the fruit was or was not affected in this way.

We were almost ready to start packing oranges in the fall when two of our clients came to us and told us we must pack their fruit right then. We investigated it carefully and found a lot of fruit on the trees that was ripe, so we started to ship and that was where we first discovered the stem end rot in our section. I sent some to the Experiment Station and some to Washington.

I have tried various things in the soaking tank; ammoniacal copper carbonate and other things, but it does not seem to help any.

Prof. Fawcett: I believe the infection of the stem end rot which shows up after the fruit is packed is made either before or during the time it is going through the washer. I believe additional infection might take place in the washer, but if you treated them after they came out, it would destroy the danger of infection. The twenty minutes or so the oranges are in the bath would not be time enough for the fungus to grow into the rind.

I believe a feasible way to prevent infection from the wash would be to have a fungicide sprayed upon the fruit when it comes out of the washer. I suppose many of the fruit are infected on the trees through the rains and dews, possibly.

Mr. Skinner: How about permanganate of potash? Would a spray of that be effective. That is what they are using in California and what I used this year.

Prof. Fawcett: They use that in California for Brown Rot and it is very good. The only trouble with permanganate is that it stains the oranges, especially if the orange has a rough surface.

Mr. Temple: The trouble with the suggestions that we disinfect the orange after it leaves the washer is this: no matter if you do that, and disinfect every orange that has become contaminated in the washer, the fruit that is already diseased goes through and shows no signs of breaking down, so that you cannot tell the sheep from the goats. After it is packed, it breaks down very quickly and the results on that box of fruit are just the same as though you had not disinfected it at all.

The Whitefly Investigations

Dr. E. W. Berger.

Mr. President, Ladies and Gentlemen:

The whitefly investigations have now been in progress for nearly four years. It is the purpose this evening to review the general results in a few words and to state briefly the recommendations for whitefly control as they apply under various conditions and localities.

Previous investigators of the whitefly worked along about the same lines that the investigators during the past four years have worked. They sprayed, found and studied some of the fungus diseases, fumigated and gave the best advice warranted by the investigations. We, including the representatives of the Bureau of Entomology with headquarters at Orlando, and the several members of the State Experiment Station, have taken up the work where our predecessors left it off; and while their work would naturally be along more general lines, it has fallen to us to continue the work more extensively in special directions. Thus while Dr. H. J. Webber, back in the 90's, sprayed and observed the work of the red and brown fungi, and Professor Gossard later fumigated, it fell to the lot of Dr. Morrill and his associates at Orlando, Fla., to make fumigation so simple that any one who can weigh and measure and count feet can fumigate. The Experiment Station at the same time has found several more fungus diseases, namely the yellow fungus (*Aschersonia flavo-citrina*) the cinnamon fungus (*Verticillium heterocladum,*) and the white fringe fungus (*Microcera* sp.), and has perfected the spore-spraying method of introducing and spreading fungus. It has refined spraying by directing attention to its peculiar applicability against the younger whitefly larvae, and has found that the so-called whitefly consists of two species, namely, the white-winged species (*Aleyrodes citri*), and the newly discovered cloudy-winged species (*A. nubifera*). These are all steps in advance, but who knows that other investigators coming after us may not carry the investigations as much farther as we believe that we have carried them beyond our predecessors. We come and look and see a few things clearly, but how many important points we may not see!

The speaker is of the opinion that the higher points of the whitefly investigations have been reached except perhaps the one of finding more of its natural enemies in the Orient or elsewhere. It is, of course, difficult to know what the outcome of such a search may be, but we can never know until we find out by actually making the search. Should no more effective parasites (insect or fungus) be found, the negative results would still be of value. The hope of relief from natural enemies more effective than the ones known at present would be disposed of, and this would probably result in making more efficient use of the means of control already at hand. One thing is quite certain, that the task of finding a more effective natural enemy of the whitefly in its native home may prove a most difficult one and require a more or less protracted search.

While, as stated, the higher points of the whitefly problem appear to have been touched, there still remains a considerable number of smaller problems that need to be solved and the finishing touches made. The conclusions of previous experiments and observations need to be continually verified in relation to different localities and varying seasons. Some of the minor problems may prove to be high points, and we cannot always know of how great importance a new discovery may be until we have made it and know some of the facts connected with it. The discovery of the cloudy-winged species appeared at first to be of but little practical importance until it was found that the yellow fungus thrives upon it only, and that it differs from the white-winged species by apparently not having any food plants except citrus. These facts, together with the knowledge that the cloudy-winged species is less virulent, are of some importance when adapting repressive measures.

METHODS OF CONTROL.

The subject of fumigation with hydrocyanic acid gas will not be specially discussed, but referred to in its proper place, because Dr. E. A. Back, one of Dr. Morrill's associates in the fumigation work is present this evening, and can answer all questions on this subject. Besides, bulletin 76 of the Bureau of Entomology, U. S. D. A., can still be obtained by sending 15 cents to the Supt. of Public Documents, Washington, D. C. This bulletin, by Dr. A. W. Morrill, gives the necessary information on fumigation.

Since the speaker has recently had occasion to discuss the different phases of control, both in speech and writing, it follows that what he has to say on this subject tonight will be a repetition to many. On the subject of control the speaker further prefers to quote from a manuscript intended as the next Experiment Station Bulletin on whitefly (Bulletin 103).

THE FUNGUS DISEASES.

It is a well established fact, but not so well known, that insects are subject to diseases as well as other animals and men. Among the principal disease producing agents of insects are certain parasitic fungi, and the whitefly fortunately is subject to attack by about six. These are the Red Fungus (*Aschersonia aleyrodes*), Yellow Fungus (*Aschersonia flavo-citrina*), Brown Fungus (*Aegerita webberi* Fawcett), Cinnamon Fungus (*Verticillium heterocladum*), White Fringe Fungus (*Microcera* sp.), and occasionally a species of Sporotrichum, related to the Chinchbug Fungus. These are all parasites of the larvae of whitefly, except the last one, which has occasionally been found infecting dead adult whiteflies and presumably had caused their death.

As it would fall without the scope of this paper to fully discuss each of these fungi, the Red Aschersonia will be alone treated in some detail followed by only brief statements on the others.

The Red Aschersonia.—This fungus has given satisfactory results in localities where the summer rains were normal, or where the trees were in good condition and the general moisture conditions about the grove were sufficient. In dry localities, or where the trees are out of condition generally, the fungi cannot always be depended upon to check the whitefly sufficiently to retain, or to bring the trees back into good condition. However, by diligent effort at spreading the fungi, some relief can be obtained even under adverse conditions, if these be not extreme. Thus, in a certain grove into which the red fungus had been introduced the previous year and in which it was not thriving especially well, giving only very inadequate relief, a single spraying in August, 1908, of the fungus spores into 6 trees in part of a row resulted in something like 10 times the amount of fungus in these trees than in those on either side or to the ends. Ten times as much fungus, of course, implies ten times as many whitefly larvae killed and that in many instances, diligent application of the fungi would give results fully commensurate with the time and money spent. Introductions of fungi should be thoroughly made, and if necessary repeated several times during the period of summer rains. The grower must not expect the fungi to do it all alone, he must help the fungus destroy the whitefly by spreading it at the best time. It should be added here that proper fertilizing and cultivation of the trees is important, since a thrifty tree full of healthy foliage presents conditions favorable for fungus growth and, of course, can better w.thstand the attacks of the insects generally.

In order to start a growth of the Red Aschersonia, it is only necessary to spray a mixture of the fungus spores in water onto the whitefly larvae in the infested trees. The spores are the seeds of the fungus and are produced in enormous numbers in the red elevations or pustules of the fungus covering the dead larvae. The writer generally uses about 40 pustules to a pint of water. More can be used, or less if fungus is scarce. The spores are easily soaked out of the fungus and in practice leaves and fungus are soaked in the water together. It is not necessary to allow the leaves with fungus to soak longer than 5 or 10 minutes, but a longer time does no harm and the mixture of spores and water may even be allowed to stand for 12 to 14 hours without injury. Microscopic examination of the fungus after having soaked it in water for a few minutes showed that only an insignificant proportion of the spores remained. The mixture of spores and water should be strained through coarse cheesecloth or fine wire gauze in order to remove all particles liable to clog the pump. Mixtures of fungus spores and water should not be allowed to stand in copper or brass pumps and vessels longer than a few minutes as copper is a fungicide and may injure the spores. It is best to avoid copper and brass vessels altogether. Growths of fungus can generally be observed with the unaided eye in about three weeks after spraying the spores and water into the whitefly-infested trees. The most successful introductions of the Red Aschersonia have been made during periods of rain and when the whitefly larvae were young.

Thus one of the most luxuriant growths of the Red Aschersonia that the writer succeeded in getting was at DeLand, during a period of rain in April, 1908, at which time also the spring brood of larvae were in the early stage of development and very susceptible to infection by fungus. Generally speaking, the period of summer rains is the most certain time to spread fungus and to introduce it into new places. Seed fungus can generally be obtained from whitefly infested groves in which the fungi have been previously introduced or in which they occur naturally. Since the fungi do not spread during winter, but are nearly dormant, seed fungus is sometimes scarce during the spring months, but can generally be obtained. By midsummer a crop of fungus has matured upon the spring brood of whitefly larvae, so that fungus is then abundant. The writer does not recommend introducing fungus after the period of summer rains is over, unless it is desired to get it started in fall, when seed fungus is most plentiful, preparatory to having it already started when spring opens. The writer has successfully introduced fungus as late as October and December, and while but a meager infection resulted at the time, this spread rapidly during the following spring and summer, or as soon as there was sufficient moisture and warmth. The mixture of spores and water may also be applied by a whisk broom when no pump is available.

Other Fungi.—The methods for introducing any one of the other fungus parasites previously mentioned are in general the same as the method just described for the Red Aschersonia. The Red and the Yellow Aschersonias, however, can be introduced with the greatest certainty, and as a whole are generally the most efficient, excepting the Brown Fungus when conditions for it are right.

One important point in regard to the Yellow Aschersonia must not be omitted. This fungus thrives only upon the cloudy-winged whitefly. This fact is important, since it would be useless to introduce the Yellow fungus on the white-winged species. The Yellow fungus might almost be said to be characteristic of the cloudy-winged whitefly since wherever the Yellow fungus is found, there also is found the cloudy-winged whitefly. The converse of this is not always true, however, since this fly may exist without its parasite.

Pinning Leaves.—Pinning leaves having whitefly larvae infected with a fungus upon them has been extensively practiced but the spore-spraying method has now almost displaced this method. If leaves are pinned, each leaf should be pinned, with its fungus side down, to the lower surface of a leaf on the whitefly-infested tree. Such was the position of the leaf on the tree before picking, and it should again be placed in its original position, as the fungus will more readily be distributed by its natural agencies when in that position.

TREATMENT WITH INSECTICIDES.

As previously stated in the topic on the fungi, there are dry times, and groves out of condition, when the fungi will not thrive sufficiently. It then becomes necessary to spray or fumigate, keeping the fungi well spread, however, during the period of summer rains.

The writer is aware that spraying with insecticides has been more or less in disfavor. On the other hand, operations and experiments of the past year indicate clearly that effective spraying can be done, provided the several stages of development of the whitefly are taken into consideration and the spraying properly timed. The difficulties in the past have probably been that spraying was done at the wrong time, reinfestation from surrounding groves, and poor spraying. The difficulty of spraying so thoroughly that the under surfaces of all the leaves become wet with the spraying solutions can be overcome only in part, by taking special care to do the work thoroughly and by spraying at a pressure of 100 pounds or over. Spraying solutions are also more effective in hot weather.

Spraying for whitefly can be carried on successfully during those portions of the year when all or nearly all of the insects are in the larval stages or are pupae. During the most of fall, beginning with October, and the whole of winter we have the whitefly in the stages referred to. During a part of April or May, following soon after the disappearance of the spring brood of adults, there is another period of about a month when but few adult flies and eggs are present and the insect is again in its larval and pupal stages. After May and through September all stages of the whitefly including the adult winged flies are generally present in the trees and the period of rains being on besides, it is not a good time to spray because most of the adults fly away and the eggs are not generally destroyed.

Fumigation with hydrocyanic acid gas is recommended for winter use when there are no eggs or adult whiteflies.

For convenience of treatment further discussion of the artificial insecticides will be given under the two following topics.

WINTER TREATMENT FOR WHITEFLY.

Winter is a favorable time to treat the whitefly, because it is in its larval stages, and there are no adults to fly away or eggs that are difficult to kill. The older larvae and cooler weather, however, necessitate using all insecticides stronger.

There are two methods of winter treatment; fumigation, and spraying. Where fumigation can be employed, it is to be preferred. Those who have carried on extensive fumigation experiments claim that it is less injurious to the tree than spraying with insecticides. Quicker and better results can undoubtedly be obtained with it, especially on the larger trees where it is difficult to wet all the leaves by spraying. For small and medium-sized trees spraying can, however, be made just about as effective.

That winter spraying against the whitefly can be made effective has been demonstrated. The solution must of course be used much stronger in winter than in summer. The writer has in mind a locality in Florida in which the growers organized a protective league, and assessed each grower one cent per year for each tree he owned. In this locality, namely, Florence Villa, the whitefly had just become started in two or three groves, and the results of spraying have been so successful that but few if any more whitefly larvae could be found last fall than three years ago. These spraying operations appear to be the most successful on record. The insecticide was a good proprietary miscible oil. Another grower states that he has succeeded in keeping the whitefly confined to a few trees in one corner of the grove for four or five years by thorough spraying with another miscible oil. For winter spraying whale-oil soap should not be used weaker than 1 pound to 4 gallons of water.

Locality Just Becoming Infested.—Winter treatment should not be omitted in any locality in which the whitefly is just coming in and is confined to a limited area. Under such circumstances there is too much at stake to delay. Co-operation should be started in the form of a protective league. All the growers in such a locality are threatened, and no grower can afford to omit paying his share towards keeping the pest confined within its present limits as long as possible. It pays better to help fight the pest in another man's grove than to have it in one's own grove. Work should not be postponed with the thought that something can still be done in the summer, since by so doing the whitefly is given another chance to spread during its swarming period in April or May. Fumigate if possible, if not, then spray thoroughly.

Badly Infested Localities.—Where a locality is completely and heavily infested, the trees should be treated in winter in order to give them a better chance to set fruit in spring. If co-operation can be effected it is possible to do the work so thoroughly that no further treatment will be necessary before next fall or winter. If co-operation for an entire locality is impracticable it may be possible to effect co-operation on the part of the owners of the localized groups of groves. Where no co-operation whatever is possible each grower should treat his own trees. In this instance spraying should be the method of winter treatment. It would be inadvisable to go to the expense of fumigation where the grove is not isolated and reinfestation certain, but spraying should be done. Later in April or May, when the grove has become re-infested from the groves of indifferent neighbors it should be sprayed again. There is a time in April or May when the whitefly larvae are young and easily destroyed by whale oil soap (1 pound to 6-9 gallons of water) or by any other good insecticide sufficiently diluted so as not to injure the leaves or young fruit. This period comes about two weeks after the spring brood of adults has disappeared from the wing. After that, during the period of summer rains, if conditions are at all favorable for fungus growth (plenty moisture, and good condition of trees) the fungus diseases of the whitefly should be introduced. Finally, if necessary, the trees should be sprayed again in October or November; in which case treatment during next winter will probably not be necessary. (See also under Spring, Summer, and Fall Spraying.)

SPRING, SUMMER AND FALL SPRAYING.

Spring Treatment.—Spring treatment should begin about two weeks after the winged whiteflies have ceased swarming and have disappeared. There are then only young larvae beneath the leaves. This period comes in April or May, and earlier, depending upon the season and the locality. In localities where the spring rains are abundant and the general moisture conditions throughout the season generally suitable, the fungi, preferably the red Aschersonia, may be introduced as previously directed. Where the conditions for the fungi are not suitable, or where it is desired to depend altogether upon spraying, the spring period indicated is a most suitable one in which to spray. The advantages of spraying at this time may be summed up as follows: (1) The whiteflies are in the young larval stages and are easily killed; (2) they are mainly on new growth and more easily sprayed; (3) the larvae are destroyed before sapping the strength of the new growth, and before much sooty mold has developed; (4) there are but few rains to interfere with the spraying.

Summer Treatment.—Spraying may also be carried on in summer during the latter part of June or July after the second brood of adult whiteflies has passed its period of greatest numbers for 10 days or two weeks. There being all stages present in considerable numbers at all times, and since rains are generally abundant, spraying at this time is not advised, except where the trees are suffering greatly. The fungi can generally be introduced to good advantage at this time and they should be spread freely whenever the whitefly is present in sufficient numbers.

Fall Treatment.—Fall is a very important time to spray for the whitefly and treatment may begin in October or November, or soon after the adult whiteflies of the late summer brood have wholly or nearly disappeared, and after the last layings of eggs have hatched. Groves sprayed in the early part of November with a spraying mixture whose principal ingredient was whale oil soap (about 1 pound to 10 gallons of water), showed that about 90 per cent. of the larvae had been killed. For the early fall spraying, whale-oil soap should not be used less than 1 pound to 6 gallons of water and may be used stronger. The advantages of fall spraying may be summed up as follows: (1) The young larvae are abundant and easily killed; (2) they are killed before they wax fat on the trees; (3) the trees remain clean for nearly five months; (4) there are few rains to interfere with spraying.

SPRAYING SOLUTIONS.

Since spraying for the young whitefly larvae must be done in spring, summer, or fall, when either tender leaves or fruit are on the trees, it is evident that a spraying solution must be employed which will not injure the foliage or the fruit. Almost any good contact insecticide can be employed, provided it is sufficiently diluted.

It has been found that soap solutions of 1 pound of soap to 6 gallons of water, destroyed all the larvae in the first three stages, and most of those in the fourth and pupal stages. Thorough spraying resulted in destroying between 90 and 96 per cent. of all the larvae on the leaves. Soap solutions of 1 pound of soap to 9 gallons of water destroyed about 90 per cent. Good's potash whale oil soap No. 3 was used, and also Octagon soap. It is probable that any kind of soap will be effective against these young larvae. In winter the soap solution should be used stronger, about 1 pound to 4 gallons of water; but a weak solution used in spring, summer, or fall, when the whitefly larvae are in the younger stages and the weather very warm, will give as good results as the stronger solution in winter.

"Golddust" was also used on young larvae at the rate of 1 pound to 4 gallons of water, and

90 to 95 per cent. were killed. Preliminary chemical examination of Golddust showed that it consisted of about 25 per cent. of soap, 62 per cent. of washing soda, and about 13 per cent. of water. One part of whale oil soap with three parts of washing soda gave practically the same result as Golddust, when each was used in the proportion of 1 pound to 4 gallons of water. One pound of whale oil soap to 9 gallons of water gave practically the same result as the whale oil soap and soda mixture, at about the same cost, which was a little less than half a cent per gallon. Whale oil soap is therefore a cheaper material to use for spraying than Golddust. A mixture equally good as Golddust can be made from whale oil soap and washing soda at about one-half the cost.

Dr. E. A. Back.

Mr. President, Ladies and Gentlemen:

Dr. Back: I regret very much that the transfer of Mr. Yothers to other investigations makes it impossible for him to be with us this evening. I also regret that the shortness of time at my disposal since I knew that I was to take his place on the program, and press of work has made it impossible for me to prepare such a paper covering the various phases of the whitefly investigations undertaken by the federal government, as your program indicates.

Since Dr. Morrill presented his paper before you two years ago, the investigation of the life-history of the citrus and the cloudy-wing whiteflies, and their control by fumigation, spraying, and natural agencies, such as fungi and possible bacteria, have been continued, and our results, aside from spraying, are now largely in manuscript form ready for publication. I will, therefore, not dwell at length upon these but state briefly that we still believe that fumigation, when conducted under favorable conditions, is the best and cheapest method of controlling the fly; that control by fungi will very seldom prove satisfactory unless Florida weather conditions change very much from those of the past five years; and that often a very large percentage of the death rate of either species is due more to possible bacteria than to known fungi. There has accumulated evidence to sustain the belief that bacteria are even more valuable in controlling the fly than known fungi. It is difficult to explain in any other way the wholesale destruction of the fly in a grove where little or none of the known fungi exist. For a better term, Dr. Morrill and myself have used "unexplained mortality" in referring to this kind of death rate.

At the present time, the agents of the Bureau of Entomology are giving special attention to insecticides and spraying. Spraying operations on a large scale are being carried on and gratifying results already have been obtained. A separate report on spraying will be issued at the completion of this work.

Instead of a paper, I have decided to read certain extracts from our manuscript which give some of the results of our spraying work with fungi. While these are not in connected form, they will answer questions that are being asked us every day. After reading these, I will show the lantern slides on fumigation prepared by Mr. Yothers.

(*Manuscript read not presented for publication as it will shortly appear in bulletin form.*)

Discussion following reading and lantern slides.

Mr. Porcher: I would like to ask if anyone present has had any practical results from fumigation.

Mr. Skinner: I fumigated a five acre grove and killed 98 per cent of the fly, and also killed all the crop for that year. My neighbor did not fumigate, and the next year all the flies from his grove—or so it seems to me—came over to my place and camped on my ground. I would not fumigate again unless everyone in the surrounding country did. It certainly kills the flies and scales, however. The Chases have two groves which they fumigated and absolutely kept the fly in check. They absolutely stamped it out. On their budded trees they have an elegant crop.

Dr. Back: I do not consider that fumigation is advisable in a grove surrounded by other infested groves unless everyone fumigates at the same time. Mr. Temple's "Baby" grove at Winter Park is a good example of the uselessness of fumigation when such conditions exist. And for this reason, also, the fumigation in the Earle and Sadler groves at Tangerine will be of no practical value in controlling the fly. On the other hand, the Friar grove at Victoria is an example of the good results that can be obtained by fumigation in an isolated grove.

Mr. Skinner: I might add, however, that the grove lost last year's crop, but it looks as though the trees will have enough this year for both years. I never in all my life saw trees have such a fine crop. The fumigation killed all the enemies the trees had.

Dr. Back: The fact that Mr. Skinner's grove did not bear a heavy crop the season following fumigation does not necessarily prove that fumigation was responsible for the poor crop. Fumigation sometimes receives credit for a poor crop when in reality it merely precedes what would under normal conditions be an off-bearing year. Our experience at St. Augustine and Victoria alone demonstrates that a heavy crop of fruit may set the spring following fumigation. And those who have noted the crop on the trees fumigated at Tangerine last winter, know that there is as much fruit on the fumigated as on the unfumigated trees.

Mr.—Even when you kill ninety-nine per cent of the fly you don't always have good results, do you?

Dr. Back: It is a very easy matter to fumigate and kill from 95 per cent. to 99.5 per cent. of the fly. While this seems like reducing the fly to the point of extinction, as a matter of fact, in a grove where there are from 150 to 200 living pupae per leaf, even if as many as 99.6 per cent. are killed, a large number of flies are left. If you kill 99 per cent. you have left at least as many flies as you have leaves, and by the following fall they will have increased to an astonishing extent. The length of time one fumigation will remain effective depends largely on the numerical abundance of the fly represented by the percentage that escapes fumigation. In other words, one fumigation when the fly is not excessively abundant in a grove may be expected to last two, or, in some instances, three years, while the amount of fly escaping a fumigation in a badly infested grove may represent numerically such a large amount of fly that the trees may become blackened by the following fall, if multiplication goes on unchecked by natural agencies. It seems probable that in very heavily infested groves fumigation two successive years can best be employed to reduce the fly to relatively small numbers when fumigation once in two or three years will keep the fly from blackening the foliage and fruit.

Mr. Scott: In Arcadia, the whitefly made its appearance about three years ago. Last winter we fumigated with these tents, I suppose about 1,000 or 1,500 trees, at an expense of $2,500.00 which was appropriated by the county. This year, if the fly has been seen there, I haven't seen it or heard of it. I have not seen a single one.

Dr. Back: In that work, about four of every thousand flies escaped fumigation. The percentage of fly killed in Arcadia is remarkable considering the adverse conditions.

Mr. Scott: We had a few chinaberry trees that might have harbored the fly and we cut them down, and all the Cape Jasmine and privet. There was some bad feeling about it, but I think it is all over now. It was just in town that this was done. We took it in time so that it has not spread out into the county at all.

Mr. Gillette: We use a great deal of spray during the summer killing the rust mite; that is, the sulphur solution dissolved with caustic soda or caustic potash. If the grove was full of the fungus you have described, would the use of this wash kill the fungus or have any effect upon it?

Dr. Back: As most groves are sprayed for the mite, I do not think that it will. I have seen groves sprayed for the mite where the fungus along the edge of the under surface of the leaf had turned color and appeared to have been killed, although I am not positive. Since in spraying a tree for the mite the undersurface of the foliage is not wet to any extent by the spray, I doubt if the fungus is seriously affected.

Mr. Porcher: If you sprayed four or five times during the summer, what effect would there probably be?

Dr. Back: I don't know how to answer that question except with this example. I know of one grove that was sprayed regularly throughout the summer for rust mite and in September that grove had the finest stand of Yellow Aschersonia that I ever saw.

Mr. Skinner: I might suggest that in spraying for the rust mite, you generally go at it from the top of the tree, so that the spray hits the upper sides of the leaves, and the fungi are on the under sides of the leaves.

Mr. Hart: Now, about straining the material; I note that you say to strain through fine wire. Is that what you use altogether?

Dr. Back: Just an ordinary wire strainer. We use wire strainers altogether.

A NEW THEORY FOR REPELLING THE WHITEFLY.

Chas. R. Hardy.

Mr. President, Ladies and Gentlemen:

The most serious menace to the citrus fruit industry of Florida appears to be the destructive effects of the whitefly. Almost every section of the State, except possibly far down on the East Coast, has suffered from visitations of the pest and considerable time and money have been spent in combating the inroads made by the insect in the groves of the orange growers.

At present three methods of extermination are being used with more or less success, viz: fungi, fumigation, and spraying with various insecticides. However successful any of these methods may be in cleaning up a grove they are but temporary expedients at best, and must be continued indefinitely, thereby adding considerably to the expense of growing a crop of fruit. The theory that I am about to suggest, and which I am firmly convinced will be the only positive and permanent means for successfully combating the whitefly differs radically from all these. It is simply to make the orange tree immune to the attacks of this insect and reasoning from analogy, I see no reason why it may not be done.

Several years ago the wheat growing industry of England was all but destroyed because of the rust that attacked the wheat fields. After experimenting with a large number of varieties of wheat which had been gathered from all parts of the world, one variety was discovered that offered great resistance to the attacks of the disease. This variety was proved to be immune and specimens growing among plants of affected kinds invariably repelled the rust. This was an important discovery, but this quality was about all that could commend this variety to the growers. In other respects it was a very poor and unsatisfactory grain. However, by crossing it with other varieties of more vigorous growth and larger heads, a strain was subsequently built up that exhibited all the best qualities desired in a good wheat and, in addition, it was also made immune to the rust fungus.

It is a well known fact to experimental botanists that individual qualities inherent in any species may be imparted to kindred species by cross fertilization and that varieties of plants may be successfully built up that will exhibit all the desirable features that may be inherent in the parent plants. How then may this principle be applied in producing an orange that may be immune to the whitefly?

Two methods at once suggest themselves.

First: bring together every species and variety of citrus fruits from every country of the globe where they may be found and subject them all to experiment. Place the whitefly among them and see if any trees exhibit repellant qualities to the attacks of the insect. If among them one plant should be found that does successfully resist the attacks of the fly, then this plant should be used, by cross fertilization, to impart its resistant quality to an orange that should as well possess all the other qualities desirable in a good fruit. But suppose, you may well object, that such a tree could not be found. It is quite possible, nay, it is even very probable, that no species of the citrus fruit is completely immune to the whitefly's attacks. In that case we must simply make it so. Another fact that is familiar to plant physiologists, is that when an organism is subjected to repeated and long continued attacks of a malignant disease, it will eventually become immune to it by the formation of antitoxins in the system and this, in many cases, is transmitted to the offspring. The African races having continuously been subjected to the attacks of the malaria germ, the negroes, even of our own country, are largely immune to this disease. The Hebrew race offers great resistance to tuberculosis because it has been subjected to attacks of this disease much longer than any other European people, and because tuberculosis appeared in Ireland long after it had become prevalent in other parts of Europe, the Irish are more subject to its attacks than any other white race. We are all familiar with the efficacy of vaccination in suppressing smallpox and of the use of antitoxins in the treatment of diphtheria and hydrophobia. But what has this to do, you may ask, with the immunizing of the orange to the attacks of the whitefly? Nothing, except that it points the way by which we may successfully cope with this peculiar trouble.

Taking into account the fact that nature provides a natural remedy for disease by gradually eliminating the weak and preserving the strong so that she may evolve a vigorous and healthy race, we would go to those orange trees that have longest been subjected to the whitefly's attacks and from the most vigorous of them raise a large number of seedling trees. These, when they had arrived at a reasonable age, should be infected with the whitefly and from those that most successfully resisted the insect other seedling should be grown. This process of infection and elimination would possibly have to be carried on for a number of generations in order that the cumulative resistant effects might be realized. On the other hand, as almost all trees and plants are subject to sudden mutations, it is quite possible that the desired result may appear in the second or third generation. It is not beyond the range of probability that if every infected grove in the State was carefully inspected more than one tree might be found already perfectly immune to the fly. I would suggest, then, that every orange grower in whose grove the whitefly has appeared should examine every tree to see if the resistant quality is apparent in any specimen. I believe, however, that the hope of producing a variety that shall be perfectly immune lies in breeding from infected trees and continuing the process until the resistant strain appears. This process offers little consolation to you of today, but if it should take fifty years to bring it about it will be well worth all the time, the labor and expense that may be expended on it.

The purpose of this paper is therefore to suggest a line of investigation and experiment that may prove fruitful of results. It is work for the State or the National government rather than for the individual grower to undertake, yet the growers themselves can do much in the way of preliminary observation that will assist in clearing the ground for a systematic attack of the problem in the manner suggested.

THE WHITEFLY PROBLEM.

James E. Kilgore.

Mr. President, Ladies and Gentlemen:

I am obliged to admit that I know very little directly on the technical side of this subject that is new and that will interest you. My best efforts have failed to bring out new facts with the proofs attached, and my study of the subject convinces me that the individual efforts of any grower of limited time and means, however observant he might be, will probably result the same way. But where the work is organized under an efficient head, with means to push it, the cumulative effect of the individual efforts may be of very great value.

I mean no reflection on the excellent work done by our experiment station men, or the gentlemen sent here from Washington. All that has been done in the past four years is due to them, and meager as the means were, especially those of the station, the results are far beyond what we had any reason to expect, and make the most valuable donation I have known to come to any business that was willing to wait till it could get something for nothing. For incredible as it may seem, we as fruit growers, or as citizens of the State of Florida, have never given a penny to help this work.

The national appropriation has given good results in improving fumigation and testing other work. Fumigation will be valuable to the progressive grower, if the less interested ones should be forced out of the business. If the cultivated plants were freed from fly in midwinter, there would be little fly left. It is claimed, that the woods are full of them, and that they would reinfest the groves in the spring, but I have failed to find a single citrus whitefly, in any stage, on a wild plant in midwinter. That there are a few such plants has been discovered by the Entomologist, but such plants could easily be eradicated.

The chief drawback with men from Washington has generally been that they cannot stay here long enough. The ablest men living would need two or three years time to study local conditions, before they can do their best work. But notwithstanding this drawback most of the pioneer work was done by these men, as well as some very excellent recent work.

The discovery of several new fungus diseases of the whitefly with practical methods of spreading them; the discovery of two species of the whitefly, and the difference in habits, and means of controling them, have been made by the Experiment Station, which has also made a general study of the spraying subject, in which it was found that any good spray will kill all the young larvae that it hits, but the pupae were found quite resistant. But a few new sprays seem promising.

All this, including fumigation, the fungi, and spraying, with a little experience nearly eliminates the damage from whitefly, under favorable conditions. This information is worth one hundred times what it cost, besides giving us well learned men, and it did not cost us anything. If "all things come to those who wait," the rest of the information we need so much will come to us, and may come free. But I am of the opinion that it would be better to secure the necessary funds and go after it, for our cheap wait is costing us millions of dollars, when with even a $25,000 annual appropriation from the State, we would probably in a few seasons see the dreaded fly no longer a pest of any importance, at least no worse than it now is in India and Japan, where it has been present for many years without serious results so far as we know. If we get the money, and we must get it, its use should be at the discretion of the director of the Experiment Station, and the Executive Committee of this Society. This sort of arrangement would not be good politics but it would be good business.

Our native fungus in most cases does good work; but when we have to combat a fungus disease, as scaly bark, withertip, stem end rot, etc., the friendly and unfriendly fungi must live or die together. So our most urgent need is an insect capable of keeping down the fly and scale, while we exterminate the pest fungi. Such insects may, and probably do, exist in Cuba, South or Central America, Asia, or Africa, where many species of whitefly, and many insects and fungus enemies to them exist, and where no competent person has studied the subject.

When the right insects are found they must be introduced here; and may be, taught to be bird wise. The bird problem is a serious one in this line of work. Most of our birds are either harmless or friendly to the farmer. Even some, like the cat bird, that are generally condemned are decidedly in this class. All the scientific work, on which our literary friends base their beautiful songs to the farmer, however, was done in places so remote, and where conditions were so different to ours, that it is of little value here, and I am sure that a competent unprejudiced observer (if there be such) would reverse most of the claims in favor of protecting the jaybird class, as they eat many insect eating bugs besides scattering weed seed, and eating valuable fruit, vegetables, grain, etc., for the protection of which we are very largely dependent on bugs, wasps, and spiders. But this is an immense task and we will not be able to properly protect the good birds till some honest, intelligent work is done in this line.

The first thing is to get the insects, and probably while we are on the hunt we will find more and better fungi also. But to do this, we must have good men, and their salary and traveling expenses must be paid. This will take "money" which has been and still is the real problem of the whitefly problem, and its solution is of an educational nature. If an automobile club wishes a $100,000 speedway, all it needs to do is to teach the farmer to consider the investment a good one, and it gets it. If any other interest wishes a few thousand or a few hundred thousand, a little missionary work among the agricultural classes, who directly or indirectly pay most of the taxes, will usually give the desired results. Now we must get ourselves to believe that a little money spent in this way would be a good investment, and when the favored interests who are so jealous of any public funds they cannot use, cry extravagance and ask if we are not already taxed enough, we can plead that such investment would make us better able to pay taxes. What we at present need is not a large amount anyway. Half of the special tax on the farmers in the sale of fertilizer and feed stamps, would do a lot of good. I don't see why the ever alert, educational interests, railroad interests, pension interests, draining interests, etc., have not observed this splendid opportunity to increase their revenue. But they may fear that if "old dobbin" got to feeling his oats he might kick out of harness. If they don't give us a little benefit from the load we carry, let's *balk* till they make it a whole lot lighter for us.

DISCUSSION.

Dr. Berger: There are places where the whitefly is just starting and where it is necessary to apply quick measures to check it, and to keep it from spreading to the surrounding groves. In such cases spraying is recommended, or fumigation, depending upon the season of the year. There are localities where the fungi have done excellent work; did as good work as would have been accomplished by ordinary spraying during the summer. In emphasizing spraying as I have done this evening, I do not mean to retract anything from the emphasis formerly placed upon the fungi. One remedy will apply in one place or at one time, and another in another place or at another time, and the more I study this whitefly proposition, the more I find that the results obtained by any few experiments in any one locality do not necessarily apply to all localities in the State. The State is too large; the conditions are too different.

Mr. Skinner: I want to ask Prof. Berger one question. It is not exactly about the whitefly, but it is one of consequence, and that is, the scale. I mean all kinds of scale, but mostly the ordinary long scale. What time is the best time to spray for the scale? What time are they generally on the move?

Dr. Berger: Some varieties first begin to move freely during March and April. They begin to move again later on, say June or July. According to what has been written about scales, we consider that there are three broods. I have not had occasion to work much with scales myself. The best way would be to watch the grove carefully. It is not so difficult to watch the trees and see the condition existing; whether the eggs or adults or crawlers are there. If they are hatching, that is, the young are crawling, that would be a signal to spray. In the spring, while spraying for the rust mite, you might mix Whale Oil Soap at the rate of one pound to about six gallons of the soda-sulphur or potash sulphur spray, which would apply against the young scales present as well as the mites. Soap would not mix with lime-sulphur solutions.

Mr. Skinner: We generally use sixteen pounds of Whale Oil Soap to the barrel, and sometimes we kill them, and sometimes we don't.

Dr. Berger: Of course, no strength of soap will destroy the eggs. It may destroy the adults but not the eggs. Spray one or two times during spring or summer when the young are crawling and note results.

Mr. Skinner: Is there any solution to effectually kill the scale?

Dr. Berger: I have seen very nice results with Schnarr's solution. It was used at Boardman in Mr. Sampson's grove last July and apparently it did not do any injury to the trees or the fruit. The Target Brand is considered in the same class. I have not had occasion to compare them, but reports put them about equal.

Mr.—How about kerosene emulsion?

Dr. Berger: Generally considered good; it is considered one of the best.

Mr.—What do you think of Thrip Juice?

Dr. Berger: Thrip Juice is recommended only against the young, crawling scales.

Prof. Rolfs: I would like to have a word. I think in a large measure our scourge of the whitefly has been due to our carelessness and indifference to the information we already have. In other words, we let infested chinaberry trees grow and breed whitefly by the millions, and then weep and bemoan our fate because the plague of whitefly is sent upon us. Now, I have in mind where a certain community thought it wiser to fight the whitefly when it was in another locality rather than to wait until it got into their own place. I found that it cost the people in that community one cent per tree per year to fight the whitefly in another fellow's grove. Now, if they had waited until the whitefly got into their own groves, they would have had to pay 25c. or 30c. a tree. We have adopted the "let alone" policy, when we should have gone out and been in the thick of the fray.

Dr. Inman: I think Prof. Rolfs was referring to our community, Winter Haven. I am drawing the attention to myself, but don't claim any of the praise. I was away when the whitefly was discovered, but I don't think it was more than forty-eight hours before a fund was raised to fight the whitefly. The assessment was one cent. per tree. There were very few of the people who did not join. Since that time, we have held the whitefly in check and have kept our groves clean and have not had a smutty leaf or fruit. The area over which the whitefly has spread, is very little, as far as we know.

Another question that I will discuss here, is the scale question. We all have some scale in the Winter Haven region, but we have it pretty well under control by adding Hammond's Thrip Juice as follows:

One-half pint Thrip Juice, beaten into an emulsion with an equal quantity of kerosene. Then add water to make a bucketful. Then strain the whole through cheese cloth into a fifty gallon barrel of Sulphur Spray, and stir thoroughly.

Thrip Juice should be used with caution and only early in the season and not after the fruit has become larger than an English walnut. Continuing its use after the fruit has assumed considerable size, may cause spots on the under side of the fruit where the concentrated drip evaporates and burns the skin. Another objection to using it late in the season is that it destroys the acidity of the fruit and renders it insipid. It is quite generally used in the Florence Villa and Winter Haven regions, and I have not for years heard of a grower complaining seriously of the scale pests.

It is very unusual to see scale infested fruit brought into the Exchange packing houses.

Mr. Porcher: We have used at Daytona Whale Oil Soap, Good's No. 3, as strong as eighteen pounds to fifty gallons of water. We have held the whitefly there in check, but have done nothing more than that.

I think I read an article by Dr. Back in the Florida Fruit and Produce News in which he speaks of the Schnarr and of the Target Brand insecticides, very favorably.

We are impressed by the fact that for years we have heard talk of the extermination of the whitefly pest, but we are no nearer this end than we were when we began. It seems to me that these government people, after they have made their scientific tests should give us complete, clear statement as to facts upon which to base conclusions. This Schnarr preparation as I understand it, has given very good results, and as Dr. Back has written an article, it seems to me that it would be a good idea for him to lead us along a little farther. I mean, the spray is recommended highly, but we hear nothing further than that. I would like a definite statement as to what it will and will not do.

Dr. Back: I would like to say that it is a very easy matter for entomologists to test our various patent insecticides and to determine their relative value. In fact, we have already done this with nearly all the whitefly insecticides and now have in press a circular on the subject which will give the information desired more fully than my recent article in the Produce News. One objection to our spending time in trying out patent insecticides is that in the past their formulae could be changed at any time and such changes necessitate a repetition of the tests. On the other hand, the general public has no way of determining the value of sprays urged upon them by solicitors except by costly experience and it is reasonable that they should have some way of learning quickly whether the spray advertised will do what is claimed for it, and that they have a protection similar to that given by pure food and the fertilizer laws. Had we been as active in telling all that we knew about certain insecticides that have been on the market during the past few years as their manufacturers were in advertising them, the growers would have been saved many thousands of dollars.

Dr. Berger: In regard to Mr. Porcher's statement that "We have held the whitefly there in check, but have done nothing more than that": what more do you want, Mr. Porcher? You have done well enough. Extermination is out of the question..

I would also like to make a little explanation here why it is that we Experiment Station and Government people are not more anxious to take up these patent sprays and test them out. We may get a batch of dope today; we don't know what the next batch is going to be like. The two may be just as different as though they were entirely different compounds. The Whale Oil Soap heretofore has run more nearly the same; it is a little different in this respect from most of the proprietary insecticides.

In my own case, working under the Adams Fund, I would hardly be allowed to take up these commercial insecticides and try them out, as I am supposed to be investigating other and more important things. It requires very little originality to try out a new spraying solution and see what results it will give.

I think from now on it will be different. There is an insecticide law before Congress, and I have just received a letter from the chairman of the committee on insecticides that the bill has passed. This law, of course, affects only interstate products, establishing certain standards to which each insecticide must conform. Proprietary brands must now get their patent and give their formula; in fact, it is very much on the order of the pure food and drugs act.

For instance; take the Target Brand, which is an article in interstate commerce. Now we shall have a right to expect that the Target Brand will be the same thing under that name all the time, that they cannot change it without permission, and we will be notified accordingly.

In regard to this bill, some of you here present received circulars and a copy of the bill from me. I was requested to push the matter the best I could here in this State. I received copies of the bill and some circulars. I sent some of them to Mr. Temple and I don't know how much we may be indebted to him for the passing of that bill. A copy went before the Directors of the Citrus Exchange and they passed resolutions recommending it.

Prof. Rolfs: I would like to say a word with regard to Mr. Porcher's question. Three different samples of one of the most popular insecticides that have come to the State of Florida, were received in my office during one week. No two of them tested out alike, but they were all under the same name. Now, what would be the economy in trying these different compounds out?

The proprietary insecticide business is in such a hopeless muddle that we cannot get head nor tail to it until we get laws regulating this just as the fertilizer and pure food is being handled. It would keep a corps of chemists busy to test out all the insecticides that come to the Experiment Station. A great number of them are practically the same thing. A great many of the analyses show that it is the same identical thing with four or five different names. We haven't time to bother with them all. I assure you that time is a commodity with us, very little of which is wasted.

Mr. Porcher: I agree with you gentlemen in all that; what I am trying to get at is that some method should be devised to have these patent insecticides tested out, because I am quite confident some of them are valuable. Now, the firm I mentioned this morning; the Cooper Nephews. They have produced a sheep dip the value of which is beyond question. My tests with it as an insecticide have been extremely favorable.

I think we ought to come to these meetings and feel when we go away that we have found out something that will be of value to us. We come here and we hear long papers, and the next man will get up and tell you he doesn't think what the first man says is very much good, as he didn't have much success with it, and then a third man gets up and tells you his way is right.

Personally, I do not believe for one moment that we will ever succeed in exterminating the whitefly by fungus. My belief is that it will be through spraying, or possibly through fumigation. While I have not, personally, any whitefly in my grove, I probably will have it in time, unless we find out something that we know will keep it in check. I consider it a most serious menace. We know that fruit that has been preyed upon by the whitefly, has lost its value. You may wash it and send it to market, but if the consumer has any taste in his palate, he will not purchase it again. Our only method is to exterminate that fly and, in my opinion, the only way to do it is by spraying in some form.

Mr. Mills: It has been several years since I have been at one of these meetings. We come here to learn things and I came purposely to hear this whitefly discussion. In Jacksonville, we do not have orange trees, but we have to fight it in the hedges. We have tried Whale Oil Soap; we have tried several of these patent remedies, but we have had the best success with the William Cooper Nephews' V. I. Tree Spray. There is the V. I. and the V. II, and we find that it gives the best results; better than either Schnarr's or Target Brand.

Dr. Back: We have tested the V. I. spray and our results do not quite agree with those of Mr. Porcher. At the recommended strength it kills but little over 50 per cent. of the fly when the fly is in the younger stages, and a very much smaller per cent. when the fly is largely in the pupal stage. Tests conducted under identical conditions with effective sprays killed close to 100 per cent. Recognizing the inferiority of the V. I. spray, as at present manufactured, the agent of the Cooper Nephews & Co. has verbally agreed to remove the spray from the market until it has been perfected.

We are not so much in need of a good spray, of which there are a number, as we are in need of thorough spraying. It is money thrown away if the work is done carelessly. For instance, last winter two groves here were sprayed with an effective insecticide, but the work was done in such a half-hearted manner that only about 50 per cent. of the fly was killed. Consequently, this spring the fly is very abundant and the foliage blackening, and it is already evident that the trees will be as black as last season. Naturally, the owner feels that spraying is a failure because he sees that his money has been thrown away. He does not realize that personal supervision together with a little educational work with the sprayers and an outfit more in keeping with the size of his trees, would have produced far different results.

Mr. Skinner: I want to stand up for the work the Government people are doing. They have gone into this whitefly proposition pretty thoroughly. I have spent, I suppose, $5,000 in fighting the whitefly and if I know anything I ought to know a little about it. I thought a year ago that spraying was the thing, but now I am not so sure of it. In some instances those who have sprayed their groves thoroughly have more whitefly than those who have not sprayed their groves at all, and that with groves right side by side. I can show you groves that have never been sprayed that two years ago were just a mass of black pollution that today are as clean as any groves you every saw, and that without the introduction of any fungus, except, perhaps, the white-fringed fungus that is native to the west coast. Of course, eventually we will find the solution of the problem, but I am free to confess that I think we are still working in the dark.

Mr. Temple: I, too, would like to say a little something about the whitefly proposition. For more than two years, I gave that my hardest study. I simply ate, drank, slept and dreamed "white fly." I sprayed, I fumigated, I applied fungus, I have done everything that anybody would recommend. I fumigated one of my groves and had it done in the most thorough manner possible; so thoroughly that I killed nearly all that year's crop. That was in February, and I had more smut in November than I had in February. In other sections of my grove where I have sprayed, the result has been reasonably satisfactory.

With the fungi, I think I have gotten the best all around results. I firmly believe that if you apply your fungus thoroughly, steadily, intelligently, that once in three years you will get a fairly clean crop.

But, gentlemen, if the best we can hope for is a clean grove once in three years, I would take an axe and cut down all my orange trees and plant the groves to peaches, which may be profitable, or camphor trees, which are beautiful. The orange industry is not worth a snap of your finger if we are going to depend on what we know to get rid of the whitefly.

I have been for two years, as Dr. Berger and Mr. Morrill will tell you, endeavoring to get a commission sent abroad to look up the home of the whitefly and find out what it is that keeps it in check; to find out what remedy Nature furnishes. I know Nature generally furnishes a means to keep the balance between the pursuer and the thing pursued.

As you probably know, Uncle Sam brought this thing in through his private green houses in Washington.

A lot of us started in and originated an idea of sending a committee abroad to try to find the original home of the whitefly and find the remedy that came to keep it down, because the whitefly came from somewhere and unless there is something there to keep it in proper limits, the place where the bird originated would have been a howling waste by this time.

We succeeded in getting a bill through, appropriating $10,000. We had selected Drs. Berger and Back as the men best fitted to go on that expedition. If any more funds were necessary there were plenty of us ready to stand back of it.

Now, I want to commit myself on the inside working of the powers at Washington. When we had gotten the bill through and the Committee on Appropriations were considering the matter, Mr. Howard went, unsolicited by any one and requested them to cut this appropriation in half. He said it was utterly unnecessary to spend that much; that he had in his office a very brilliant young man, thoroughly competent to make this investigation and report to us. If we do anything with this whitefly problem, we will have to send someone who is competent to be entrusted with this important commission, back to the place where the fly came from and find what bites it there. We must raise the money our own way, and then we can spend it our own way.

Mr. Hart: I want to say that Mr. Temple is expressing my ideas exactly, as to the remedy we may look forward to for doing away with the whitefly and making it a minor trouble.

It was not so many years ago since the purple scale was a serious menace to us. It is still with us, but not so very serious. I believe firmly that when we find the original home of the whitefly, we will find it to be a minor trouble, and if it is a minor trouble, there is some cause for it. If we find that cause and bring it here, the whitefly trouble will drop out of sight. I am ready to assist in this matter in any way that seems best.

I went to Washington last September to see what I could do in regard to this matter. I was one of the committee appointed by this organization. The other members of the committee could not well meet with me there at that time, but I expected them to go to Washington with me on the way back. I wanted to know whether the men we wanted to see would be there at the time we got back. I met with every courtesy and among others of the men I talked with, was Dr. Howard, and he put up this proposition in regard to Mr. Woglum. I was innocent enough, and supposed everything was all right. When I came back and reported, we started to raise a sum for the Florida growers to help in the work. Dr. Howard's proposition was that the Government would pay. Prof. Woglum's traveling expenses and for the Florida growers, or any other growers, who might be interested, to help with such sums as they cared to. Since then, it looks as though there is a nigger in the woodpile somewhere, and I have not known just what to do. If the orange growers want to raise the sum to send our professors there, Dr. Berger and Dr. Back, I am ready to contribute my part. I take it that if we must look for our help in the original home of the whitefly, we must do the whole business ourselves.

Mr. Barber: I would like to say a word in regard to the whitefly. This is something that affects everybody in Florida, whether they are orange growers or not. There seems to be a difference of opinion as to what is the best method to get rid of the whitefly.

I believe the suggestion made a few minutes ago is the correct one. I believe we should send someone to find out where it comes from and what its natural enemy is, and when we do find out, bring it here. It affects me and every other nurseryman in the State of Florida, and what it has done is not half what it is going to do. I have been able to keep it out of my nursery, so far, but I know that it is coming, soon or late. You can't convince people in other states that we have not got it in our nurseries and state after state has passed laws prohibiting the introduction of our stock into their confines.

The State of California burned $50.00 worth of pecan trees for me last winter a year ago, because they had passed laws of absolute quarantine on all trees out of the State of Florida. Now, we know that the whitefly would not live on a pecan tree, but they burned my trees just the same.

I know everyone here is interested in this matter, and we will all do all we can.

Mr. Wakelin: The question here and now is, what are we going to do about it? Did I understand that Dr. Howard is the man who is going abroad?

Prof. Hume: A Mr. Woglum, who was recommended by Dr. Howard. the one who is going abroad, and I understand he is to start on his trip about the first of July.

Mr. Temple: It doesn't do us any good to say anything, as the matter has been taken out of our hands by Dr. Howard. Of course, we can hope that there will be some results, although I doubt it.

Mr. Painter: What must I do with the funds?

Mr.—I move the funds be returned to the senders.

Mr. Henderson: I would like to ask if it would do any good to ask to have the men exchanged and instead of sending their man, send a man that we may select. It seems to me that we ought to have something to say about it.

Mr. Temple: I move that the secretary of the Florida State Horticultural Society be instructed to communicate with the Department of Agriculture and the proper bureau, suggesting to them the appointment of Drs. Berger and Back of Florida, as men to take up this investigation of the origin and natural enemy of the whitefly.

Mr. Henderson: I second that motion.

Prof. Hume: It has been moved and seconded that the Secretary communicate with the proper authorities in Washington and try to get them to substitute our men for the one they have already appointed to go abroad. All in favor please saye "Aye." The motion is carried.

Mr. Skinner: Mr. President, I object. The motion has *not* been carried. You did not ask for the negative of that question. Now, I feel that it is a very unwise move to make, and it may be there are others here who feel the way I do about it. I rise to a point of order.

Prof. Hume: You are right, Mr. Skinner, and I was wrong. The motion has not been carried.

You have all heard the motion; those in favor please say "Aye." Opposed "No." The motion is carried.

Mr. Temple: We can't be any worse off than we are now, whatever action the government may take. Mind you, through Mr. Fletcher we got the government to appropriate $10,000, then this man Howard, without any initiative or request from anyone, went before them and told them it was entirely too much; that they might just as well cut that in half; that he had a young man in his office who would go for his expenses; that is the way they foisted this thing off on us.

I think maybe when our Secretary takes the matter up this way it may put a little different light on the matter. Those people up there don't know our situation at all. They think Howard knows what he is talking about and we poor farmers aren't capable of judging what we want.

Mr. Rosenfeldt: You have overlooked Mr. Painter's request as to what to do with the money. I move that the money be returned to the people who sent it.

Prof. Hume: It has been moved and seconded that the sum of money that Mr. Painter has in his possession on account of the whitefly investigation, be returned to the people who so kindly and public spiritedly sent it to the Secretary of the Society. Motion carried.

Mr. Burton: I think there is one point that this meeting should take into consideration, and that is, the subject of having laws to protect yourselves. You ought to have a State law that would obviate the possibility of importing insects or pests of any kind. It is possible for your counties to do something, but there would not be much evenness about it.

Out in California, somebody brought in some trees from Florida that had the whitefly. You ought to have seen those Californians. They came pretty near having a fit. They didn't rest a day, hardly. They took the matter up before the Horticultural Commission. The head of that department said, "I am very sorry, gentlemen, but we have not a dollar in the treasury." The Exchange finally sent a man to Sacramento to see the governor and requested him to reimburse them for the money they would have to expend in stamping out the whitefly. The governor readily promised to do what he could for them, and it ended by $15,000 being appropriated out of the treasury, they turned this over to the State Horticultural Commission and they did not stop until every whitefly was exterminated. I have heard since that the inspectors have been where the whitefly made its appearance and could not find a trace of a fly that was not killed.

Now, is such a thing as that possible in Florida? Could you shut out anything in Florida? I think it is obligatory on every citrus grower to use his influence in having a bill like this presented and passed. You should make the man who represents you swear that he will do everything in his power to shut out those things that you have not yet been afflicted with.

I was in Lakemont a few days ago talking to one of the growers who is an old friend of mine: he said, "I will vote for any law you will have drafted and sent up there, in this line." He said, "We will have to have a Horticultural Commission that will have power and money behind it to put it in execution, and we don't want any of these wishy-washy laws that have a thousand loop-holes you can get through." It has to have the State finances behind it and the State police power behind it. It is the duty of every citrus grower to get right after his legislators and make them pledge themselves to go before the next legislature and put such an act through.

Prof. Rolfs: I will go Mr. Burton one better, and say that we not only *ought* to have such a law, but the nurserymen actually *need* such protection. The nurserymen seem to be asleep to their own interests. They have absolutely no protection of any kind, and nearly every state in the Union is beginning to legislate against them. We may at any moment find that it is impossible to ship our goods out of the State, not having anyone to officially inspect them. We have been rocking along, simply letting the matter go on from day to day. It is time the nurserymen of the State did something. The Nurserymen's Association should get right in touch with this Association and have such a law passed as will give the State inspector power to act.

The Experiment Station has gone more than its length to help the nurserymen out, and I suspect before the next legislature the Experiment Station will have to cease its inspection. The other states have taken our certificates because they have confidence in Dr. Berger and not because they had confidence in anything else. It is personal confidence in him. However, the inspection as it is now handled is a very precarious thing as well as being very unsatisfactory to all parties concerned. There is no one who can compel Dr. Berger to make an inspection if he does not want to do so. I seriously doubt if the Federal Government will allow anything like this much longer.

I really would like to know what the nurserymen are going to do when the time comes that they cannot have their stock certified by Dr. Berger.

Prof. Hume: I appreciate the fact that the nurseryman is worthy of all the condemnation that Prof. Rolfs has heaped upon him. It certainly does seem that they are a "harmless" organization. I thoroughly agree with both of the gentlemen who have spoken, that it is time something was being done.

Appointment of Committee on Legislation.

W. C. Temple, Winter Park.

Capt. R. E. Rose, Tallahassee.

Dr. F. W. Inman, Winter Haven.

Mr. Skinner: I move that Mr. Burton's name be added to that committee. Motion seconded and carried.

Mr. Burton: I think it very unwise to put me on that committee. You will find me dead timber, I am afraid. About the time the Legislature meets I won't be thinking about a thing but oranges.

Prof. Hume: I really don't think we can excuse you, Mr. Burton. We need a man with your ideas and your ability. While you may not be able to go to Tallahassee, you have so many ideas inside of your head that would be of benefit to the committee, that I would very greatly regret it if you insist on refusing to serve.

Some Principles Underlying the Use of Fertilizers

A. W. Blair.

Mr. President, Ladies and Gentlemen:

As one looks back over the reports of this society, he is struck with the great variety of opinions that have been expressed with reference to the use of fertilizers for any given crop; and at first it might seem that we have made but little progress. On the other hand, we need not expect agreement of opinion; indeed in many cases there could not be such agreement. We must take into consideration the numerous types of soil, the difference in seasons and in methods of culture, and the personal equation. Because A has used a certain formula or a certain brand of fertilizer with success and profit, it does not follow that B, working on a different type of soil or using different cultural methods, or with different moisture conditions, will have equal success with the same fertilizer. We cannot adopt certain formulas or certain materials and confidently say that they are good for all times and in all places. We may, however, get at some of the underlying principles which govern the use of plant foods, and the man who does this will apply his fertilizers with more intelligence than the one who pays no heed to these principles.

PLANT FOOD AND SOIL FERTILITY.

We must learn that the terms *plenty of fertilizer,* and *soil fertility,* are not synonymous. Soil fertility refers to the crop-producing power of the soil, while the fertilizer is only one of several necessary conditions for crop production. There must be in addition, moisture, warmth, aeration, drainage, good texture, and the presence of bacteria in order that our soil may be productive. The *crop-producing* power of the soil constitutes its fertility. We are coming more and more to recognize the value of natural agencies in crop production and we must learn to so direct these natural agencies that they will be most potent for our benefit. Conditions must be made favorable for their activity. In the past we have perhaps relied too much upon the efficacy of commercial fertilizers without due regard to their effect upon the soil and upon other agencies that are at work, and in some instances we have entirely ignored other vital requirements of plant production. We have practiced constant cultivation, and have as constantly applied commercial fertilizers until in some cases we have brought about unnatural conditions, and the result has been that we have had more than our share of diseases, insect pests and the like. I do not mean to say that all our troubles are due to these unnatural and unfavorable conditions which we have created; but we do know that unfavorable conditions often tend towards a weakened plant, and that a weakened plant is more susceptible to diseases and insect attacks. To state the idea in a different way: Fertilizers cannot give their best results, no matter how lavishly or how carefully applied, if the crop must encounter other unfavorable conditions, any more than a powerful locomotive with a heavy train of cars can give its best results over a track with light rails and a poor roadbed. In the latter case the light rails and poor roadbed become the limiting factor, while in the former case any one of several conditions may prove a limiting factor.

SOME FACTORS LIMITING THE EFFICIENCY OF FERTILIZERS.

1. Deficiency of Water.—Perhaps I can make this clearer by giving some illustrations of what I mean by limiting factors.

Not many days ago while passing over one of the lines of the Atlantic Coast Line Railway I saw citrus groves where the leaves were curling. Under such conditions no kind or quantity of fertilizer could do much for those trees. There must be water to bring the fertilizer into solution before the plant can use it, and when the leaves begin to curl we know that the supply of moisture is failing. Here the efficiency of the fertilizer is limited, and that too, at a most critical time, by a deficiency of water. To get the benefit of fertilizers at such times we must either irrigate or put the soil in such condition that the moisture from beneath may be brought up by capillary action. This latter, however, is impossible if at a depth of four or five inches or a foot beneath the surface there is a plow sole or hard stratum of earth. This hard stratum becomes the limiting factor (in the case of trees) for it prevents the roots from going in search of food and moisture and also prevents the moisture from coming up near the surface where it is needed to dissolve the fertilizer.

2. Deficiency of Humus.—The efficiency of fertilizers may be further limited by a deficiency of humus in the soil. White sand is a poor material to hold moisture and plant food. On the other hand, if this sand is well supplied with humus its capacity to hold these materials is greatly increased. This in itself may mean handsome profits; for although the soil may be well supplied with fertilizers, if the moisture necessary to bring these into solution is wanting the crop will suffer. Many instances could be cited where the crop yield has been greatly increased by incorporating with the soil an abundant supply of humus. We have heard much in recent years of the failure of groves to put on a full crop of fruit; and undoubtedly much of this trouble is due, not to a lack of fertilizers, but as has already been pointed out to the lack of sufficient water to bring the fertilizer into solution at a critical time. Irrigation will help to solve this problem but where irrigation is not practicable the next best step is to increase the supply of humus, which will in turn increase the water supply. Indeed it is well to have an abundant supply of humus, even where irrigation is practiced. For thereby the loss by leaching will be greatly reduced.

3. Acid Soils.—Again fertilizers may be limited in their efficiency by an acid condition of the soil. Organic matter decaying in the soil results in the formation of acids which will accumulate if the soil is not naturally well supplied with carbonate of lime. These acids are harmful to nitrifying and other friendly bacteria, and also to some plant roots. However, the great need for humus in the soil requires us to have the decaying organic matter and with it the resulting acids, but these acids may be neutralized by supplying bases where such bases do not occur in sufficient quantity. Examination has shown that the soils in many sections of the State are acid, and until this condition is corrected the efficiency of fertilizers applied to such soils will be limited, and as a result the crop-producing power of these soils will be lowered. Carbonate of lime in the form of finely ground limestone has been found well adapted for this purpose.

When sulphate of ammonia is placed in the soil as a fertilizer, nitrification takes place, and the ammonia, in the form of a nitrate, is either used by the plant or lost in the drainage waters; while the acid radical which we call sulphuric acid is left free to unite with a base, such as lime (in which case gypsum or land plaster would be formed). However, if not enough bases are present, the acid condition of the soil is increased. This has been well demonstrated at the famous Rothamsted Experiment Station in England, where certain plots were continually fertilized with sulphate of ammonia for years, finally becoming almost non-productive, while on land previously treated with lime or marl the annual application of sulphate of ammonia has not had this effect. In commenting on this work, Dr. Hall, director of the station, says: "The long continued use of manures like the ammonium salts, which are effectively acids, must have altered the reaction of the soil and made it sour. This is very palpable on the plat which has received a very heavy dressing of ammonium salts alone, and on which there is now a large amount of sorrel, except upon the small portion where the chalk had been applied." Doctors Hall and Miller speaking of one of the fields on the farm of the Royal Agricultural Society at Woburn, which has been under experiment since 1876, say: "The amount of calcium carbonate present is exceedingly small, barely determinable in fact, yet the plats continue to yield normal crops, except those which have been manured with ammonium salts. The latter, in recent years, have become almost sterile, showing an acid reaction to litmus paper, and refusing to grow wheat or barley, unless they first receive a dressing of lime."

At no other place in this country has so much work been done on acid soils as at the Rhode Island Station, and in one of the reports from that station Dr. Wheeler says, "One fact has been fully established—that sulphate of ammonia if not applied in connection with lime or other substances capable of neutralizing or overcoming the natural acidity of the soil, further increases the injurious action upon the growth of most of our agricultural plants." In another place, he adds: "the yields of the 38 miscellaneous crops show without exception, where no air-slaked lime was used, that the sulphate of ammonia was inferior in its action to the nitrate of soda, and in most cases probably poisonous. On the other hand, where lime was applied in connection with the two forms of nitrogen, the ill effect of the sulphate of ammonia was not only overcome, but in the case of several crops the yield from the limed sulphate of ammonia plats even exceeded that where lime was used with the nitrate of soda." He attributes the value of the lime to its overcoming the natural acidity of the soil and the acid tendency of sulphate of ammonia. Robert Warington, an English agricultural chemist, has made an extended study of the comparative value of nitrate of soda and sulphate of ammonia, and he concludes among other things that on lands containing no carbonate of lime, sulphate of ammonia cannot be profitably used but nitrate of soda may be used. On lands containing a large amount of carbonate of lime, sulphate of ammonia gives its best results when it has been plowed or harrowed in immediately after it has been distributed. Loew has pointed out that acid compounds as super-phosphates, or acidity-producing compounds as sulphates should be avoided on acid soils, while alkalinity-producing compounds as nitrates should not be used on alkaline soils.

These statements are not to be taken as arguments against the use of sulphate of ammonia, but as a plea for the more general use of carbonate of lime to correct the natural acidity of the soil and the acidity which results from the continued use of sulphate of ammonia. In some sections of the State the soils are just as much in need of having lime supplied, as they are of having phosphoric acid or potash. The State, is however, generously provided with the natural limestone rock; we have the mills for grinding it, and railroad facilities for transporting it; and if by failure to take advantage of such resources, we continue to limit the productivity of our soils and the efficiency of the fertilizers which we use at a great expense, we will have only ourselves to blame.

SELECTIVE POWER OF PLANTS.

Writers on Plant Physiology have called attention to the fact that plants have the power of appropriating an acid and leaving the base, or of appropriating a base and leaving behind the acid with which it was combined. We thus speak of the basic or acid tendency of fertilizing materials. Thus in the case of sulphate of potash the plant undoubtedly uses more of the base, potash, that it does of the acid and we speak of this substance as acid in tendency. On the other hand, with nitrate of soda, the plant requires more of the acid radical or nitrogen than it does of the base, soda, and we speak of this as basic in tendency. In accordance with these principles Mayer has classified certain manurial substances according to the following groups:

1. Physiologically Neutral.
   Calcium sulphate (gypsum).
   Magnesium sulphate.
   Sodium chloride (common salt.)
   Superphosphate, (acid phosphate)
   Potassium nitrate. (This approaches closely group 3).
2. Physiologically Sour.
   Potassium chloride (muriate of potash).
   Ammonium sulphate.
   Potassium sulphate.
   German potash salts in general.
3. Physiologically Basic.
   Calcium carbonate.
   Wood ashes.
   Caustic lime.
   Potassium carbonate.
   Undissolved calcium phosphate.
   Sodium nitrate (nitrate of soda.)
   Bone meal.

(Loew would probably place superphosphates with the physiologically sour materials.) Such a classification will be helpful in determining whether certain systems of fertilizing are tending to increase or decrease the natural acidity of the soil. (Shell hammocks, and places where limestone and marl come near the surface are not likely to be acid.)

LIME NOT INCOMPATIBLE WITH SUPERPHOSPHATES.

There has been a wide-spread belief that liming decreases the efficiency of superphosphates, the theory being that the soluble phosphoric acid unites with the lime to form insoluble phosphate of lime. However, Wheeler at Rhode Island has shown with different crops and with ten different phosphates (including four superphosphates), on land deficient in carbonate of lime, that liming greatly increases the yield in almost every case. I give herewith his results with Mangel Wurzels.

Mangel Wurzel (Norbiton Giant)

	Limed	Unlimed
Dissolved bone-black	328	3
Dissolved bone	380	101
Acid phosphate	340	8
Fine ground steamed bone	447	16
Basic slag meal ("Thomas" phosphate)	362	73
Floats	223	0
Raw iron and aluminum phosphate	36	0
Roasted iron and aluminum phosphate	153	0
No phosphate	40	0
Double superphosphate	145	1

Very similar results, though not quite so striking, were obtained with Swedish turnips and German golden millet. From these it will be seen that with the four superphosphates (acid phosphate, dissolved bone, dissolved bone black, and double superphosphate), the yield was invariably greater where lime was used than where it was omitted. From this it would appear that the efficiency of superphosphates is not lessened by the use of lime.

LIME NEEDED WHERE IRON HARDPAN OCCURS.

Several writers have called attention to the fact that the efficiency of phosphates is increased by the use of lime, where iron and alumina occur in considerable quantities. If there is a deficiency of lime there is a tendency for the soluble phosphoric acid to unite with the iron and alumina, forming insoluble phosphates of these metals. If, however, the soil is well supplied with lime the phosphoric acid would unite with this to form phosphate of lime. In this connection Hilgard says, "Very large percentages of ferric (iron) hydrate may, especially in the absence of lime carbonate, render even large supplies of phosphoric acid inert and useless by the formation of a totally insoluble ferric (iron) phosphate." It is probable that the free use of carbonate of lime on iron hardpans, which occur to a considerable extent in this State, would have a beneficial effect, by preventing the phosphoric acid from combining with the iron. The fact that we find phosphoric acid in most of the rocks containing iron, may I believe, be taken as evidence that there is this tendency for the phosphoric acid to combine with iron.

CONCLUSIONS.

After all it is not so much a question of whether we use 11 or 13 per cent. of potash or 5 or 6 per cent. of phosphoric acid. When the crop is gathered we would probably not be able to detect a difference of one or two per cent., for we usually apply more than the plant can utilize. It is a question of getting the greatest possible benefit from the 5 per cent. of phosphoric acid or the 11 per cent. of potash that we do apply. If unfavorable conditions make the greater portion of this ineffective, it may mean a shortage in crop returns of 1-4, 1-3 or even 1-2 and this becomes a serious matter. There is, I believe, room for great improvement along the line of making the fertilizers that we use more effective. The profits will come not so much from saving the cost of one or two per cent. of plant food, but rather from the increased yields due to deriving full benefit from the whole amount applied.

STUDIES.

Mrs. N. M. Prange.

Mr. President, Ladies and Gentlemen:

This paper, like my others, is not claimed to be in any way the product of original research, but is the result of careful study. Really during the past twenty years, I have had a great deal of practical experience with Florida soil in the production of both fruit and vegetables, but this has only helped me to understand my studies, for before taking up this fad, I gave but superficial attention to the groves and while managing the truck farm, brought about enviable results by plain common sense, or perhaps it was nothing but luck. At any rate it was by no scientific knowledge. As I look back to those days I can see where I could have saved work and made even more money by actually understanding what I was doing.

It has been my aim in these papers to show people who do not aspire to become *leaders* in this line of thought, how easy it is to grasp the fundamental principles, the understanding of which adds so much more to the life which they are following from both mental and financial points of view.

Our first step at this time is to examine the plant. Whether tree or vegetable the process of growing is practically the same. There are three distinct parts,—the roots, the stem and the foliage. Different vegetations have different root systems, but all are alike in that there is no real opening into the roots, therefore all nourishment must be taken in liquid form: also in that it is only near the tips of the rootlets that the absorption of fluids—osmosis, it is called—can take place.

The extreme tip of a rootlet is protected by a hard cap that it may push its way through the soil, while its "feeding" section is often covered with hair-like protuberances, multiplying the surface many times. These tiny rootlets also give off certain acids which render soluble much plant food that cannot be dissolved by water alone.

It is a root's nature to avoid light and to seek moisture. It will go in the line of the least resistance, growing around obstructions, and wherever a good feeding ground is found rootlets are formed rapidly, giving full service to the plant which they support. If, however, the environment is not congenial, rootlets wither and die, and the plant receives no nourishment from that portion of its root system. Roots demand a proper supply of both air and water. To supply this demand the grower must cultivate his soil properly. Lumpy soil is bad for several reasons. The hard lumps act as obstructions, wasting the energy of the roots as they grow around them and checking capillary action by the large spaces between them. The excess of air in these spaces rapidly dries out any moisture that the rains may give such soil so that often the rootlets die in the attempt to encompass such obstructions. Plants must have water not only for itself but as a vehicle of food. The ability to hold moisture decides to a great degree the productiveness of a soil. Fine particles of soil not only increase capillary action by which underground water is brought to the plant's service but they present much greater surface to retain the rain water and to be acted upon by dissolvent forces. We all know how much more readily a lump of sugar dissolves when crushed, and in the same way all other things yield to dissolution according to the surface exposed to attack. Soil should hold water in a film around each particle—as seen on an orange that has just been dipped in water—and this is all it will retain when there is a chance for the water to pass off. If there is a lack of drainage so water fills the *spaces* between these particles there is no room for air and therefore the supply of oxygen necessary to the bacteria of the soil is shut off and trouble begins.

We must not look upon the earth as an inert mass. A fertile soil is alive with bacteria. Bacteria are the lowest form of vegetable life,—tiny one-celled plants—but their influence for good or ill is incalculable. We who are working the soil are more especially interested in nitrifying bacteria which are essential to the changing of nitrogen to nitric acid, or in other words, making the element nitrogen available for plant food. These bacteria can thrive only where there are the right degrees of moisture and heat, and freedom from acid conditions:—hence another great value in perfect tilth and proper drainage. On the other hand where excessive moisture and acidity exist, the denitrifying bacteria thrive. These tiny plants take oxygen from seemingly every combination found but their work is especially noticeable where by the breaking up of these combinations it sets the element nitrogen free and thus allows it to escape from the soil. Thus poor tilth and drainage not only prevent an increase of fertility but cause actual loss of the most valuable plant food the soil contains.

We have dwelt in particular upon the desirability of having *fine* soil particles, but it is possible to have soil too fine to give best results. This is sometimes the case in clay lands and is particularly true in "puddled" soil, for "puddling" the soil is done by disturbing it when there is so much water present as to allow the soil grains to move freely about and become placed in the most compact position. This prevents proper circulation of air and often causes so much trouble from the effects on bacterial conditions and the general texture of the soil that it will take two or three years to overcome the results of a few hours ill-advised cultivation.

There has been so much agitation about the necessity of supplying humus to the land, that every grower recognizes the value of humus though often he is rather bewildered as to the reasons therefor. Humus is plant food to be sure, but that is its least value. It retains moisture and with it the plant food this moisture contains. It is said that a soil well-filled with humus will hold eight times as much water as one entirely lacking this valuable constituent. Humus is a most congenial dwelling place and also a food for nitrifying bacteria, therefore, causes great multiplication of these useful organisms. Humus also does much good by improving the texture of the soil. When the land is sandy and too open, the finer particles of humus help to correct that condition, and the humus is coarser than the soil particles of clay, so it opens up such land to freer circulation of air and all the accompanying benefits. One can hardly overestimate the value of humus, but still he must realize that its greatest value comes through its retention of plant-food-laden soil water which otherwise would carry its precious burden onward to the drains.

When the vegetation which produces this humus is grown on the ground over summer the fresh green blanket protects the soil from the excessive heat of the sun and thereby removes a great factor in the creating of acid conditions. However, the grower should never turn under this green vegetation or its fermentation will cause it to be a source of great harm instead of benefit. It should be dead and dry before being incorporated with the soil.

Land should be thoroughly prepared before planting any kind of crop, whether it be grove or garden, and thereafter worked with due care for the roots. It is not consistent to strive to create a root system to feed trees or plants and then deliberately impair that system to such an extent as to reduce its strength from 25 to 50 per cent; yet that is what many a grower does time and again. During proper seasons land should be given shallow cultivation to conserve moisture by creating a dust mulch and to avoid a crusting over which shuts off the circulation of air, but this cultivation should never disturb the plant's roots. There is another most important reason why the gardener should cultivate frequently, and especially after a rain, and that is *to keep the soil black.* White reflects, black absorbs, heat. With other conditions the same a dark soil is several degrees warmer than a light one, and those few degrees in temperature will often increase the growth of the plant wonderfully.

The plant needs in its construction about fourteen different elements but Nature makes a bountiful provision for all except nitrogen, phosphorus, potash and sometimes calcium, so we need to study only these which we have occasion to supply. *Chemistry* teaches us that plant food is plant food wherever found, but *practical experience* teaches us that the form and surroundings of that plant food have great influence on its effect.

In all animal substances as well as in vegetable matter, the breaking down of existing combinations which we call "decay" creates more or less acidity according to the condition and surroundings of these substances. If there is an abundant supply of air, enough but not too much moisture, and the temperature is neither too high nor too low, nitrates are formed from the nitrogen, and the humus contained in the vegetable or animal matter is a valuable addition to the land. So, under right conditions, organic sources of plant food, though the slowest of all "ammoniates" are desirable except for the citrus family. But if the weather be cold or the soil lacking in moisture the decay is so slow as to be scarcely perceptible, while if there is an excess of water, humic and other deleterious acids are formed in place of nitrates and instead of plant food we have plant poison. This latter condition readily arises under the combined influences of the summer's heat and heavy rains.

We have noted the needed presence of certain bacteria to transform the element nitrogen to plant food. Their work is to combine oxygen with nitrogen to make nitric acid. After they have done this, it is most important that there be at hand a bountiful supply of base to unite with this nitric acid and form nitrates, and to neutralize, not only the nitric acid but all other acids. If base is lacking it must be supplied before good results can be obtained, and it is at such times that we need a knowledge of the different forms of calcium. The form generally preferred is the carbonate of lime found in ashes and air-slacked lime, but the hydrated, the "quick" or caustic lime, and also the finely powdered limestone have their places.

The chemical nitrates are the quickest acting sources of "ammonia" that we can apply, as they are ready for the plant's use as soon as dissolved and so deliquescent that they invariably find enough moisture to dissolve them, therefore they are most valuable to start a quick growth, especially in a dry season. The great drawback to their use for a full supply of nitrogen is the waste that is bound to occur when rains come before the plant has used it all. Nitrate of soda and nitrate of potash are our general sources of this form of plant food at the present time, though calcium nitrate is knocking at the door of the fertilizer market. The nitrate in each of these materials is in exactly the same form. The soda in one and the lime in another tending to sweeten the soil, while the potash in the nitrate of potash is the straight K_2O plant food.

Another chemical used is sulphate of ammonia which in its action is slower than the nitrates but quicker than organic matter, even when favorable conditions surround the latter. It also is surer in its action and free from the disagreeable features attending the change of organic nitrogen to ammonia. The continued use of this chemical will call for an application of lime, as its chemical reactions in the soil cause loss of lime; but this is a small drawback in comparison with its incalculable value, especially to the citrus grower.

Much attention has been given to the effects these varying sources have upon plant life. Generally speaking, the citrus tree demands chemical sources, the pineapple, organic sources, while the garden products need the different sources in well-balanced proportions. These sources are all classed as "ammoniates."

Now we come to the essential termed "phosphoric acid"—another misnomer—for there is no real *acid* in any properly prepared fertilizer. All chemical fertilizers are in the form of salts. A *salt,* as explained in last year's paper, is the result of an acid being *destroyed* by a base displacing the hydrogen. In nitrate of soda, sodium has driven out the hydrogen, while in nitrate of potash, hydrogen has been exchanged for potash. In the first, the plant extracts the nitrogen from the *radical* of the acid, while in the last it takes food from both radical and base. In sulphate of ammonia, it is the base we think about as furnishing plant food after the necessary nitrifying process, though both sulphur and oxygen are essential to the plant's development. In the sulphates of potash it is also the base that is bought for food. The ammonia in sulphate of ammonia and the potash in the sulphate of potash are combined with the *radical* of sulphuric acid—exactly the same part of sulphuric acid that exists in sulphate of lime and every other sulphate—just the sulphur and oxygen. These elements are absolutely harmless unless combined with hydrogen in certain proportions to form an acid. There is no possibility of reaction taking place for the hydrogen has been defeated in a fair fight. The base has stronger attractions or it could not have displaced it. It is on this principle of "a fair fight and no favor" that our phosphoric acid is made available for use. The radical of phosphoric acid is the form from which the plant gets its phosphorus, but in the natural state this radical is in such close combination with lime that neither water nor the exudations from the plant roots can do much in the way of breaking the chemical forces; but, fortunately for the grower, the chemist's skill can overcome this difficulty and we have either dissolved bone or acid phosphate to apply to our fields, knowing that in both ingredients we have a mono-calcium phosphate and a sulphate of lime. The same form of plant food is in each, but it is accompanied by a little more sulphate of lime in the acid phosphate than in the dissolved bone. This sulphate of lime is really no plant food, but it has a wonderful influence on the crops because of the chemical changes caused by its presence in the soil, through which much latent plant food becomes available. Such an agent is termed a "catalyzer" and it is now generally recognized that phosphoric acid is also a great catalyzer, and that it well pays to apply far more than is actually needed by the plant, because of this quality. Another effect of a large phosphoric content is a tendency to hasten maturity. This is a detriment in the raising of some crops, beans and celery, for instance, but the citrus grower who wishes to avail himself of the advantages of an early market finds this fact of great value.

Basic slag is another source of phosphoric acid. It is very slow acting and its value is still undetermined.

Peruvian guano is called a phosphatic fertilizer, but contains some of all four essentials. Though of organic origin, it cannot be classed as an organic fertilizer, really, for its condition is such that although it has all the virtues of organic matter it has none of the evils, therefore it can be used in citrus culture. Indeed, under some circumstances and when reenforced with the correct proportions of the proper chemicals, it stands pre-eminent.

We have given considerable force to the word *available* because in both ammoniates and phosphatic goods, the "plant food" is so likely to be useless to the plant. When there is an abundance of unavailable plant food in even the poorest soils, *why add more?* The value in applied fertilizer is in its *quick results.* If we have to wait until the next year or the next generation to get returns for the money invested this year we are losing the use of our money, for there is only the plant food we have paid for and the longer it stays in the soil the longer our money is locked up. Some people have expatiated upon the effects shown in after years. A certain amount of plant food will produce only certain results and the longer it takes for it to produce these results, the more time there is for wastes through drainage, etc. A grower should build up the *texture* of his soil by proper tillage and the addition of humus, but Nature has forestalled him in furnishing unavailable plant foods.

All our potashes are water soluble and in the same form whether from organic sources, ashes, or from the different potash salts—nitrate, sulphates, muriate or kainit. They differ only as to their surroundings. The organic source used is pulverized tobacco stems and the one drawback is the extreme high cost. This precludes its general use. The potash in ashes also costs so high that ashes are invariably bought because of other qualities and not for their potash content. We have already taken up nitrate of potash under the nitrates, and dealt with sulphate of potash under our talk about acids. We would mention, however, that the low grade sulphate of potash contains a large percentage of sulphate of magnesia and is liked by the citrus grower because this magnesia acts readily as a base and aids in sweetening the land. Muriate of potash is the richest of the potash salts, but because of its chlorine content cannot be used on certain crops. It is especially undesirable for citrus trees and tobacco. Kainit has even more chlorine, part of which is in combination with sodium, making about one-third of kainit our ordinary salt. This is quite effective in vegetable raising for driving away insects and some fungous troubles, but for many crops would need to be applied at least a month before planting or it would "burn" the plants.

Thus we have much to think about when trying to supply food to vegetation just what sources—just what proportion each of the different forms of ammonia used should make of the whole ammonia content, that there be no lack, no waste,—just how much phosphoric acid and potash to put with this ammonia to give *exact* balance to this particular crop. It is a long, long lesson and one that must be worked out in the field; but when it comes to mixing these ingredients, how many times does the lack of chemical knowledge cause great loss! I know, personally, one prominent gardener who mixes ashes with his fertilizer and chuckles as he smells the escaping ammonia, because the mixture is *"so strong."* It has often seemed to me that one of the wisest sayings I ever heard in regard to home mixing of fertilizer was: "The man who knows enough to mix his fertilizer, generally knows enough *not to."*

Let us for a closing paragraph briefly note the course of the plant food after it enters the plant. It is absorbed through cell walls as through the walls of the rootlets and passes from cell to cell upward, remaining the same crude sap, incapable of nourishing the plant, until it reaches the leaves. There it is "digested" and becomes "elaborated" sap capable of forming live substance, first in the vegetable kingdom and then on to animal matter. This change can take place only in those portions of the plant which are green in color, being the result of the combined action of chlorophyll and sunlight. Chlorophyll is the green substance in leaves, young twigs and immature fruit and while absolutely necessary to higher plant life, is powerless to act except under the influence of the sun. All growers appreciate the value of *color* in the leaf, but many fail to realize the great importance of abundant foliage and of giving sunlight free access to same. Dense growth encourages disease as well as insects.

From the leaves, the elaborated sap goes by way of the inner bark to supply the various needs of the plant.

Three questions naturally arise: Why does the soil moisture enter the plant? Why does it work upward? How is it that the right materials are carried to the right places to supply the plant's needs, if these materials are at hand, and after the need of a certain substance is supplied, generally speaking, the roots take up no more of that substance, however plentifully it may lie around them?

The first is answered by the fact that the soil water is less heavily laden with plant food than the plant's juices so it pushes its way into the cells. The upward circulation is caused by this action combined with capillary attraction and the tendency of Nature to fill space, and space for more sap is constantly being made by evaporation from the leaves. The return circulation is aided by the heavier weight of the elaborated sap, but as to the rest—well, I have studied attempts to explain this and have found only very lame "explanations." We are dealing with *live* substance that exercises a control of its functions not possessed by inert matter. As my entire work has been seeking to understand with a view to acting in accord with Nature, and I fail to see how I could take any part in this work were it possible to understand it, I simply accept it as one of God's great mysteries and bow my head in reverence for His wondrous works.

Acknowledgments are due to the efficient State workers whom I have mentioned as having helped me from the beginning of my studies. They are tireless in their efforts, recommending lines of study and carefully explaining any obscure points. The past year Profs. Floyd Fawcett and Vernon and Dr. Berger have been especially helpful.

Books Studied: "Agriculture for Southern Schools" under the correspondence course conducted by Prof. Vernon. Earle's "Southern Agriculture," Johnson's "How Crops Feed" and "How Crops Grow," Master's "Plant Life on the Farm," King's "The Soil," Hilgard's "Soil," Stevens' "Plant Anatomy," Peirce's "Plant Physiology," Greiner's "How to Make the Garden Pay," and many special crop books like Fraser's "The Potato" and Tracy's "Tomato Culture," as well as books on combating insects and diseases like Lodeman's "The Spraying of Plants," etc.

Corn As a Second Crop

E. S. Hubbard.

Mr. President, Ladies and Gentlemen:

The vegetable crops of Florida are mainly grown in the winter and early spring, and whether profitable or not the greatest economy in farm management the grower can accomplish is to follow the vegetable crops as far as necessary with forage crops for the farm animals and poultry, and of these forage crops the most important is corn.

The southern types of corn are richer in protein than the more starchy northern varieties and form a more complete food for stock. The Michigan Experiment Station has shown that horses will endure as much work on the same weight of corn as of oats at less expense, and I have kept my own horses in good health and condition for several years on no other grain than home grown corn. Ground on the cob with addition of a little cotton seed meal, home grown corn makes an inexpensive food for milk cows and the feed bill for poultry becomes almost a negligible quantity where there is a well filled corn crib to draw on with a sheller standing by the door.

In choosing varieties the flinty ones should be selected to minimize the loss by weevils and the farmer should select his seed carefully to improve and perpetuate the type he wants. Taking one season with another I do not consider it profitable on my soil to grow the socalled prolific varieties setting several small ears to the stalk which under unfavorable conditions go largely to nubbins and require a great deal more labor to harvest and shell. For the past three years I have been growing Cocke's Prolific which I think gives me better average results than any I have tried. This variety shows eight, ten and twelve row ears, the ten row predominating, and sets mostly two ears to the stalk. By selecting twelve row flinty ears I have largely eliminated the eight row and reduced the number of ten row ears. Under my conditions two ears to the stalk, twelve rows to the ear seems to produce the maximum yield at the minimum expense of handling.

I plant in drills with a two row western style planter after digging Irish potatoes last of April, without giving the land any preparation and the dried up vines give very little trouble.

This planter puts in one and one-half acres per hour with fair length rows. I plant in rows three feet four inches apart the same width as my Irish potato rows and lay by the corn in similar ridges as for Irish potatoes, driiling cow peas in the furrows with the planter when laying by the corn. When the corn crop is harvested by husking in the field I drag down the stalks with a cutaway harrow and then split the ridges with a sulky disk cultivator followed by a middle burster thereby listing all the stalks, pea vines, etc., into the furrows and ridging the land for the coming winter's Irish potato crop. There is a marked improvement in the fertility of land where trash is conserved as humus instead of being burned off. After the corn has dried out several weeks on a floor, I keep it in old strawberry refrigerators which are rat proof and as warm weather comes on about once a month pour in a little bi-sulphide of carbon to kill the weevils. I expect to shell, sack and sell more than enough corn each year to pay for making the crop. I estimate my average yearly yield at thirty bushels of shelled corn per acre though sometimes the best land will run as high as fifty bushels. Several southern experiment stations have proved it does not pay to pull corn fodder, the loss in weight and solidity of the corn costing more than the fodder is worth. After leveling the potato land crab grass comes in plentifully, and two cuttings, August and October, average at least four tons of hay per acre.

With home grown corn and hay as rotation summer crops for the winter vegetables, the Florida farmers have a great advantage for the acreage cultivated over their northern brethren.

Ornamentals

THE MOST BEAUTIFUL JAPANESE AND CHINESE EVERGREENS FOR OUR FLORIDA GARDENS.

H. Nehrling.

Mr. President, and Ladies and Gentlemen of the State Horticultural Society:

There is no country in the world where flowers, trees, shrubs are so universally beloved as in Japan. They are inseparable from the life, art and literature of the people, and to deprive the Japanese of their flowers would be to take the sunshine out of their lives. Beautiful plants are enjoyed equally by the high and low. The charming natural landscapes of the mountain sides, of glades and glens and along the lakes and rivers are a continual pleasure to one and all. The richer classes, in the seclusion of their well-kept gardens, can almost constantly feast their eyes on the beautiful, while the poor have the benefit of the public parks, gardens and flower shows, and even the poorest of the poor devote a few cents of their earnings to the gratification of their taste. Flowers in beautiful and tasteful china pots or vases are everywhere present, and the private grounds—but particularly the temple gardens—are replete with floral treasures. They were the delight of the first explorers. The pioneer botanists and horticultural collectors raved over the many new and extremely beautiful plants, which they discovered in the gardens and forests of this island empire. In fact Japan, and more recently also China, have been almost inexhaustible treasure grounds for the plant collector. Our gardens are at present replete with plants from these far-eastern countries. I shall mention here only a few. The Japanese Lilies are the most exquisite, the most beautiful in the world. The Chrysanthemum reigns supreme in our flower shows in November. The Japanese or Kaempfer's Iris with its huge flowers in many fantastic colors is a glory in many of our moist gardens, while the Paeony is the undisputed queen of June at the north. Unfortunately only a few of these plants succeed well in Florida. But we have the gorgeous Camellia or Japonica, as it is universally called in the south. We have the deliciously scented Banana Shrub, the Cape Jasmine or Gardenia, the Pittosporum and the Loquat, the Hortensia or Hydrangea, the evergreen Azaleas, the gorgeous Fortune's double Yellow Rose, and the dense Cherokee, Banksia and McCartney Roses, all hailing from Japan and China. For our subtropical gardens most of these, including the Bamboos, are ideal plants in every respect. They are extremely beautiful, but not more beautiful than our own natives. It should always be kept in mind that the native plants must form the foundation of every garden. Among palms the Cabbage Palmetto, and in extreme southern Florida, the Royal Palm should always occupy the first place. There is no more beautiful flowering evergreen tree in the world than our native Magnolia grandiflora. The charming Loblolly Bay, the Dahoon and the Holly, the American Olive, have all characters of their own, and when well-grown are not outrivalled by exotic forms. The Live Oak is as beautiful as it is picturesque, and the Laurel Cherry, very dense and bushy, is a tree always graceful and conspicuous. Our native Juniper, commonly known as the Florida Red Cedar, can rival in beauty with many exotic conifers. The Wax Myrtle cannot be missed in landscape gardening, its broad bushy growth, and the faint brownish cast in the green of its aromatic foliage makes it particularly effective. Indeed we could make beautiful gardens in using only our native plants were we deprived of exotic material. But variety is the spice of life, and in horticulture we look constantly for variety. The larger the number of species we grow, the more different their forms and flowers, the greater and the more lasting will be our pleasure. There cannot be the least doubt that the beautiful Japanese and Chinese plants supplement happily our own native species.

I have experimented largely during the last twenty-five years with Japanese and Chinese plants, particularly with broad-leafed evergreens, having imported directly from Yokohoma and Tokio large consignments. Many were the losses and few the results at first. But the blame was on my part, not on that of the plants. All these plants arrive with rootballs of heavy soil. If set out with the ball this dries out in our dry season, the roots cannot penetrate into the surrounding soil, and the plant is invariably lost after struggling hard for life. Every particle of soil must be shaken or washed off, and the plant cut back and re-set. If transplanted in good rich soil, it will usually grow. The right time for planting is November and December. Out of a number of about 150 distinct species, I have found that the following are a perfect success in my high pineland garden of western Orange county.

Michelia fuscata—Banana Shrub or Banana Magnolia, is the jewel among all these plants. Flowers here at the beginning of April. Blossoms creamy white, each petal faintly edged violet. Strongly and deliciously fragrant, the fragrance reminding of ripe bananas. The form of the shrub, which eventually attains a height of 15 feet with a crown diameter of 10 to 12 feet, is extremely graceful. A native of China but largely cultivated in Japan.

Michelia compressa—A native of southern Japan. The flowers, which are very fragrant, are pale yellow and over an inch in diameter. It grows well but is often infested with scale insects.

Illicium religiosum—The Japanese Star Anise shrub, is a very bushy growing, beautiful and interesting plant. The leaves when crushed are strongly aromatic, reminding of sassafras, and the small inconspicuous flowers exhale also a faint perfume. It attains a height of 15 feet. The lower growth is very broad and at the top it tapers to a narrow point. It is one of the sacred plants of Japan, always planted in the neighborhood of temples and common in private gardens. From the powdered bark, mixed with resin are prepared the "smoke candles," with which incense is made in the temples. I have quite a number of fine specimen plants, which grow luxuriantly on high pineland. The Japanese and Chinese deciduous Magnolias,—almost evergreen in Florida—such as Magnolia Yulan, M. stellata, M. Soulangeana, M. obovata, M. parviflora and M. Watsoni,—grow well with me, flowering from November to March. All my plants though healthy are rather stunted, never making such exquisite specimens as we see in Augusta, Ga., Atlanta, Washington or St. Louis where many of them grow to tree size and are masses of color in early spring, before the leaves appear.

Camellia Japonica—One of the glories of our southern gardens, ranks very high as an ornamental shrub. Before the big freeze I have seen specimens from 20 to 30 feet high in Tallahassee, Quincy and Monticello, and some about equally tall in Jacksonville. Camellias grow well eveverywhere in my garden even in full sunshine, but they are doing best and flowering most profusely in half shade and in rich rather moist soil. There are hundreds of garden forms, double and single, and all are beautiful.

Camellia reticulata—From Hong Kong and southern China, has very vivid rosy-red single and double flowers. It grows much better and flowers more profusely than the common Camellia.

Camellia Sasanqua—The Susan Kuwa of Japan, is a small bushy tree of dense growth. There are single and double forms, some of them immaculately white. All the flowers are fragrant. They flower with me in November and December. The double white form blooms most profusely at Christmas time. This species and its varieties is better adapted to our soil and climate than any other Camellia.

Camellia Thea—The Tea Shrub, is a fine ornamental plant, perfectly at home in our State. It should be planted everywhere where choice flowers are appreciated. The blossoms are single, pure white with a bunch of yellow stamens. Some forms are very fragrant.

Cleyera Japonica—This is one of the most conspicuous and impressive of all my plants. The growth is dense and conical. The foliage is glossy green and of oval form. In May the nodding creamy white small flowers appear most profusely, perfuming the air of the entire garden. In August the cherry like reddish, mealy fruits burst open and show the numerous vivid red seeds which form an additional charm. The old leaves assume a bright red color.

Eurya Japonica—and its variegated forms are also charming shrubs, but need shade and some attention. This is usually a small shrub only a few feet high, but Prof. C. S. Sargent saw a specimen in the woods surrounding a temple near Nakatsu fully 30 feet in height. The color of the leaves is yellowish green on the upper surface and decidedly yellow below.

Ternstroemia Japonica—is another plant, like Cleyera Japonica, which is considered sacred by the votaries of the Shinto religion and therefore planted in the grounds of the Shinto temples and in most private gardens. Though the flowers cannot be considered showy the foliage and the growth are very conspicuous. It thrives well in Florida and is always an object of great beauty.

The finest and most beautiful of all the Hollies is the Japanese *Ilex latifolia*—perhaps the handsomest broad leaved evergreen tree that grows in the forest of Japan. It is much cultivated in private and temple grounds. The leaves are about six inches long and four inches broad and very thick dark green and exceeding lustrous. The large scarlet fruit of this tree, which does not ripen until the late autumn or early winter months, and which is produced in the greatest profusion in axillary clusters, remains on the branches until the beginning of the following summer. This holly forms beautiful specimens in our gardens and it should be largely planted not only on account of its brilliant fruit but also on account of the size and the character of its abundant foliage. It requires rich and rather moist soil, but succeeds well on high pine land. My largest specimens planted in 1897 are now about nine or ten feet high.

Ilex integra and I. rotunda—Both are doing well in good soil, but *Ilex crenata* does much better. It forms an exceedingly dense and beautiful shrub 3 to 4 feet high. The leaves are very glossy and not at all like those of our own hollies. The berries are black. It is much grown in Japan and is now common in this country as far north as Philadelphia. Varieties with variegated foliage are common and apparently much esteemed. It is surprising that almost all the broad-leaved evergreens grown by the Japanese have produced in the course of time many silver and golden variegated forms. They were carefully preserved and largely propagated. Even among the bamboos and palms, the orchids and the herbaceous perennials such variegated forms are numerous and highly prized by the Japanese. This fact shows plainly that these plants must have been grown in the Mikado's empire since times immemorial.

Othera Japonica—Appears to be closely allied to the hollies. It is a dense evergreen shrub with glossy foliage and black berries. It grows well with me on high and low land. One of the founders of this society, the late Mr. E. H. Hart at Federal Point, informed me years ago that he had a specimen in his grounds fully 15 feet high and of a dense and compact habit.

Euonymus Japonicus—With green, silvery and golden variegations in its abundant foliage is not as often seen in our gardens as its beauty justifies. The plain green-leaved form is a very robust grower, but this is also divided by the Japanese in quite a number of forms or varieties. There is one with very large glossy foliage, *E. Japonicus var. macrophyllus,* another with very small leaves, *var. microphyllus,* another one having an upright columnar habit, *var. columnaris,* etc. Very beautiful are the variegated forms, and as they can be used very effectively as ornamental border and hedge plants, they will prove valuable for our gardens. There are golden and silvery variegated forms with large and small leaves. The variety *E. J. argenteo—variegatus,* has leaves edged with white, another form shows white blotches. The form *E. J. aureus* has leaves almost entirely golden yellow but when they get older they change mostly to a deep green. In *E. J. aureo variegatus,* the leaves are blotched with yellow. There are other forms all very pretty. The Euonymus to do its best in our gardens needs a rich deep soil and during winter or in the rainy season an application of good fertilizer. All are small growing plants rarely exceeding 4 or 5 feet in height. There is a scandent species, the climbing Euonymus *(E. radicans)* common in middle and northern Japan, where it carpets the ground under forest trees and often climbs 20 feet high on the trunks, which it encircles with great masses of lustrous foliage. This fine climber is of great value for decorating the bare trunks of pines and oaks in our gardens. I had most beautiful specimens of this species, also a number of variegated forms (*E. radicans var. argenteo—marginatus,* with foliage bordered white; *var. roseo-marginatus,* with leaves bordered pink) but they were destroyed by a severe forest fire. This species requires shade and moist rich soil.

Hydrangea Hortensia (the first as well as the second name are used in popular language)—is one of the greatest ornaments of our gardens. Requires shade and rich moist soil. Attains a height of 8 feet and is covered with hundreds of immense flower clusters in April, May and June. Growth very dense and bushy. The Japanese grow almost hundreds of distinct forms of this plant and there are many of them in cultivation in this country. The majority have beautiful rosy-red flower clusters but they all change to a beautiful deep azure blue, (or even into a kind of indigo blue) in our Florida soil. The following varieties are the best for our purposes. *H. Hortensia*—(first introduced from Japan in 1790 to France and named after Hortensia, the daughter of Empress Josephine and mother of Napoleon III). Common in our gardens. *H. H. var. serrata,* with serrated segments; *H. H. var. nigra* with dark purple or violet almost black stems, very distinct and beautiful. One of the best. *H. H. var. Otaksa* has white flowers, which do not change their color. *H. H. var. Thomas Hogg* is another fine form. These glorious plants deserve special plant sheds for their well-doing and should be grown by the hundreds and thousands.

Aralia papyrifera (Fatsia papyrifera)—A common and most impressive plant of our gardens. I remember having seen specimens 12 to 15 feet high and as much in diameter in Orlando years ago. In

November they usually flowered, and were surrounded by numerous buzzing insects.

The large, much lobed leaves, deep green above and silvery beneath are extremely ornamental and when in flower the plant is still more conspicuous, though the large loose bunches of blossoms are only greenish white. This is the plant, which supplies the celebrated Japanese and Chinese rice paper.

I have had no success with *Aralia* (*Fatsia*) *Japonica* and with the very ornamental allied *Dendropanax Japonicum.* There is no doubt that I would be able to grow them to perfection now. My experiments were made ten to fifteen years ago. At that time I also experimented with the New Zealand Flax (*Phormium tenax*) and its varieties, and lost all plants. Last year I again made an attempt. I planted them out in my Caladium shed, and they are thriving vigorously.

I have always admired the beautiful dense oval shaped specimens of the Evergreen Snowball in New Orleans and Mobile, where grand specimens 15 to 20 feet high can be seen in the gardens and parks. This is the fragrant *Viburnum odoratissimum.* The foliage is large and lustrous, the branches dense, and the fragrant large flower trusses are produced in the early days of April. I have a fine specimen in my garden but it is crowded together with other shrubs. In order to admire its unique beauty of growth, it should stand alone in an isolated spot. It needs rich and rather moist soil for its development. *Viburnum Awafuki* and the large leaved *V. macrocephalum* also grow well with us if they receive good care. Without cultivation and constant care few of these exotics thrive well in this sandy, thirsty and hungry soil.

The Indian Azaleas (*Azalea Indica*), not an inhabitant of India but of southern China, is one of our fashionable spring plants. The firm of Henry A. Dreer of Philadelphia alone imports from 14 to 15 carloads each spring and all are sold out a few months later. In southern Georgia, I have seen gardens glowing with the beautiful shades of these gorgeous flowers. I saw them in masses and as single specimens. I was informed that they would not grow in Florida, but I have had beautiful healthy plants along the border of my lake. They were, unfortunately, destroyed by fire. The most beautiful collection of these charming plants is undoubtedly found in the gardens of Mr. H. L. Beeman, of Orlando. In shady ravines along the shores of Lake Sue there are specimens 6 to 8 feet high and these are a mass of blooms in late January and early February.

Andromeda Japonica, and *A. formosa,* the latter with waxy white fragrant flower bells, thrive well in shady moist spots. Both are very handsome evergreens, the second species being the best of the two.

Osmanthus aquifolium, the Holly-leaved Olive, forms a very fine dense tree in northern Florida, but in the southern part of the State it is only a rather small shrub 3 to 4 feet high with a compact head, loaded in October and November with small fragrant flowers. It can only be grown successfully in shady moist situations.

Osmanthus fragrans, better known as Olea fragrans, the Sweet Olive, is a native of China. Its strongly and deliciously fragrant flowers are produced here in the late fall or early winter months. This is a gem among shrubs, but though it thrives well in Florida, it never attains a large size. My plant is at least 16 years old but it is not taller than six or eight inches. I think it would prove a fine subject for grafting on our native O. Americana or on the True Olive.

Ligustrum Japonicum—The Japanese Privet, is one of the finest avenue trees in New Orleans, being loaded in November with grape-like clusters of berries. The foliage is very dense and each leaf is oblong and of a deep green color. It is not a success on high land but will undoubtedly prove valuable on low rich moist soil. It has pendent branches, and is always very unique and conspicuous.

Ehretia serrata is an interesting Chinese tree. The leaves are large and serrated, and in March large clusters of fragrant milky white flowers appear. It thrives well on high and low land and is a rapid grower. My specimen comes from one of our most celebrated horticulturists, Mr. Theod. L. Mead of Lake Charm.

The Laurel family is richly represented in Japan and China, and almost all its members form very distinct and beautiful objects in our gardens. We all know the Camphor tree, *Cinnamomum camphora,* which forms an ornament of many of our Florida gardens. Its dense growth and fine form speak for it everywhere. Young specimens always look best. Old specimens are more picturesque than beautiful.

Cinnamomum cassia, the Mock Cinnamon Tree, is even more beautiful, a dense large leaved tree with bright glossy green foliage, which has a glaucous hue on the underside. It is a native of southern China and appears to be quite as hardy as the orange. There is a most beautiful group of these trees in Mr. E. N. Reasoner's grounds at Oneco, Florida. It thrives well on high and low pine land. *Cinnamomum Loureirii* is a middle-sized tree from Hong Kong and Cochin China. Leaves large and glossy green, and the form of the dense growing mass of branches is rather globular. *Cinnamomum pedunculatum* from Japan, with thick deep green lustrous foliage, silvery white underneath, is also well adapted to our gardens. Years ago I saw strikingly beautiful specimens of both of these two last species in the hotel grounds of the Sanford House at Sanford. The specimens were so dense and so extremely beautiful that they attracted my attention immediately. I have never been able to obtain plants of these two species. *Machilus Thunbergii* and *Litsea glauca* are both handsome evergreen trees from Japan, but they only thrive well in low rich soil.

I cannot recommend the species of the genus Elaeagnus too highly. *E. umbellata* and *E. longipes* are two good fruit-bearing shrubs which grow finely in my garden and fruit abundantly. The first one ripens its almost cherry-like drupes early in May, the latter in June and July. Both are interesting also from an ornamental point of view. The following kinds, known also under the names of Oleasters and Silver Shrubs, belong to the finest and most beautiful of all our ornamental plants and thrive particularly well on high and dry pineland. All of these kinds are half climbing, densely evergreen and of unique beauty. They all flower in November, perfuming the air to a great distance with their clove-like, or rather carnation-like odor. A little after New Year the bushes are covered with a profusion of oblong berries, which can be utilized for making jelly. The masses of new leaves, which appear in early April or late in March, are beautiful silvery white above and almost pure white underneath. When mature they are dark glossy green above and silvery below with numerous minute brown dots.

Elaeagnus reflexa with blunt recurved hooks along its rampant shoots is the tallest grower. I have masses of them in my wild garden among young pines, which they cover completely. The shoots grow 15 to 30 feet in a few seasons. They are well adapted for covering young oaks, camphor trees, wild cherry trees, etc. The flowers are small whitish, of clove-like form and exhale a strong and most delicious perfume during November. The young shoots are cinnamon brown.

E. pungens is not quite as rampant a grower but it soon forms dense masses of foliage and branches. The leaves are larger, deeper green and the branches are of a dark grayish color. The fruit is large and reminds of currants in taste. I have hybridized these two species and obtained a distinct kind with large fine fruit.

There are silvery and golden forms of this species and all are beautiful. All grow well in rather dry soil. *E. macrophylla,* the Large-leaved Silver Shrub, is perhaps the most beautiful of this group. It is a rampant and dense grower. All are well adapted for pergolas, garden houses, for ornamental hedges and for large groups among other trees. They are also fine as isolated specimens. They should be found in all our gardens.

Pittosporum Tobira is an old inhabitant of our Gulf Coast gardens. In Mobile I have seen trees 20 to 25 feet high, embellished with a dense crown of glossy deep green oval foliage. The creamy or sulphur colored flowers, appearing in dense trusses at the ends of the shoots, are about as fragrant as orange blossoms. There was a fine tree of this pittosporum in the rear of the court house in Orlando, fully 15 feet high, but it has disappeared.

Its variegated silvery form is rather dwarf, forming dense flat heads about 5 to 6 feet high.

The Loquat, *Eriobotrya Japonica* is one of the most beautiful ornamental trees we have. Its fine form, its large plaited foliage, its sweet-scented flowers, and its conspicuous fruit-clusters combine to make it an object of rare beauty.

Daphniphyllum glaucescens and *D. macropodon, Aucuba Japonica, Skimmia Japonica,* the charming and deliciously fragrant *Daphne odora,* thrive best in deep shade and in rich soil. All are very valuable evergreens of rather low growth. *Damnacanthus Indicus,* a little spiny shrub with white fragrant flowers and red berries, grows in similar situations.

Photinia serrulata so common in the gardens of Georgia and northern Florida does not do so well in my garden as I desire. It would perhaps do well in moister locations.

Rhaphiolepis Indica from Hong Kong is a dense large growing shrub with glossy ovate leaves and clusters of fine white blossoms, covering the entire plant early in March. The young leaves are bright red. *R. ovata* is of low flat growth. *Stereospermum sinicum* and *Stranvaesia glauca* are both Chinese evergreens of exceptional beauty.

Buddleia variabilis superba adds a new type of beauty to our gardens, when it has fully developed its numerous flower-shoots. The flowers are bluish violet, fragrant and appear here in Florida late in April. *Nandina domestica,* the Sacred Bamboo of Japan, is also a very interesting and beautiful plant. We must not omit from our list the Sago Palm, *Cycas revoluta,* which grows equally well on high and low land and is perfectly hardy all over the State.

The Windmill Palms, *Trachycarpus excelsa* and *T. Fortunei* are rarely found in our gardens, though very distinct and handsome. There is a large fine specimen of the first named species in Mr. W. J. Ellsworth's garden at Jessamine, Fla.

The two species of Bamboo Palms, *Raphis flabelliformis* and *R. humilis,* grow best in half shade among ferns and caladiums and such like plants. Both form eventually large clumps of many stems, the first one growing 6 to 8 feet high, while *R. humilis* never grows taller than about 3 to 4 feet.

It would lead too far to go into detail in describing the many fine coniferous plants of Japan. I have only found the following adapted to our soil and climate. *Podocarpus Japonica* and *P. Nagei,* both requiring shade, and *Cunninghamia Sinensis.*

Of the evergreen climbers the following may be mentioned: *Kadsura Japonica, Stauntonia hexaphylla, St. macrophylla* and *Trachelodspermum jasminoides,* all exquisite woody climbers. The two Honeysuckles, *Lonicera Japonica* and *L. Halliana,* are too well known to need to be recommended.

I have now in my garden a large number of tender evergreen trees and shrubs from Yunnan, southwestern China, which were collected recently by Mr. E. W. Wilson for the Arnold Arboretum and which were sent to me by Prof. C. S. Sargent of Harvard University for experimental purposes. None of these novelties are yet named. This will be done as soon as they have flowered.

W. J. Ellsworth.

Mr. President, Ladies and Gentlemen:

When we scan the pages of previous issues of the reports of this society in order to avoid what has gone before, it seems rather difficult to find anything to say that may be regarded as of sufficient value to justify taking the time of the society to say it. However, in a more or less general experience of upwards of 20 years in plant growing in this State there may be some bits of experience perhaps profitable to study, and these we will attempt to recall.

We began the practice of horticulture, ornamental as well as practical, on a location among the sand hills of the West Coast with full confidence in the fertile soil of that locality and its advantageous situation beyond the reach of frosts, knowing (?) that here our much prized "tender things" of glass houses and hot beds would laugh Old Boreas to scorn. In December we planted geraniums, heliotropes, fuchsias, etc., not exactly for shade but to have some shrubbery about the place while our trees, such as helianthus, ricinus, hollyhocks, rubber trees, etc., were coming on to make the permanent shade desired. For our hedges we could have nothing finer than asters, mignonette, candytuft, etc.; true some pruning might be required but our new hedge shears were equal to that.

In the way of bulbous plants we had brought with us a good variety of tuberous-rooted begonias, cyclamen, goldenbanded and other lilies, tigridias, dahlias, etc., all of which would be useful at the shows in the fall. All these were duly planted and started on their mission of the desert. During the succeeding weeks, while these things were forming that sturdy groundwork so necessary to a permanent structure, we indulged ourselves in numerous tours through the hammocks so common to our part of the State.

In February something went wrong, somebody had made a mistake. And our embryo shade trees, hedges, etc., were prostrate in the grip of an icy norther. What was to be done? Back to the woods we went to figure it out. After all perhaps nature knew what she was about, so we began again, with material from the hammock. We planted our "boulevard" with live oaks, water oaks, magnolias, red bay, gums, cherry laurel and American holly, all of which are in abundant supply.

For the embowering of our cottage we brought out cross vines, yellow jessamines, smilax, coral honeysuckles, trumpet creepers and others. For shrubbery for so high and dry a situation we selected varieties found in the higher soils, such as azaleas, andromedas, gray beard or fringe tree, dog wood, and from the mud we took the needle palm, which has succeeded admirably.

As thorough work when planting is more than half the battle, we dug large holes, used an abundance of first class muck well mixed with the sand, pressed the soil firmly about the roots and watered liberally, after which the trees and shrubs took care of themselves.

All the varieties named have proven well adapted to our light dry soil. Contrary to all advices we have found the live oak equal in growth to the water oak.

Some other plants found in the sand hills effective for use about our homes are "Butterfly flowers," belonging to the milk-weed family. We have found numerous shades of orange and lemon colored flowers. These have thick, fleshy roots and transplant readily. They bloom in spring and early summer and individual flowers hold quite a long time.

Liatris, or button snake root, in five or six varieties, mostly with light purple or magenta colored flowers; some bulbous rooted, others of a tuberous rooted nature. These bloom from September to November and are prominent in our list of fall blooming natives.

There are also a number of varieties of wild asters which can probably be successfully placed under cultivation. Flowers one-half to one inch across, in shades of purple.

Centrosema Virginiana, belonging to the pea family, is a charming little vine found along the edges of hammocks. The blooms, which are about 1 1-2 inches across, come in various shades from lavender to light blue.

But the season is advancing and we will leave the hammocks and study the lists of introduced plants. These we shall for convenience place under the head of Hardy, and Half Hardy.

Among hardy plants are a number of Bamboos, which thrive well in almost any soil and are exceedingly handsome in appearance. Bambusa argentea, and its variegated relative, argentea striata, are specially vigorous growers in the hardy class, attaining a height of 30 to 40 feet, and may be considered of value for the purpose of windbreaks. Bambusa metake is a handsome dwarf sort, with broad leaves, attaining a height of 8 to 12 feet. The Golden Bamboo, Bambusa aurea, spreads rapidly by means of underground stems and is likely to prove a nuisance on a lawn.

For general purposes the Oleander may be classed as hardy though usually injured more or less by our extreme cold waves. While some of the varieties are well known, the family as a whole does not receive the attention deserved. Of easy growth, good decorative appearance and with an abundant return in the way of deliciously fragrant flowers during many weeks of spring and early summer, planting has mostly been limited to four or five sorts. That there is quite an extended list of varieties does not seem generally known. We find in one Florida catalogue a list of 17 varieties, consisting of double and single forms of red, pink, white and cream and various shades and markings in pink and white.

The Crape Myrtle is also a very satisfactory hardy shrub of easy growth. For weeks in summer covered with great glowing umbels of flowers in many shades of color from lightest pink to crimson and purple. The white variety has not proved as good a grower with us as the other sorts but its delicate beauty justifies all necessary coddling.

Pomegranates are also well worth a place in any grounds. Their glowing scarlet flowers resembling a bouquet of crape set in a crimson wax holder are very conspicuous and pleasing amid the deep green foliage of the plant, while the large apple-like fruits are much esteemed by many who use their juice in making drinks.

The Silk Oak, though not literally hardy with us, survives all except the most severe freezes, and excepting the winter of 1894-5 has not been cut back severely by cold. Its racemes of curious yellow and purple flowers are very attractive and the tree itself presents a striking and handsome appearance.

In the Camellia family we have a good range of sorts of great beauty. While we have not found the Camellia to thrive in full sun we have had good results growing the plants in half shade.

A very showy family of plants is the Chinese Azalea. Of dwarf, compact habit these plants so cover themselves with bloom as to almost conceal the foliage, and resemble huge bouquets. The varieties, of which there is quite a wide range, come in various shades and markings of pink, crimson, white, etc., and in double and single forms. These do well in a light soil in partial shade.

The Sweet Olive, or Tea Olive, is a plant of easy growth and very desirable. Its dwarf habit and dark green foliage form a pleasing appearance, and it produces freely in spring quantities of small, cream colored flowers with a most charming ripe peach fragrance.

One of the most peculiarly striking plants in our list is the Bottle Brush, the name of which adequately describes the blooms. These are developed in clusters four or five inches long and about 1 1-2 inches diameter, are freely produced, and the plant in full bloom forms a most beautiful object. The Bottle Brush thrives readily in poor, dry soil and blooms several times a year. There are various shades of pink, crimson, white, etc.

Among Half Hardy Shrubs we have several varieties of Bauhinias of great beauty. Bauhinia alba has large pure white flowers 3 or 4 inches across. Bauhinia purpurea is one of the most showy and handsome of the family; the flowers are marked purple, white, mauve, etc., and are produced in great numbers in winter or early spring.

Chinese Hibiscus and Allamandas are most valuable shrubs in this list, producing freely all summer quantities of showy and beautiful flowers. Though easily killed down by frost they readily start again in spring and bloom freely in summer. In fact the Allamanda may be said to be benefited by this frequent pruning as it results in the production of new, fresh wood.

The Dwarf Poinciana should have a prominent place in any lawn planting. Its red and gold flowers are most beautiful, and freely produced the greater part of the summer. While not so ready to start after being killed down by cold, is readily grown from seed and commences flowering when quite small.

Other shrubs of easy growth and that start readily after injury by cold are Cestrums, both night and day blooming sorts, producing myriads of small, white flowers that in the case of the night blooming sorts perfume the air for a long distance around.

Clerodendrons, with flowers of white and deep red; Eranthemum, deep blue flowers; Plumbagos, pink, light blue and white flowers freely produced most of the summer; Hamelia patens, small scarlet flowers; Tabernaemontana or Rose Bay, white flowers; Thunbergias, blue and white.

In Hardy Vines we have Bignonias in variety, flowers of yellow, red, cream, purple, etc., all free bloomers; Tecoma capensis, practically hardy, red flowers produced during the greater portion of the year; Wistarias, blue and white; Honeysuckles in variety, as also a considerable variety of Jessamines, so called, of which probably the Star or Confederate Jessamine is of the most value. This sort produces over a period of several weeks great quantities of small white flowers with a charming fragrance.

In Half Hardy Vines there is a very extensive list, including some varieties of Bignonias, notably Bignonia venusta or Flame Flower, a most vigorous growing sort which starts quickly after injury by cold and flowers again the following fall. In bloom it is one of the most striking objects imaginable, large plants producing such numbers of blooms as to give the effect of great sheets of flame. We have a plant of this variety that though killed to the ground two years ago bloomed at the eaves of a 35-foot tank house the past winter.

The Antigonon or Rosa de Montana is also one of the most valuable of vines; of an herbaceous character, starting early in spring commences blooming early in the summer and produces in the greatest profusion its rich pink flowers until fall.

With so abundant a supply of hardy and half hardy trees, shrubs, vines, etc., from which to draw for our needs for permanent planting there would seem little requirement for annuals, which call for a greatly increased amount of care and attention to attain success.

And while considering our plans for planting let's not forget the birds. Flowers and birds are fit companions and both do much to add to the pleasure and content of home surroundings. Include in your planting one or two wild cherries, some elders, lantanas, a few downy myrtles, cattley guavas, and other fruit producing plants and your bird friends will sing so sweetly your home will be more attractive to your human friends.

DISCUSSION.

Discussion after Dr. Nehrling's paper.

Mr.——: I move that a vote of thanks be extended to Dr. Nehrling for his paper.

Vote taken standing. Unanimous.

Mr. Temple: I would like to ask if that Sacred Bamboo can be secured anywhere. Are any of the dealers in Florida handling that Sacred Bamboo?

Dr. Nehrling: I do not know. I think I have seen it in some of the older catalogues years ago. My specimens came direct from Japan. Do you handle it, Mr. Reasoner?

Mr. Reasoner: No, we do not have it.

Mr. Mills: We carry it. It is a mighty bad thing to speak up for your own business right here, but since the question was asked, I will answer it. That we have is from one of the original plants brought to this country. D. G. Ambler had it, and after the fire Mrs. Ambler gave it to me to plant. We have propagated it, and I can say it is one of the best things in Florida. In the winter time it is a beautiful red color, and the plant seems to be perfectly healthy.

Prof. Hume: For those who do not know the gentleman speaking, I would say that it is Mr. C. D. Mills, of Jacksonville. I have seen the plant growing in Tallahassee. It seems to be perfectly hardy there, even though the temperature goes down to fourteen or fifteen degrees.

ORNAMENTALS FOR THE LOWER EAST COAST.

J. B. Donnelly.

Mr. President, Ladies and Gentlemen:

I have been asked to present a paper on ornamental planting on the lower East Coast, but, as I am only acquainted with conditions and plants at Palm Beach and vicinity, I will have to confine myself to that locality.

As you are probably aware, Palm Beach is a strip of land lying between Lake Worth and the ocean, it varies in width from one-fourth to one mile, and consists of a rocky ridge along the lake front, and a sandy one on the ocean; the depression between is of a swampy nature. It has been filled in and drained in many places and makes fine garden land, but some of it still remains the home of the alligator and turtle. Along the lake front are the winter residences of wealthy people who come to occupy them every year, and on these grounds around these homes, is where the plants and trees are grown that I will try to describe.

The cocoanut palm (cocos nucifera) is perhaps the most prominent feature of the landscape. They grow here in large numbers, some of the original planting—thirty-five years ago—still remaining, beautiful trees fully fifty feet high bearing hundreds of nuts every year. As they are easily propagated, they are largely used as an avenue tree and for windbreaks, etc.

Several varieties of the Date Palm (Phoenix) are represented by many fine specimens. A good many set fruit every year which rarely ripens, owing to heavy rains about the ripening time, (August and September.)

The Royal Palm (Oreodoxa regia) grows very well here. Many specimens are fully forty feet high. A few of them bore seed for the first time last year. There has been a great number of young plants set out in recent years that are doing well.

There are not as many varieties of palms planted out here as might be, and I have no doubt they would do as well as those that have been planted. We have nice specimens of Areca lutescens and A. rubra, both varieties bearing quantities of seed every year. Latania borbonica also bears seed, Caryota urens, Seaforthia elegans, Pritchardia Pacifica, and the California palm, Washingtonia robusta are well represented.

The socalled Sago Palm (Cycas revoluta) grows luxuriantly here, some specimens are eight feet high and bear quantities of seed.

We have a magnificent specimen of Cycas Circinalis, with leaves ten feet long.

Pandanus utilis grows to a large tree with heavy branches and bears seed every year. P. Veitchii makes large clumps from ten to twelve feet high and holds its variegation well. When planted close it makes a fine hedge or windbreak.

A very ornamental plant which grows well here is Ravenala Madagascariensis. It grows about twenty feet high and blooms every year making seed freely. Strelitzia regina is another fine plant that grows to a height of fifteen feet. The variety, Augusta bears seed freely, humilis blooms but does not produce seed. Of the Agaves we have several varieties that grow to a large size and send up tall bloom stalks. They are used as single plants on the lawn and planted on the dividing line between lots, as there are no fences.

Of the Conifers we have Araucaria excelsa and A. glauca. They make very handsome trees.

Bamboos, when protected from the east wind do well. We have several varieties, many of them fifty feet high.

Among the tropical fruit and shade trees which are largely planted here may be mentioned Albizzia Lebbek, Poinciana Regia, Tamarindus Indica, Cecorpia palmata, Cupania Sapida, several varieties of Anona, Cicca disticha, Eugenias, Persea Gratissima, Harpephyllum Caffrum, Terminalia Catappa, several varieties of Ficus, Casuarina equisetifolia, Grevillea robusta, Achras Sapota, and many others. The native Ficus (F. Aurea) which grows here to such a large size is a very fine shade tree. There are several other native trees that are very desirable, such as the Satinwood (Chrysophyllum) Sea Grape (Coccoloba uvifera), Mastic, etc.

Of flowering shrubs the Oleander and Hibiscus in many varieties are largely planted both as specimen plants, clumps, hedges, and windbreaks. Several varieties of Bauhinia, Cestrums, and Cassias, Cordia Sebestina, Artobotrys, Galphimia Nitida, Hamelia patens, Jacobinias, Ixoras, Murraya exotica, Lawsonia alba, and many others furnish cut flowers at all times.

Of vines, the most popular here are Bougainvillea Sanderiana, and Bignonia Venusta: besides these we have Abrus precatorius, Allamanda Hendersonii, Antigonon leptopus, Quisqualis Indica, Beaumontia Grandiflora, several varieties of Jasminum, Ipomoea, and Aristolochia, Cryptostegia Grandiflora, Stephanotis floribunda. Thunbergia—two varieties, several varieties of Bignonia and Tecoma, Stigmaphyllon ciliatum, Petrea Volubulus, and many others.

The red flowering Bougainvillea—B. lateritis—is a recent favorite. It grows as well, and blooms as freely as B. Glabra, and is, I think, a decided improvement in the color of the flowerbracts.

In ornamental foliage plants our Crotons take the lead. We grow about twenty varieties. They are grown in beds, borders, and single specimens. They are cut back every year, and are so easily propagated that every one has a supply of them. Some specimen plants are fifteen feet high and are very handsome.

Acalyphas—four or five varieties—vie with the Crotons in coloring and effectiveness in beds, borders and single plants. They also have to be cut back, sometimes twice a year. Phyllanthus Nivosa var. Rosea picta is used for hedges and borders. It is very handsome, and much admired by visitors, Aralia filicifolia, and A. Guilfoylei, and several varieties of Panax are much used. Several varieties of Furcraeas, aloes, and Euphorbias are used as single plants and for outlining boundary lines, and Yuccas are used for the same purpose and for protecting orange groves from predatory visitors. They make a good fence and windbreak.

There are a great many other tropical and sub-tropical trees, shrubs and plants that I have not mentioned that grow here in the open ground without any protection whatever.

I have two Orchids, Vanilla planifolia, that are growing on the north side of two Date Palms for the past six years without any protection; they have bloomed for the past two years, but have not set fruit.

During the winter months we grow quantities of annuals, such as Salvias, Petunias, Marguerite Carnations, Candy tuft, Mignonette, Nasturtiums, etc., etc., for cut flowers. Besides these we have good Tea and Hybrid Tea Roses, Easter lilies, etc. I may add that there is very little attempt made at landscape gardening. In some places plants are huddled together in a border without any regard to their future size, or else planted out promiscuously in the open, usually in straight lines with no regard to vista or surroundings.

The subject of my paper is an interesting one to me. There are so many trees and plants growing here that I have not mentioned, and which if I did, would make this paper much too large, so I will close.

Theodore L. Mead

Mr. President, Ladies and Gentlemen:

My paper today will necessarily consist of only a few notes, as since I have been of the fraternity of market-gardeners I have found that crops, especially under cloth cover, require all the time there is, including days and nights and holidays and Sundays and leave little time for any side interests.

My orchids surprised me by their endurance of hardship and neglect. I managed to water them with the hose about once a week and fired the greenhouse boiler on the coldest nights, but could do little else. The glass sashes were removed during the summer, leaving the lath shading so that the plants had the benefit of the summer rains. Nearly all the terrestrial plants in the greenhouse died from neglect, but at least two-thirds of the orchids survived and gave a gratifying display of flowers in their season. A few rare hybrids now ornament your president's desk.

The new amaryllis varieties, as bred by Dr. Nehrling at Gotha, have proved a great improvement upon the scarlet sorts commonly grown in Florida gardens, and we owe Dr. Nehrling a debt of gratitude for putting these beautiful forms within our reach, as his seedlings are nearly equal to the foreign named varieties, which cost often ten dollars and more for each bulb, when imported from the European fanciers.

With a little patience anyone may now have a royal bed of these fine varieties at small expense. Two or three bulbs may be purchased, and the pollen transferred from flower to flower when they bloom. Seedpods full of seeds will be ripe in a few weeks from which hundreds may be grown by the amateur.

Three years ago I had a single bulb; I sowed the seeds it produced in a raisin-box of rich soil and gave them only ordinary attention till the next summer, when I had 200 small bulbs to plant out. They have made a well-filled bed about 4x20 feet and though only half of them flowered this year, the bed was a blaze of bloom, as many as 150 flowers being open at once, many of them of great size and varying in color from nearly white to deep scarlet and crimson.

My vegetable gardening experience has taught me that Florida soils must have a steady artificial water supply to yield satisfactory returns of either flowers or other products. If flowing wells can be had and clay is near the surface, subirrigation is all that can be desired, but only a few can have such facilities. Now that good gasoline engines can be had for $30 or $40, they are as necessary and no more costly than a good fence is in the cattle and hog country which still comprises most of rural Florida.

Ten minutes time a day and maybe a cent's worth of gasoline will make almost any Florida desert blossom as the rose, beside supplying an abundance of water for household purposes, and this should become as much a matter of course in every Florida home as is a cook-stove or a set of bedroom furniture.

Tropical Fruits

SMOOTH CAYENNE PINEAPPLE CULTURE AT PUNTA GORDA, FLA.

J. M. Weeks.

Mr. President, Ladies and Gentlemen:

Some weeks ago I was requested to write an article on the above subject, and I asked the gentleman making the request whether or not he wanted a true history of the fruit as I know it here—the failures as well as the successes. "Oh," he remarked, "you need not mention the failures." The article was not written. I believe the stating of actual facts as nearly as we can give them, and the presenting, as nearly as we can, reasons for the successes and the failures in any business, to be better eventually for the State and the community, than painting everything "rosecolor," thus finally creating discontent and disgust in the enthusiastic settler.

My experience in pineapple growing has been limited to the culture of the Smooth Cayenne variety, under sheds, near Punta Gorda during the past ten years.

Almost all the lands in and adjacent to Punta Gorda are adapted to the shed-grown, fancy, Smooth Cayenne pineapple, but some are better than others. For instance, lands lying within one-half mile of Charlotte Harbor are better protected from cold than those farther away. Then some low lands which can be readily drained are better than the higher, lighter, more sandy soils, because they seem to contain more humus and the pineapple is a very gross feeder.

The country about Punta Gorda is nearly level, with a gradual slope from the interior to the shores of the bay, thus giving good drainage where ditched. Its natural growth is pine trees and palmettoes.

The first step for the prospective pineapple grower, after selecting and purchasing his land, is to have it cleared, or "grubbed." This will cost him from \$30.00 to \$50.00 per acre, the price being governed by the amount of trees and palmettoes on the tract. Then it should be plowed and later harrowed fine. The first plowing will cost \$6.00 per acre, and the harrowing from $4.50 to $5.00 per day.

The construction of the shed is next in order. Ten years ago when we could buy the best lumber for $14.00 per thousand feet delivered, we used 1x3 inch slats, generally 16 feet long, for the partial covering, placing the three-inch slats three inches apart, thus making a half cover, and a protection from both heat and cold. These slats were placed north and south so that there would be alternately sunlight and shade over the plants and the fruit, as the sun makes its daily journey from east to west. They were placed on 1x8 inch by 16 ft. stringers, which rested on fat pine posts eight feet apart one way by fourteen or sixteen feet the other way. Those sheds then cost about $600.00 per acre. The great advance in lumber, however, necessitates the construction of cheaper sheds, so we now place our posts fourteen by fourteen feet apart, using No. 10 galvanized wire instead of the heavy 1x8 stringers, No. 14 wire for cross supports and ordinary building, or plaster laths, woven with No. 16 wire, instead of the 1x3 slats for the cover. This shed can be constructed for about $400.00 to $450.00 per acre. It is about seven feet high, and protects the pineapple from both extremes of heat and cold, and conserves the moisture in dry seasons. This, together with proper fertilization and cultivation, produces pineapples so large, so juicy, so luscious, and so tender that one fruit will be sufficient for two meals for a large family and the pulp may, if desired, be separated from the peel and eaten with a silver spoon.

Next, the beds are made up and the plants are set out. There are four kinds of plants, viz., suckers, slips, rattoons, and crowns. Of the four, suckers are best and crowns least desirable. I usually set plants eighteen by twenty-four inches apart, thus getting about ten thousand to the acre. Other growers set them at different distances, each to his own liking. Plants cost from $25.00 to $50.00 per thousand, according to whether they are or are not culled. As before stated the pineapple is a gross feeder. After having been set out the young plants should be fertilized immediately and afterwards at intervals of every six weeks, of course being frequently worked with the "scuffle" hoe. At least $100.00 in fertilizer per acre should be given the plants to bring them to maturity.

Plants mature their fruit from fifteen to twenty-four months after having been set out, and the same plant, or rather, the plant and suckers thereon, will bear, if properly cared for, several crops. I have plants which were set out more than five years ago and which are still giving me good results. The richer the soil in which the young plants are set, the longer will the fruiting continue.

The pineapple has many diseases and the fruit many enemies. Thus, wilts (a fungus growth), root-knot, dieback, ants, and mealybugs are some of the principal enemies of the plant. It matters not which of these diseases attacks a plant the result is much the same, that is, the roots die and the plant languishes, getting what nourishment it can without roots. Six years ago we used to throw these plants in piles outside the pinery and burn them, to prevent, as we supposed, the further spread of disease. Now, we simply pull them up; cut off the dead roots, strip them, put them back in a hole made by a posthole digger, throw a half-handful of fertilizer among their leaves and let them grow. About 75 per cent. of plants so treated do well. We fight the enemies of the fruit with poisons.

Results after all are the test of success, hence, we want to know what are the results of all this expenditure, labor, and waiting. If the land and plants be properly selected, if the plants be carefully and conscientiously fertilized and cultivated, and are thrifty, the first crop should be about four hundred crates per acre at an average price of about $2.00 per crate. After crops will run about three hundred crates per acre. Of all the fancy varieties, the Smooth Cayenne is most cultivated for market here, because it is smooth, while all other varieties with which I am acquainted are serrated; because its flavor is delicious; because its appearance is striking and tempting, and because it is a better shipper than most of the others. He who buys one real good Smooth Cayenne will want another.

I have used the word "failure" in connection with pineapple culture, and will say that any one who will not give labor, fertilizer, and close attention to the business had better not go into it. There have been failures in every section where the shed-grown Smooth Cayenne pineapple has been grown. Perhaps proportionately fewer in Punta Gorda than in some other sections. I believe the soil and conditions about Punta Gorda to be especially adapted to the growing of this fruit.

Miss Florence R. Harden.

Mr. President, Ladies and Gentlemen:

The excellent papers of Mr. Reasoner and Mr. E. V. Blackman, read before this Society last year, on tropical fruits, not only gave the names of a great many of the varieties that have been grown in Florida, but discussed many points of interest concerning the best known varieties.

This paper will, I fear, be rather rambling in style, and will merely touch upon a number of fruits and questions about them that will be intended to provoke much discussion. There is no doubt in my mind that tropical fruits should have a more important place in this Society than they have ever yet had. The limited area in which these fruits will thrive, and the undeveloped condition of that portion of the State, together with the fact that most Americans have not become acquainted with even the existence of such fruits, partly accounts for this lack of interest. I should say lack of general interest for most of the information that I can find about tropical fruits has been written by men who either live in Florida, or have spent much time in studying her resources and problems. I do not know how we are to induce people to take a general interest in the pamphlets, bulletins and reports that have been written for us. The government has done its part to help the faithful ones to teach us all, but, alas! I do not think they are read as they ought to be. Perhaps, a more serious difficulty is, that the tropical fruits ripen in summer time when such a large per cent. of our educated people are out of the State.

It has been proven that a great many of the choice fruits may be shipped safely, long distances. I have several times had mangoes and avocadoes shipped to me when they had to make a three or four days' journey and they reached me in good condition and kept more than two weeks in an ordinary refrigerator, a few ripening each day.

A little of my experience in having a display of tropical fruits at the Michigan State Fair at Detroit, may be given here. There were more than thirty varieties in the collection. The weather was very hot in the Southern States through which they had to pass and yet the first shipment which was well packed arrived in fairly good condition and the fruits kept so well that I had a creditable display left at the end of ten days.

The keen interest the people took in these fruits was a constant surprise to me. Hundreds had never seen a grapefruit and the citrons, pawpaws, avocados, cerimans, green cocoanuts, sapodillas, mammee apples, guavas, limes and many others aroused the keenest interest and many amusing questions.

Almost every minute some one would say: Do you eat them? All these things? This too? Others who had traveled in the tropics were full of intelligent questions about the country where these wonderful fruits grew. The taste for most of these fruits is supposed to be acquired, but I do not remember a single person who did not relish a fruit that I prepared for tasting. One great trouble is that often they are either under ripe or over ripe when first tried and of course that causes prejudice.

I can remember when few people in the western states knew the taste of pineapple, and the little green things were so sour that it is a wonder they got a hold on the people as soon as they did. I have a great many tropical fruits growing in my orchard and I find that most people like them at first taste, when they are just ripe.

Something is usually said about mangoes and avocados, and I would not take up your time with them, but I must say a little. The East Indian mangoes are certainly delicious, and salable, but, so far, they are such small produecrs for me that I think we need to know more about them. I have a large budded mulgoba, a beautiful tree, that is eight years old and it had the first blossoms this year and there are two fruits hanging on. Other trees seven years old have also the first bloom this year and only a few fruits. The Bennetts have done some better, but not well. They bloomed splendidly, but do not set much fruit. The Gordon did about the same.

Eight years ago, we secured four dozen mulgoba mangoes from Mr. Gale of Mangonia—large luscious fruits they were. We planted all the seed as an experiment. The seedling trees are large, vigorous and beautiful. They are very different in appearance. This year a number of them are fruiting, and I am eager for them to ripen. The fruit on three of the trees is a dark rich purple, with green underneath. They look like they will be large—are the shape of the mulgoba, and I think they are going to be a month earlier than the budded trees. Part of the other trees have fruit shaped like No. 11, some having large fruit and abundant quantity, while others are thin, poor looking fruits and still others are rounder. I hope to have a more interesting report of them next year.

Dr. Gifford has some of the Philippine mangoes that he secured in Mexico that he hopes will do well here. The quality he says is as good as the best East Indian varieties, and they are heavy bearers.

Last year, Mr. Blackman reported that the Department of Agriculture at Washington had pronounced an avocado, originated by himself, and named the "Blackman" to be the best avocado yet tested, all points considered.

This year, I have the honor of making a similar report—as a fruit sent from my orchard and named "The Haden," in honor of Captain Haden, who planted the seed, was pronounced to have more good points than any yet tested. May the honor be shifted each year!

Unfortunately, I have had to leave the State in summer the past seven years, and have missed learning many valuable lessons.

I believe that there are possibilities of preserving, evaporating and otherwise treating these fruits, that would prolong their season.

One of my neighbors dried some of the fruits of the carissa and said it acted very much like dried apples when soaked in water.

The Carissa Grandiflora is one of the handsomest of our plants. The large white flowers are both beautiful and fragrant and the deep red fruit on the dark green foliage is especially attractive. The first is a good deal like a raspberry in flavor, and makes a nice sauce or jam.

The tamarind can be dried or put up in sugar or molasses, as the Bahamans do, and makes a pleasant drink when added to water, or they are nice used as a conserve. I find that almost every one who passes my tree stops to look for a few ripe tamarinds and they are eaten as rapidly as they ripen.

The sapodilla has been neglected, as it is a fine fruit and the tree is very ornamental. I find that the fruit makes one of the best sweet pickles I have ever made, I am going to try to dry them this year.

It takes the seedlings a long time to bear, and there is a saying among the Bahamans that he who plants a "dilly" tree will not live to see it fruit. This may account for its scarcity in the gardens as most people are very fond of the fruit, and the tree grows of itself, after it is started. It grows wild on the keys.

The sapota blanca is an unusually beautiful tree. Only a few weeks ago I said that I did not esteem the fruit of it highly but recently I have changed my mind. My tree is not in a good place and has very little attention, but I believe if it were well treated that we might grow to value it as they do in Mexico, where it is a great favorite.

The Surinam cherry is such a nice fruit—the tree and fruit are both beautiful. I hope that more people will plant them. Many prefer them to strawberries, and they are certainly much less trouble to grow. The Barbadoes cherry is said to be even superior to the Surinam cherry.

No paper on tropical fruits should fail to speak of the pawpaw (Carica papaya).

It is so delicious and so wholesome. The fondness for it grows upon one and it can be prepared in different ways for the table. If you are short of vegetables, a green papaw, stewed like squash and seasoned with salt, pepper and butter can not be told from squash. If you want an apple sauce, season it with lemon or lime juice and add sugar. When ripe the favorite way is to eat them from the shell like a cantaloupe, but strangers like them better peeled, cut in cubes and seasoned with sugar and lime juice.

The Cocoa plum grows wild on the beaches and when one can get them they make a splendid substitute for the northern May cherry, if lime juice and sugar are added after they are stewed in water. The guava is so well known that I have not spoken of it although it is a very interesting fruit to me. Time would fail me, were I to try to tell of all the interesting fruits that we have in south Florida, so I desist.

Cocoanut Grove, Fla.

Irrigation Experiments

Milo B. Williams.

Mr. President, Ladies and Gentlemen:

During the spring of 1909 a co-operative arrangement was entered into between the office of experiment stations, U. S. Department of Agriculture, and Dr. Charles Drennen, of Orlando, Florida, for the installation of an experimental irrigation plant and distribution system for the purpose of investigating the practical and economical methods of applying water to citrus groves in Florida.

Preliminary surveys were run and tests made during the spring months of 1909, the tests being conducted with the pumping plant Dr. Drennen had at that time. Water was conveyed through the orchard in open ditches and applied to the surface by means of furrows or in basins, and a study made bringing out the following general data.

(1) That the loss of water is excessive when run for a length of time in open supply ditches made in the sandy soil.

(2) That water can be distributed over the surface in small furrows, providing the furrows are given proper grades and from 25 to 30 gallons of water be supplied to each furrow per minute.

(3) That the tendency of the dry soil is to present a resistance to the taking of water when first applied, which aids greatly in the flooding of small basin areas.

(4) That the water when applied to the Florida high land soil in furrows does not percolate laterally in the root zone of the citrus tree more than 2 or 3 feet distance from the point of application in five days' time, but has a tendency to go downward rapidly and be wasted in the deep porous white sand, making it necessary for a close spacing of furrows and a large flow of water to each furrow for a short length of time.

From this data it was decided to remodel the pumping plant already on the ground in such a way that it could be used in supplying a distribution system built similar to the concrete construction used so extensively in the irrigation of citrus groves by gravity flow in Southern California.

THE REMODELED PLANT.

The pumping plant as now installed consists of a 25-horse power Hagen gasoline engine, connected by belt to a 5-inch Gould centrifugal pump of the one-stage type. The water is drawn from a large lake supply and lifted to an elevation of 34 feet above the lake water level, where it is delivered into a concrete standpipe which is situated at a controling elevation in the orchard.

The suction consists of a 7-inch steel pipe, while the discharge is made up of two 5-inch pipe lines to utilize some of the pipe on hand, left from the old plant.

The economical capacity of the pumping plant is 44,000 gallons per hour, and the distribution system is designed to handle this amount.

The general design of the distribution system consists of large water-tight conduits, laid below the cultivated surface and following the most prominent ridges and reaching all high points in the orchard. At points where it is desired to supply water to furrows or basins small standpipes or hydrants are placed in the underground conduit and the water brought to the surface through this construction. Each hydrant is equipped with a valve which controls the amount of water taken from the underground supply, while in the sides of the standpipes are small division gates which divide the total head into the individual furrows. By means of check valves built into the main lines of the conduits the water can be taken in part or in whole to any portion of the orchard.

The construction of the distribution system was begun during the spring of 1910. The first conduit to be tested out was built of concrete according to standard specification for their making in southern California, which calls for a "dry mixture" pipe, or a concrete pipe made from a comparatively dry mixture of sand and Portland cement wetted only to a consistency that will permit immediate removal of the molds, and cured carefully afterwards by applying water in the form of spray until the cement will set. Each section of pipe is coated on its inside surface with a mixture of neat cement paint and the standard design of tongue and groove joint, as used in southern California construction, molded on each length. Three thousand feet of the above design of pipe was made and laid in the Drennen orchard.

In testing this amount of pipe under the Drennen grove conditions, the following difficulties have been encountered: That the same design of joint as used in the California field, where the water flows through the lines by gravity and under low pressure heads, is not practical for the pressure heads necessary to conduct water in the Drennen grove. That the shells of the dry mixture pipe are undesirably porous regardless of the neat cement paint lining.

With these data on hand, together with the results of comparative tests which this office has obtained from experiments with "wet mixture" concrete pipe, vitrified sewer pipe, and "dry mixture" pipe during the past winter months, it has been decided to delay the construction of the Drennen system and make arrangements to complete it in part with "wet mixture" pipe and in part with vitrified sewer pipe, which will give us a comparison of the three constructions under the same conditions.

Molds for the "wet mixture" pipe are now being built, which will turn out pipe 8 inches in diameter in sections 5 feet in length with a tongue and groove joint. A separate mold is being made also that will make a reinforcing concrete collar to be placed about each joint to overcome the difficulties encountered in the California joint.

OBJECTS OF THE EXPERIMENTS.

The Drennen plant is being installed with the following experimental objects in view: (1) To learn the possibilities of surface application of water in the irrigation of citrus groves in Florida; (2) to study the effects, value, and disadvantages of irrigation; (3) to determine the cost of pumping and applying water in irrigation by the surface methods; (4) to gain data as to the quantity of water necessary for the insurance of citrus groves against drouth, and to open a field of cheap pipe construction that will meet Florida requirements.

The plant when completed therefore, will be so constructed that the different methods of surface application may be experimented with, on different plots of the orchard, and a study made of the feasibility of each method. An effort will be made to determine the proper size, depth, length, grade, and spacing of furrows to use in obtaining an even distribution of moisture through the root zone and give the least waste of water. The proper amount of water to apply per irrigation, and the length of time between applications, with respect to the amount of rainfall, cultivation, and soil moisture, will be investigated in the hope of obtaining data that will be of value to those who are developing water resources or designing irrigation plants. The system will be equipped with measuring devices, whereby a continuous record will be kept of the amount of water used, together with the time of application. A standard rain gage is placed in the orchard so that the exact record of precipitation and its distribution as to time can be had and the total amount of water any one plat of the orchard receives during a day, a month, or a growing season can be calculated.

M. E. Gillette.

Mr. President, Ladies and Gentlemen:

I am at a loss to know why I was selected as chairman of the Committee on Irrigation, as while I am generally on the water wagon, I know very little about irrigation. Fortunately, however, one of my associates is Mr. Campbell of Jacksonville, who knows as much as anyone in the State about irrigation, and upon being notified as having been appointed on this committee, I immediately wrote him and asked him to prepare a report on this subject. He replied that this was his busy season and that he was working twenty-four hours a day and didn't have time to attend to it, but I have always found that the busy men are those who do things. He told me the other day he didn't think he could be here, but he came into the room a little while ago and gave me this paper. He said he never read a paper before an audience in his life and said he was too modest and wouldn't I read it.

I don't know whether he meant that as a reflection on me or not, but I will read you the paper.

(Reads Mr. Campbell's paper.)

Now, Mr. Campbell referred in his paper to a system of irrigation which I discussed at the last meeting and possibly it may be interesting to some of you to know that since that time I have installed a plant similar to that I described at Daytona. Perhaps some of you were not at that meeting, and I will tell you what the plant is like.

At one time, I had a plant which required the use of a hose, and I disliked that very much. I found the hose rotted out in about one year, and it took a number of men to handle it, and altogether it was quite unsatisfactory. While we got water on the trees of course, and while the first cost was not heavy, the cost of putting the water on was heavy, and it was pretty hard work, and for those reasons it was quite a temptation to put off applying the water, hoping from day to day that it would rain and thus obviate the necessity for going to all the expense and trouble until long after we should have begun to water. To avoid that, I thought I would like to have it automatic, So Mr. Campbell installed a plant for me at Winter Haven. I now have this system covering ten acres, but intend to put it over forty acres.

The engine used for power is a 50 H. P. double cylinder Hagan; the pump is a two-stage Gould's Centrifugal. The main is six inches. The laterals from this main are 2½ to 1½ inches. The main line runs up to this ten acre lot and then the same size main runs right across it, dividing it into two five acre tracts. The trees are twenty-four feet apart. The whole tract now is set to nursery and the stand trees are the same size as the nursery seedlings. I am letting them come right along with the nursery seedlings. In putting down the pipe, we put it about eighteen inches under ground. The pipe under the ground is protected with a preparation of asphaltum, and the parts that stand up outside of the ground are galvanized.

There are six laterals leading from each side of the main. Each lateral takes care of two rows of trees, and where they lead off from the main there is a valve right at the main. Then a ¾ pipe is put in opposite and up to within a foot of each seedling or grove tree. Then the pipe goes up at right angles to just above the top of the tree. In other words a pipe is put over each tree. You see, the pipe is absolutely out of the way, and if it were not for the upright pipe over each tree you would not know there was an irrigating plant on the place.

Now, when we want water, my man goes down and turns on as many of the laterals as the pump will supply. We have a four inch sewer pipe that goes over the valve so as to keep it covered and keep the dirt out. Then he goes on down and starts the pump. We figured that we would run an hour on each one of the six lines on each side of that five acres. We figured that if we start in the evening, by six o'clock in the morning we would have let each line run an hour. That would give me an inch and a half of water over the whole ten acres in ten hours.

You know how dry it has been. During the dry period I went up there one day. The man ran the engine until 12:00 o'clock, and I told him to run only a half hour on each section. At midnight, one side of the pump failed to work. I went there the next afternoon and there was not a place on that ten acres where I could kick up the dirt with my foot and find a particle of dry earth. Everything was absolutely soaked.

Now, you understand this work was all done with one man. While the initial expense is heavy, the running expense is mighty light. All there is to do is to start the pump going, go up and open and close a few valves, and that is all there is to it. One man goes to work at 5:00 o'clock in the evening and works until 6:00 o'clock in the morning, and the whole grove is completely watered.

Then there is another advantage of having the pipe over the trees. The water comes down just like a rain, and washes off the leaves and drips down to the ground. As soon as the tree grows high enough so that the pipe does not reach to the top, I will extend the pipe so that it does. The water coming that way is just as near like a rain as anything can be. If we ever do have whitefly, which we probably shall have some time, I believe that we can colonize the fungi in those trees and keep the pest very much in check. I believe it was at the last meeting where Prof. Rolfs said he did not think it would be possible to have whitefly in a grove where you could have moisture enough to propagate fungi successfully.

As I have said, the first cost is pretty heavy, but I have never found anything in this light, porous, sandy soil that we can grow without sprinkling. I tried running the water down furrows, and have never found it to my satisfaction.

I believe my method is one that will absolutely control the amount of moisture in an orange grove. Now, if we can have the fire pots in the winter months (not that we ever have any cold at Winter Haven) and have the water overhead in the summer, it seems to me we have a cinch on growing oranges and will be millionaires in less than no time.

The spring is a critical time in the life of a crop. We may get the bloom all right, but if we don't have moisture enough to keep it on the tree, we won't get many oranges in the fall. Most of them go to the ground. Now, when you have an irrigation system such as the one I have installed, where you can have it when you see it is necessary, and don't need to be afraid of the expense or trouble, you can keep enough bloom on your trees to insure you a crop.

I would say that the cost of watering a grove, when you once get the plant installed, will be about $5.00 or $6.00. That includes the man necessary to do the work, the gasoline, the wear and tear on the engine; in other words, that is the total cost to you.

Mr. Stevens: What was the cost of installing per acre?

Mr. Gillette: It cost me $5,500.00 for the ten acres. Of course, this buys the engine, pump, 600 or 700 feet of six inch main, and then I had to go from my pump house to the lake, which took 500 feet more of the six inch main. It is estimated that the next ten acres will cost about

$2,500.00. Of course, the nozzles and sprays are included. They are quite expensive. You will note Mr. Campbell says in his paper that he has a new nozzle that he thinks is going to work pretty well.

Mr. ——: I understand you to say you have 3-4 inch pipe over the trees?

Mr. Gillette: Yes, sir. That seems to give service. Just as soon as we start the pump and turn those valves on, it looks like a fog. It is a solid mass of spray, and in ten minutes' time the ground seems to be thoroughly wet, but, of course, it takes longer than that to put on water enough to do any good. I don't really believe that it will take longer than from 6:00 o'clock until midnight to water the grove sufficiently, however.

Mr. ——: What is the estimated capacity of the pump?

Mr. Gillette: I have forgotten, exactly. I think it was guaranteed 7,500 gallons a minute and actual measurements showed I was getting over 10,000.

Mr. Campbell: Hold on Mr. Gillette, Make that 750 gallons instead of 7,500.

Mr. Gillette: All right, I guess it is 750. That shows that some people here know what they are talking about, so far as the engineering proposition is concerned and I don't pretend to but when it comes to knowing the results I want to obtain and whether or not I am obtaining them, I know pretty well what I am talking about.

With my system, it will be possible to water the whole forty acres in two nights, and I believe I had rather have a forty-acre grove irrigated this way, than 100 acres without irrigation.

J. P. Campbell.

Mr. President, Ladies and Gentlemen:

In the past I have had occasion to talk irrigation to several of you personally, and believe that I have done better by the subject that way than I will addressing you as a body, especially as I have had my time so fully taken up that it was only yesterday at the solicitation of Mr. Gillette, chairman of the Committee on Irrigation, that I decided to prepare this article.

It is not my intention to attempt in this short space to discuss the subject of irrigation from a technical standpoint, but will attempt briefly to cover some of the points most essential to the uninitiated who contemplate irrigation.

Several years ago when I first became interested in the subject of irrigation it took hard work to find a farmer or fruit grower who would even take the time to talk about irrigation. The few plants that had been put in up to that time were mostly improperly designed and constructed, and had not been successful, so the average grower dismissed the subject as being impossible or impractical. Now, a very different state of affairs exists and there are very few practical growers who do not realize the desirability, and most of them the actual necessity for irrigation on almost all crops that are grown in the State. There are, however, a great many of us who have very vague ideas regarding the subject of irrigation, and it is for the benefit of such that I will attempt to explain very briefly something about the different systems used in the different localities of the State, and under the varying local conditions.

Have a letter here, which is similar to a great many I receive, reading as follows:

"I am interested in the subject of irrigation, and would like for you to give me full information and tell me how much it would cost to put in five acres."

This is all the information given. He does not state what system of irrigation he is interested in, the source of water supply, the character of soil, the crops to be grown, or a great deal of other information absolutely necessary in order to give him the information he requests.

If this party, who for convenience we will call Mr. Jones, had been located in the Sanford celery district where flowing wells are easily obtained, and where celery, lettuce and other similar crops are grown, and where on account of the hard sub-soil sub-irrigation is successfully used, he would probably never have written for information, but would have followed the example of his successful neighbors, put in a tiling system and used sub-irrigation, although I know of very prominent growers having perfect systems of sub-irrigation, who after seeing the very decidedly superior results obtained by their neighbors with a sprinkling system, have decided to use it themselves, retaining tiling system for drainage only.

If he is located at Hastings where similar conditions prevail, but where potatoes are the principal crop, he can plant on beds about 20 feet across with water furrows in between them, and by filling these furrows with water, it would in a short time spread out on the hard sub-soil and permeate entire land between.

If Mr. Jones is in the strawberry district of Bradford county, the flowing wells could not be obtained, but the water supply in the driven wells would come up near enough to the surface to be taken up with a suction pump and distributed into head ditches running along the highest point of the tract to be irrigated, and as the strawberries and other crops in this section are usually planted on individual ridges instead of on broad lands, he can run the water down between alternate rows leaving the intervening middles dry for convenience in cultivation and picking, the operation to be reversed next time water is applied. For this kind of irrigation it takes very little power, as the water only had to be raised to the surface, and a very cheap style of pump can be used. If the well is large enough and water supply sufficient so that it will not lower beyond 18 ft. from surface when pump is in operation, a 4 H. P. engine will take care of a 4 inch centrifugal pump with an approximate capacity of 300 gallons per minute, which would under ordinary conditions be ample for as much as ten acres.

On smaller acreages in this territory, the low pressure type of Rotary pump can also be used to advantage, if the wells are free from grit. If, however, there is any sand in the supply this type of pump should not be used, as the excessive wear on the cams would ruin the pump in a short time.

If Mr. Jones was located at Center Hill or some other point in the State where he has good heavy soil, and does not wish to go to the expense of putting in sprinklers close enough together to cover, he will probably use the over head perforated pipe system, where the lateral pipes are placed about 50 ft. apart and supported on posts about 6 ft. high. These lateral pipes are tapped about 3 ft. apart, and usually small brass tubes are inserted so that the orifices will not become irregular or stop up with rust. Each lateral is supplied with a union so that it can be rotated, and a handle so that the lines of sprinkler tubes can be turned from one side to the other gradually, and in this way the entire surface covered. This system of irrigation is very popular and is probably more extensively used by vegetable growers than any other system.

We will next suppose that our party is located at Eustis or some of the other points where similar conditions exist, and wishes to irrigate an orange grove. His land has considerable fall but is extremely sandy, and as he considers irrigation somewhat as an experiment, he does not care to put much money into it. He gets his water supply from a clear lake, and as the total natural and friction head is not too great he can use a single stage Centrifugal pump and a gasoline engine for forcing water up along the high side of his grove. He should use a large size pipe so that the large volume of water will not be decreased by unnecessary pipe friction. On the pipe along the high side of grove he should have large hydrants or plugs not over 100 ft. apart, and following out the original idea of cheapness he can convey the water discharged through these hydrants through a cheap canvas hose to the intervening rows between the hydrant openings. When this is all done and the pumping plant is started, he will probably find that on account of the extreme looseness of the soil, even the large head of water he has will not flow down between the rows very satisfactorily, and to overcome this he can use a machine made especially for that purpose which opens up a very shallow furrow and packs it at the same time, not only in the center but on the sides as well. He can open up three or four of these furrows between each row of trees, and when he now turns on his water he will find that it will glide down these packed furrows very freely, and by letting it run to the very lowest point first and gradually damming up, letting it spread out until the top is reached, you will get a very even distribution of water and quite satisfactory results. Of course, where the soil is not so loose and sandy this opening up and packing furrows is not necessary. If Prof. Williams is present he will probably tell you about the successful experiment he has made at Orlando, using a similar system, and Mr. Mote will probably be willing to tell the Society of a plant he has recently installed on his magnificent grove in Lake county, where this system is used in a very highly satisfactory manner.

Again, we will suppose that practically the same conditions as first mentioned above exist, except that party has quite a large grove that on account of irregularities of the soil it is impossible to use the first mentioned system to advantage, and that while he wishes to hold expense down as low as possible he is at the same time a believer in the sprinkling system of irrigation, also that the natural and friction heads are so great that he cannot use a single stage Centrifugal pump. In this case we would recommend that he lay his main pipe throughout center of tract to be irrigated and have lateral pipes properly proportioned, gradually increasing from ends up to main, laid on each side of main in every third or in every fifth middle, depending, of course, on the distance apart trees are planted. Then along these lateral pipes between every third or fifth row have hydrant stands for connecting hose. He would use as many pieces of hose as were necessary to take up the capacity of his pump and of sufficient length to reach all intervening squares between hydrants, the distribution to be through sprinkler stands placed on ends of these hose. If water supply is obtained from lake or from a well where the supply comes close to the surface and is free from grit, a high pressure Rotary pump can be used to advantage. If, however, there should be considerable sediment in the water it would be best to use a multiple stage Centrifugal pump that would not be affected by the grit, and to use strainers on the sprinklers. In fact, on account of their extreme simplicity and durability the different makes of Two-Stage pumps are rapidly taking the place of many of the more expensive types. Their efficiency may not be quite as great to start with, but their deterioration is not so great. This method of irrigation is now used quite extensively, and there are many members of this association using it.

Finally, we will suppose that our seeker after irrigation information is located on the comparatively flat but very porous soils found in the lake regions of Polk and Orange counties and other portions of the State where flooding and most other systems would be out of the question. We will also suppose that he wishes the best system that money will buy, one that will wet his lands perfectly in a short time, and at the same time gently so that the soil will not be washed or packed, and which can be operated at a minimum expense. Under these conditions no matter what crops he may wish to grow, he will select an engine of large power and a pump of large capacity. He will use very large main pipes to supply a system of laterals placed 25 to 35 ft. apart of such proportions as are necessary to supply and give a uniform pressure to sprinklers placed on stands 5 to 10 ft. high and 25 to 35 ft. apart along these laterals. At intersection of each of these laterals with main he will have a cut-off valve so that he can turn on as many of the lines of sprinklers as his pump will supply at a sufficient pressure so that the water from the sprinklers will over lap between. All the pipe system except sprinkler stands, will, of course, be buried deep enough to be out of the way of cultivation. If properly proportioned and installed this will be an ideal Florida irrigating plant.

The only draw back to the extensive use of this last mentioned system has been the large initial expense of installation as the Rival type of sprinklers usually used heretofore have been of such large capacity that it required a system of very large and expensive piping to properly supply them. I understand, however, that there are now sprinkler nozzles on the market that give a much less quantity and at the same time a very even and satisfactory distribution. If this is so the cost of piping can be considerably reduced, and with its most perfect distribution and minimum cost of operation and maintaining it, this system will eventually come into very general use. At the last meeting of this Society Mr. Gillette told about his ideas of a plant along these lines which he has since had installed, and I hope that we will hear from him regarding it.

In the limited time at my disposal I have only touched a few of the many points to be considered, and I would like to say more regarding the different types of engines, pumps and sprinklers, the different conditions of water supply, etc., but time forbids and I will close.

Deciduous Fruits of Florida

F. P. Henderson.

Mr. President, Ladies and Gentlemen:

Deciduous fruits do not receive the attention in Florida that they should receive.

I do not know that I can add anything new on this subject, but I want to speak of a few of our most common fruits.

Permit me to say first of all, that I believe if we gave the same study, care, and fertilizer to our deciduous fruits that we do to citrus fruits, they would be just as profitable.

I do not think this would be true of the orange belt alone, but taking the State as a whole. I realize the fact that where the deciduous fruits do best, citrus fruits cannot be grown profitably, and where citrus fruits do best, most deciduous fruits could not be grown profitably. There are a few sections in central Florida where both do equally well.

First, I shall speak of peaches. The peach is one of the four or five deciduous fruits that can be grown in Florida in a commercial way with a good margin of profit to the grower.

The peach is without doubt, the most popular fruit in America today.

There is a greater acreage planted in peaches than any other fruit.

The peach is grown over a greater area and is adapted to a greater range of climate than any other fruit.

The peach brings quicker returns on the investment than any other fruit.

And I believe, when we learn how to properly grow and market the peach it will pay larger dividends than any other fruit. I realize the fact that the peach business, in Florida, has almost been wiped out during the last eight or ten years by the San Jose Scale, but with the present improved and scientific way of destroying this scale with fungi we need hesitate no longer to plant peach trees.

With my last two years' experience I do not believe it a very difficult or costly task to almost entirely obviate loss from this pest by the latest method of distributing this fungi by spraying the spores on the trees as soon as they become infested with the scale.

But my business here is not to deal with insects and diseases, but with fruits. There are a few varieties of Florida peaches, such as Jewell, Waldo, Florida Gem, Imperial, Marguerite and a few others that are unsurpassed in flavor by any peach in the world, if properly grown. These varieties are becoming very well known in a few of the eastern markets and are preferred to any other peach.

But aside from the market value of the peach, almost every land owner, not only in Florida, but in most of the states in the United States can have all the peaches they want the whole year round, by the right selection of varieties for each locality and by canning fruit while in season. But I must drop the peach here and mention some other fruits of commercial importance. Figs, kaki or Japanese persimmons, and plums are gaining in favor and importance as commercial fruits. The demand for canned and preserved figs is away beyond the supply and is rapidly growing. There are several varieties that succeed well in Florida, but perhaps the celestial or sugar fig is the best allround fig we have.

There is no more delicious fruit grown in Florida than a well grown good ripe Japanese persimmon and as soon as the fruit loving public learn how and when to eat it, it will become a very profitable crop to grow.

By a proper selection of varieties we can have for the table or to ship, Japanese persimmons six months in the year.

Figs and Japanese persimmons have a great advantage over most other fruits as they are almost entirely exempt from disease and insect enemies. Japanese persimmon trees have proved to be rather short lived in most places in the State, but in my opinion it is due almost entirely to want of proper care and fertilization. A Japanese persimmon needs as much fertilizer as an orange and as good care otherwise in order to bear the immense crops they bear every year and keep health.

There are three or four varieties of plums which will pay well to grow for market and which should be found in every home garden. The Terrell, Howe, and Excelsior are about the best and most reliable varieties. They are a cross between the Kelsey and the native varieties.

There are many other deciduous fruits that can be grown in Florida with more or less success, such as pears, quinces, apples, grape, etc., but I will only name a few varieties of each that succeed here.

Do not waste time and money planting any of the northern pears in Florida. LeConte, Keifer, Smith, Cincincis and Garber do well almost anywhere in Florida.

The Japanese Quince does well almost anywhere in the State. Some other varieties succeed in some localities.

I believe a few varieties of apples could be grown here for home use by using southern varieties such as Jennings, Florida, Red Astrachan and Horse Apple and by grafting on our native wild haw root. In 1902 I grafted an apple on a wild haw root dug out of the woods and in 1906 it bore about two dozen apples. That fall San Jose Scale killed it. Last spring I grafted a Red Astrachan apple into a haw root. At this time it has three apples on it.

I shall experiment further in this line.

As fine grapes can be grown here as anywhere in the United States. Of course all the Bullace or Scuppernong varieties do well almost any where in Florida. Of bunch grapes the White Niagara, Moore's Early, Delaware, Agawam and a few others do well here.

The reason of our failure to have plenty of all these fruits is not the soil or climate of Florida, but a failure to use varieties adapted to our soil and climate together with ignorance of how to plant and care for trees after planted. I will close this paper by mentioning a few essentials of success.

First never buy trees grown outside of Florida. We have several nurserymen who make it their business to find out and grow varieties especially adapted to Florida. They are as intelligent and as honest as any nurserymen in the world and will give you free of charge any information you may desire. If you are not well posted yourself or know a local agent who is, the best way to get trees that will succeed, in your special locality, is to write to some of our nurserymen in the State and tell them to send you the varieties you need of any fruit you may want. Second: Always cut back lateral roots to one to three inches long according to size of tree, and cut back the top to one to three feet according to the size of the tree before planting. Third, keep clean either by cultivation or mulching. Fourth, fertilize heavily using commercial fertilizer always except on pecan trees, use about two pounds the first year—1 pound in February and one pound in June for each tree. Five pounds the second year and from five to fifteen pounds every year thereafter. I regret that the subject of this paper covers so much ground that it cannot be specific enough to be of as much value to the grower as it should be.

I regret also that so little attention has been given deciduous fruits by the State Horticultural Society, not only this year, but for the past several years. The Society has become largely a citrus grower's association rather than a Horticultural Society. I do not blame the citrus growers for this, only so far as the framers of the program for the annual meetings may be dominated by citrus growers, and thus give preference to the citrus industry and thus neglect to develop the vegetable and deciduous fruit interests which, important as the citrus industry is, are together more important to the proper and well balanced progress of the horticultural interests of the State. I suggest, therefore, that these interests be given at least the place their importance deserves on our next program and that one man be added to the committee on deciduous fruits and one to the committee on vegetables whose business it shall be to give the society the best possible statistics on these branches of horticulture at our next annual meeting.

Florida Citrus Exchange

R. P. Burton

Mr. President, Ladies and Gentlemen:

After the grower has devoted several years of hard work and close study of details in bringing his grove to a productive age, the most vital question in his mind is,—how to put his product on the market for the most money. After years and years of varied experiences with gradually diminishing profits in Florida, men of activity bestirred themselves, not only in their own interest, but the general interest, to devise means by which this question could be solved.

About two years ago the venerable Dr. Inman visited California, seeking light upon this subject. It was my pleasure to meet him upon that occasion and give him some suggestions relative to the marketing of the California output through cooperation. Returning to Florida, Dr. Inman interested a large number who visited California about a year ago, when it was again my pleasure to conduct them to various packing houses and show them the details not only of the workings of these, but of the associations, the sub-exchanges and the central exchange. Returning to Florida, the gentlemen composing this committee of investigation called a convention of growers together, when it was decided to organize the Florida Citrus Exchange.

The theory of organization is, that the grower manages his own affairs, by first coming together in various communities organizing associations, these associations electing representatives who organize sub-exchanges, who in turn elect their representatives who constitute the Board of Directors of the central organization. Having no associations in Florida, it was necessary to begin at the top, organizing the central exchange, which, through the energy and financial assistance of the patriotic growers who performed this work, the growers were brought together in their associations and sub-exchanges.

The central exchange is divided into its various departments: The sales department with a sales manager, through which the entire country is divided into districts and a salesman or district manager placed in charge of each one. These district managers, where there is a sufficient volume of business to justify, are employed on a salary basis; where there is not sufficient business to justify this, brokers are used; these district managers and brokers have been selected with the greatest care, the sales manager going into each district, canvassing the situation, seeking out suitable men to represent the exchange and arranging terms with them, subject to the approval of the Board of

Directors of the Florida Citrus Exchange. By reason of his wide acquaintance throughout the country, the sales manager was successful in securing the services of the best talent in nearly all cases. Where he was unable to secure the best talent, it has been necessary from time to time to make changes. The sales are made through auction where distributing centers are sufficiently large to justify this, the exchange's own representative conducting all sales through an auction company. The auction points at present are Boston, New York, Philadelphia, Baltimore, Buffalo, Pittsburg, Cleveland, Chicago, St. Louis, Cincinnati, and New Orleans; all other markets are private sale markets in which sales are made f. o. b. shipping point, or on a delivered basis. Experience has demonstrated that the most effective distribution is through delivered sales. The fruit must be taken to the wholesale dealers and the business made attractive to them by eliminating as far as possible, all speculative features. The exchange adopted this course by which it has been enabled to go into new territory where dealers had ceased to use Florida oranges, but during the past season, have again taken up the handling of our fruit. In some instances our district managers have taken cars into their territory, divided them up between several dealers, thereby inducing them to push Florida oranges when they would not buy a car load.

California marketed during the season of 1898-99 about 14,000,000 boxes of citrus fruits. There was no part of this country which they did not penetrate, going into all Canadian points, Europe, Honolulu and Australia. Sixty per cent of that output was marketed through the California Fruit Growers Exchange, which has served as a model for the Florida Citrus Exchange in its formation and methods of marketing. This California organization is now putting its oranges and lemons into Florida, but not a box of Florida fruit goes into California, owing to their stringent laws against the importation of insects, and fruits that carry them.

In conducting the business of the Florida Citrus Exchange, it is necessarily done by telegraph. In the course of the day's work the incoming telegrams are put into a bulletin and sent to every association manager daily. All telegrams sent from the central office are put into a bulletin and both the incoming and outgoing telegrams are sent to the sub-exchange manager. All shipments are given a serial number and all telegrams relating to these shipments are by the serial number, and when they go into the bulletin, the abbreviation of the sub-exchange making the shipment is placed before the number. As these telegrams are received or sent from the central office, they are entered upon a card manifest covering the shipment. Each sub-exchange manager is supposed to go through the bulletins locating any of his shipments that are mentioned in these telegrams and the telegrams entered upon his cards. Each association manager is supposed to go through the incoming telegrams, a copy of which he receives in the bulletin, and enter upon his cards any telegrams referring to shipments made by his Association. In this way, any association or sub-exchange manager, or the central office can take any one of these cards covering any given shipment, and give to the owner of the fruit covered by same, all information relative to that shipment, at a moment's notice. If the association and sub-exchange managers keep up with the bulletins from day to day they see the market conditions reflected therein and are in position to form their own conclusions as to the advisability of forcing shipments or otherwise. Every grower affiliated with an association or a sub-exchange is at liberty to go into the office, peruse these telegrams from day to day and keep himself posted. This system will, in the end when the growers have learned its merit, educate the growers themselves up to a point of keeping closely in touch with the market conditions everywhere and give them a clearer insight into their own business than they have ever had.

The cashier's department receives and disburses all funds of the central exchange under order of the Board of Directors. After a car of fruit has been sold through the sales department, it passes to the cashier's department and no further account is taken of the transaction by the sales department, unless some inquiry is made by interested persons. All financial matters of either the central exchange, or the various districts throughout the country, pass through the cashier's department and are submitted by the cashier at the regular weekly meeting of the Board of Directors for their consideration and action. This department also has charge of the supplies for the central office, and through co-operation with the general northern agent, supplies for the district managers. It will, therefore, be seen that a very efficient accountant is necessary as the cashier.

The traffic and claim department is the third, and not the least important one of the central organization. All matters of transportation rates, etc., are referred to the manager of this department. When account sales are received they are placed in a jacket with the card manifest covering the shipment, the inspection report made by the inspector in the district where the car is disposed of, the original bill of lading, and all correspondence relative to that particular car. The claim manager goes through each of these jackets, scrutinizing them closely for overcharges, shortages, evidences of neglect on the part of the transportation company in handling the shipment, and if any legitimate basis for a claim appears, he immediately prepares a claim and files it with the initial transportation company. These claims are followed up from time to time if prompt settlement is not made. As an evidence of the efficiency of this department, since the opening of the season, the claim manager has filed 2394 claims, aggregating $69,647.59 and has collected 1214 claims, aggregating $11,477.86, and has withdrawn as uncollectable, 10 claims, aggregating $187.81. I think it will be conceded that this is a wonderful showing for so short a period's work. The manager of the transportation and claim department of the Florida Citrus Exchange is one of the most experienced men in the country, having been connected with the claim department as one of its adjustors of one of the largest transportation companies in this country, for six years. His experience as a railroad man covers a great many years prior to his connection with that claim department. He is well up on transportation matters, as well as handling claims with transportation companies. His policy has been to file claims only which had merit, thereby commanding the confidence of the transportation companies in his honesty of purpose, which has already been established. Present indications are that this department alone will collect enough from claims against transportation companies to pay more than one third of the entire running expenses of the Florida Citrus Exchange covering all of its departments. It is reasonably safe to say that without this department a very small percentage of these claims would have been collected and the money paid to the growers to whom it belongs.

The exchange has a general or business manager, whose duties are multitudinous. All matters pertaining to the business between the sub-exchanges and the central exchange come under his supervision. Also, the relations of the associations to the sub-exchange are often brought to his department for advice and adjustment. Matters of general interest to the organization are taken up by him with the various heads of the departments for consideration and final disposition.

Aside from the heads of the departments in the central office we have a general northern agent whose duties are to supervise all districts, to go in time of trouble to any district and look into matters that may arise, ascertain whether or not the district managers are performing their duties properly, seeking out the weak points in the organization on the other end of the line, finding new men to fill places that are not properly filled, scrutinizing all correspondence that may be sent to him from the central office and from the district managers, and finding the weak spots and strengthening them. It has happened during the past season that we have had to send the general northern agent from city to city where we had reason to believe correct reports were not being made of shipments to those districts. In every case where this has occurred, he has found that the reports that were made to this office were in accordance with the facts.

The entire business of the Florida Citrus Exchange is conducted under the supervision of its Board of Directors which meets weekly in its office at Tampa, for the purpose of considering all matters that may be presented by the different heads of the departments and the general manager.

It will be noted that having provided ourselves with a selling force in the field and a competent northern manager to keep tab on the salesmen, we have equipped ourselves with machinery for the proper distribution and sale of our fruits, which insures success. We have reason to believe from such reports as we have from points throughout the country, that our sales department is of the very best. It has been stated by those who are in position to know, that the organization in this direction is five to six years ahead of the organization among the growers themselves. The weakest point in the organization, apparently, is in the local associations. It will require several seasons for the growers to learn the details of the management of their own affairs and learn that it is their business and that they must pay close attention to details in preparing their fruit for market, which is done through the association packing houses.

Florida has been increasing her output from year to year. Beginning with less than a quarter of a million boxes of citrus fruits in 1895 with a market for several times this quantity, there was no difficulty in disposing of the output at home at satisfactory prices to dealers who came here for them. While that was in process, California was increasing her output and systematically exploiting every market that could be reached with her fruit. She did not wait for the dealers to go into her packing houses for her fruit, but took it to the side tracks and made it to their interest to handle California oranges to the exclusion of all others. By this means, California was successful in so distributing her crop as to give her growers satisfactory prices, with increasing crops. Florida, on the other hand, contented herself with depending upon dealers who would come here to buy the fruit, or speculators on the ground who would buy and sell to other dealers. Of the latter, there were various characters. As a general proposition, the home speculator began shipping oranges early, before they were ready for market; in many instances assuring the dealers to whom they were selling that the fruit was mature and ready for market. This method of handling the business had the effect of restricting the consumption of Florida oranges, as one purchase was sufficient to satisfy consumers that Florida oranges were not palatable. They merely served to fill in the time between the last shipment of California Valencia lates and the early shipment of California navels, and as soon as they could get the latter, they had no further use for Floridas. This has gradually driven the Florida oranges to a few large centers, chiefly along the Atlantic Seaboard.

The effort of the exchange has been to discourage the shipment of immature oranges and grapefruit in order that consumers may be brought to appreciate the superior quality and flavor of mature Florida oranges, which will insure largely increased consumption, without which the growing of this luscious fruit in Florida will surely be disastrous to those producing it. In order to attain this end, the growers themselves must be brought to realize the actual conditions as they exist. This can never be accomplished except through concerted action on their part, as exemplified by the workings of the Florida Citrus Exchange.

Discussion after Mr. Burton's paper:

Mr. Hart: The interest of the men outside of the exchange should be mentioned tonight in connection with the exchange. I often wonder what the conditions would have been if it had not been for the exchange this year. We hear of the high prices outside of the exchange and the low prices gotten by the exchange. It seems to me that if we had not had the exchange the conditions would have been very different. The difference in the commission men alone has paid for the exchange several times. The way they commenced the season was to give low prices, and they gave us to understand conditions would not allow high prices. The commission men have been doing their very best to make a good record this year, and they have made a record they would not have made if it had not been for the exchange. Whatever the exchange has done in the way of prices, even if it should turn out that they have not done as well as the people outside, certainly the exchange has done a good thing for the shippers of the exchange through stimulating the efforts of the commission men.

Mr. Temple: You heard in the course of Mr. Burton's remarks a statement of a fact that has come before this body previously at this meeting; that is, the laws of California that prevent practically the possibility of shipping into that state a disease or insect that might gain a hold. They carry it to such an extent that you cannot ship a kumquat into California without going through all kinds of procedure.

I was there for three years and wanted to have a grapefruit that was fit to eat, and had a box shipped to me from Florida. The first box didn't show up, and kept on not showing up, and I finally got a letter from some inspector saying that if I would come down and pay the fumigation fees on that box of fruit, which amounted to $3.00, he would give me what was left of it. He said it was affected with a good many different kinds of scale—more than we ever heard of in Florida. I told him to go and eat that grapefruit himself.

Now, I wish you would join in with the legislative committee and formulate a resolution in some way, and call on the State Legislature to pass laws similar to those now in California. Mr. Burton says California is sending oranges and lemons into this State. Their lemons are good, but they have some weird diseases out there that we don't want to get. We have troubles enough of our own without running the risk of importing any.

They are so exacting with us that it is time we ourselves should grow suspicious. You know what the old farmer's advice is. "When you swap horses, examine the other fellow's horse where he examines yours, and you will find the blemish."

Prof. Hume: I am very certain that this society is willing to join right in with them on this line. I am certain the society is willing to give it carte blanche along that very line.

Mr. Burton: Let me tell you some of the experiences along the Pacific Coast in that connection. As Mr. Temple states, you can hardly carry a man there from Florida unless he goes through a course of fumigation.

When the Florida delegation of growers was in California last year, one of the Boards of Trade gave them some kind of a "blowout" and one of the Florida members presented them with a box of Florida Valencias for the occasion. They were brought into the board room and passed around. One of the most critical of the Board members came to me and said "How many more of those oranges are there?" I told him I didn't know. He said "If they don't eat them all, burn up what is left; don't let them get out of this room."

Washington produces large quantities of deciduous fruits, and they have laws as stringent as California. We have more than once had oranges inspected and fumigated at heavy loss. The inspectors are very critical and it is not uncommon to hear of whole shipments being fumigated, and when you fumigate a car of oranges or lemons, somebody is going to lose money.

We shipped a car of lemons to Spokane which was sold at $4.75 f. o. b. The inspector examined it and pronounced it infected with San Jose scale. I wired him the car was not infected. He wired back that they would fumigate the shipment, when they would allow it to enter. I told him we would divert the car from the State. He wired back that the shipment was infected and it was his duty to fumigate it right then and there. I took the matter up with the State horticulturist, who went to Spokane and inspected it himself and said he was certain it was red scale instead of San Jose Scale, and it would have to be fumigated. Now, the red scale would not do an apple or a peach tree any harm, even if the shipment had been infected with that scale. That just shows you, however, of how much importance they consider this point, which you in Florida do not consider at all. There is not a law in Florida when it comes to protecting your citrus trees against disease.

Report of Officers

REPORT OF AMERICAN POMOLOGICAL MEETING

Mr. President, Ladies and Gentlemen:

Although the programme calls for "Report of American Pomological Meeting," it is not my purpose to go into details of the very interesting and well attended meeting, held at St. Catherines, Ontario, Canada, September 14-16, 1909, but rather to call your attention to the outcome of that meeting, as far as decision on the place for the next one was concerned.

There were present at the meeting fourteen members from Florida, including the president, secretary, treasurer and one member of the executive committee of the Florida State Horticultural Society; and we deemed that we had sufficient official representation to warrant us in inviting the American Pomological Society to hold its next convention in this state. Such an invitation was duly presented by President Hume, and seconded by all of the officers of our society present, and the American Pomological Society took the matter under advisement. As is customary with that society, the final decision as to place of meeting was left to its executive committee.

In March of this year, Professor John Craig, Secretary of the American Pomological Society, met with the Executive Committee of the Florida State Horticultural Society in Jacksonville, and informed us that our invitation had been accepted, and it was decided that the American Pomological Society would hold its next session in Florida in the latter part of January, 1911, and that the place of meeting should be left to the Executive Committee of the Florida State Horticultural Society.

Except as being held late in January, the exact date at which the meeting should be held has not been fixed, and this, perhaps, had better be left to the Executive Committee of this society, dependent somewhat upon the dates that will suit our visitors best. I have, therefore, to announce that the meeting of the American Pomological Society will be held in such place in Florida as this society may select, some time in January, 1911. Not only will the American Pomological Society meet with us, but the Executive Committee of the Florida State Horticultural Society deems it proper that this society should sanction the extending of special invitations to other southern horticultural societies, to meet with us at that time, and, with this end in view, I wish to submit the following:

Resolved: That the Secretary of this Society be authorized to issue invitations to the State Horticultural Societies of Texas, Louisiana, Mississippi, Alabama, Georgia, North Carolina, South Carolina, Virginia, Kentucky and Tennessee, and to the Horticultural Societies of Cuba and Porto Rico to meet with us at the time of the next meeting of the American Pomological Society.

Now, ladies and gentlemen, I wish to relate to you a bit of history: Our Florida State Horticultural Society was organized at Ocala, April 10, 1888, a little over 22 years ago. Our charter members numbered 18. The very first work done by this society, after its organization and election of officers, was preparation to receive and entertain the American Pomological Society, which was to meet in this State in the following February, 1889. In addition to the American Pomological Society, the Georgia State Horticultural Society was invited to meet with us. The three societies met at Ocala on Feb. 20, 1889, in the large building of the Semi-Tropical Exposition, where was on exhibit one of the finest displays of citrus and other fruits that has ever been made in the State. In welcoming the visiting societies, our president, Dudley W. Adams, said, in part:

"During a somewhat busy life it has been my good fortune to perform many very pleasant duties, but among them all none ever gave me more pleasure than now, in behalf of the infant State Horticultural Society of Florida, to receive as our guests that full grown giant, the American Pomological Society.

"To be thus honored by the presence of the foremost pomological society of the world would seem to fill to the brim our cup of satisfaction, but when, as today, we can also take by the hand that stalwart organization, the State Horticultural Society of our big sister, Georgia, then, truly, our cup runneth over.

"With the reverence due from youth to age, with the respect due from the student to his teacher, with the affection due from the child to his parents, we bid you welcome to our State, our city, our homes, our hearts."

Since that time President Adams, and most of the other seventeen charter members, have gone to their long reward, but, to a certain extent, history repeats itself, and we are now to have the pleasure of welcoming again to our State the foremost Pomological Society of the Western Hemisphere—which means the foremost in the world. It is a great pleasure to me to announce their coming, and it now remains for this society to take such active measures as shall insure to our honored guests the hospitality that is due them to receive—and us to give.

This society, the city that may be selected, and the State of Florida, should unite in tendering them a welcome that will be a royal one. Remember that the American Pomological Society represents in its membership, not only each of the United States of America, but Canada, Cuba, Manitoba, Australia, Japan, New Mexico, Hawaii and other foreign counties. At the time of their previous meeting in Florida, the railroads of the State had their representatives in Ocala, to arrange in person for a ten day's excursion, wherever our visitors wished to go, throughout the length and breadth of Florida, and they were taken to Homossassa, Citra, Tampa, Orlando, Sanford, Indian River, Mount Dora and many other sections. Their estimate of our magnificent fruit exhibit is shown by the fact that the committee on awards gave silver medals (Wilder) to Lake County Shippers' Union, Marion, Sumter and Lee Counties, Rev. Lyman Phelps, E. H. Hart and Dudley W. Adams. Bronze medals were awarded to Citrus, Polk and Volusia Counties and to O. P. Rooks and E. S. Hubbard. I mention these facts to impress upon you the recognized important position this society occupies, and as an incentive for us to do our best to equal or surpass the honors extended the American Pomological Society in this State twenty one years ago, as well as those extended them in the various other States, in which they have met during the past half century. As nothing worth while is ever acomplished without organized effort, I sincerely hope that this society will take it in hand, in a vigorous manner, with the result that at the close of the American Pomological Society's meeting with us next January in Florida, the general verdict of that society will be, "the best ever."

(Since the above report was read the time and place for the American Pomological Society meeting has been named as Jan. 31st and Feb. 1st and 2nd at Tampa.—SECRETARY.

MINUTES OF THE MEETING OF THE EXECUTIVE COMMITTE

A meeting of the Executive Committee was held in the Secretary's office on February 24, 1910, those present being Prof. P. H. Rolfs, Messrs. Geo. L. Taber, E. S. Hubbard and E. O. Painter.

On motion it was decided that the 23d annual meeting of the society would be held in Orlando on May 17th, 18th, 19th and 20th.

On motion of Mr. Taber it was resolved that the president take up the matter of the society's financial shortage, either individually or through a committee, as he may deem best.

The following contributions were made towards the shortage:

G. L. Taber..........	$25.00
E. O. Painter.........	25.00
P. H. Rolfs..........	10.00
E. S. Hubbard........	10.00

For the programme it was suggested that Mr. Milo B. Williams, of the Department of Agriculture, be requested to make a demonstration of Surface or Furrow Irrigation at Dr. Drennan's place, during the meeting. Prof. W. W. Yothers, of Orlando, was mentioned for an article on the Whitefly.

It was moved by Mr. Taber that hereafter all libraries pay membership fees.

It was moved that the secretary secure transportation and hotel rates.

Moved by Mr. Taber that the secretary be authorized to employ a stenographer. Adjourned.

A meeting of the Executive Committee of the Florida State Horticultural Society was held in the office of the secretary on Friday, March 25th, those present being Profs. Rolfs and Hume, Messrs. Taber, Hubbard, Painter and Prof. Craig, of the American Pomological Society.

It was moved and seconded that the time of the meeting of the American Pomological Society be left to Prof. Craig and his executive committee.

Moved and seconded that an invitation be extended to all horticultural societies in the South to participate in the joint meeting of the Florida State Horticultural Society and the American Pomological Society, the states named being North and South Carolina, Georgia, Alabama, Mississippi, Louisiana and Texas, also Cuba.

The question of entertaining the visiting delegates was discussed, and it was thought possible that trains could be chartered to visit different parts of the State.

It was decided that a display of the fruits and nuts of all Southern States be encouraged. Prof. Craig stated that Wilder medals would be given, and that he would furnish the society with the particulars.

It was moved by Mr. Taber that Prof. Rolfs and Mr. E. O. Painter be instructed to solicit invitations for entertainment.

After a thorough discussion of ways and means for entertaining the American Pomological Society, and other societies, the Executive Committee adjourned to await further information from Prof. Craig and his associates.

The Executive Committee of the Florida State Horticultural Society met in the office of the Secretary June 6, 1910.

Present: Messrs. Rolfs, Hubbard, Taber, Hume and Painter.

Letters were received and read from Mr. Gillett and Mr. Craig—and filed.

Moved by Mr. Taber that the opening of the American Pomological Society meeting be on Tuesday evening, January 31st, and that the length of the programme be left with the American Pomological Society. Carried.

Moved by Mr. Hubbard that the secretary correspond with Secretary Craig in regard to list of Wilder medals and other prizes that will be offered by the American Pomological Society, and to secure any other information on the awarding of prizes that will enable our growers to understand just what they can compete for. Carried.

On motion the secretary was instructed to correspond with Mr. Gillett and get information on the following:

Hotel Rates.—A definite statement of what the rates will actually be; the number at the different hotels that can be accommodated, and how many the Tampa Bay Hotel will accommodate. It is essential that the hotel rates to members be fixed, so that there will be no trouble or misunderatanding when settlement is made.

Railroad Rates.—To get rates from all points in the United States, Canada and Cuba.

Entertainment.—What will it consist of and what days of the week it will be given. This information is wanted so that it can be included in the programme.

Local Committees.—A local committee should be appointed to look after hall for meeting, hall for exhibits, facilities for showing exhibits and to receive, place and care for exhibits.

Prizes.—See if he can get the railroads to offer a prize of $1000.00 more or less, for special exhibits. Also to see if county commissioners will offer prizes for local sections.

The Executive Committee hereby gives Mr. Gillett authority to do anything and everything that will add to the interest and attractiveness of the meeting of the American Pomological Society next January.

Moved by Mr. Painter that Prof. Hume correspond with the National Nut Growers' Association with a view of getting them to make an exhibit at Tampa during the American Pomological Society meeting.

Moved by Mr. Painter that Prof. Rolfs be a committee to correspond with the County Fair Association to get them to make an exhibit at Tampa.

Moved by Mr. Hubbard that 1000 copies of the proceedings of the Florida State Horticultural Society be printed in the usual form and style. Carried.

Moved that the president take up the matter of standing committees and appoint same.

Adjourned to meet at call of chairman.

E. O. PAINTER,
Secretary.

REPORT OF THE SECRETARY

Mr. President, Ladies and Gentlemen:

At the Daytona meeting your honorable body elected Professor Hume, Mr. Taber, Mr. Hart and your Secretary delegates to the American Pomological Society, which convened at St. Catharines last September. All four were present at the meeting. The results of the meeting you have in Mr. Taber's report.

The same committee was also requested to visit Washington and take up with the Department the desirability of securing some trained person to go abroad and try to find some natural enemy to the Whitefly. Mr. Hart was the only one of the committee who could go to Washington, and his report will enlighten you as to what he learned.

The matter was also taken up with our Senator Fletcher, and a bill was introduced appropriating $10,000 for whitefly investigation abroad, but was subsequently reduced because Prof. Howard reported to the committee that $5,000 would be sufficient, as he could send Prof. Woglum, who would only want his expenses. The orange growers have been disappointed at this, for if the first sum had been left, one or two whitefly experts like Dr. E. W. Berger or Dr. Back could have made an investigation that would have more promise, on account of their long-continued touch with the whitefly problems here.

Your secretary and Mr. Gillett, of the Citrus Exchange, undertook to raise some funds for the expense of the whitefly investigation, but were not very successful. The following amounts were received:

W. S. Hart	$25.00
John T. Pirie	25.00
B. F. Chilton	25.00
M. S. Sams	10.00
G. M. Wakelin	10.00
John H. Sams	10.00
H. J. Wilmshurst	5.00
F. H. Boye	2.50
A. L. Ingerson	1.00
Robert Taylor	1.00
	$114.50

As this amount was too small to do any thing with, I have held the checks, and await the society's instructions as to what to do with them.

All of you know that our expenses have been running a little behind each year, until the deficit piled up to over $600.00. In my first circular letter to the members, I stated the case, and the response has been very liberal. Up to this time I have received on this Deficiency Fund the following:

G. L. Taber	$50.00
E. O. Painter	25.00
P. H. Rolfs	10.00
E. S. Hubbard	10.00
L. A. Wilson	15.00
Chas Sellmer	3.00
H. G. Stouder	1.00
B. F. Tillinghast	5.00
M. Fugazzi & Company	2.00
Chase & Company	19.00
J. P. Felt	5.00
J. T. Chapman	1.00
E. M. Condit	1.00

W. W. Wright	1.00
W. J. Lewis	1.00
Fred Nordman	1.00
A. E. Campbell	1.00
H. H. Tussey	1.00
L. F. Dommerick	5.00
A. H. Brown	5.00
Chas Montgomery	1.00
Mrs. W. E. Cadman	6.00
B. F. Chilton, Ronnoc Grove	20.00
R. E. Rose	5.00
Mrs. R. E. Rose	5.00
F. G. Sampson	12.50
Mrs. F. G. Sampson	12.50
E. S. Burleigh	5.00
A. J. Grant	5.00
E. K. Harris	20.00
W. R. Moore	1.00
L. B. Knox	5.00
Esperanza Fruit Co	5.00
Chas Bemenderfer	2.00
J. B. Herman	1.00
C. A. Robinson	1.00
William Allen	10.00
Prof. H. A. Gossard	1.00
G. M. Wakelin	10.00
Dr. J. F. Corrigan	1.00
R. A. Palmer	1.00
Wetumpka Fruit Co	5.00
Ellis G. Blake	3.00
Walter R. Moses	4.00
Herman Merrel	2.00
Dr. H. K. Grisham	1.00
W. J. Ellsworth	5.00
C. H. Thompson	5.00
Henry S. Pennock	3.00
John Kendig	5.00
U. A. Denison	1.00
S. F. Rou	5.00
E. E. Cannon	5.00
A. L. Long	1.00
George Duchardt	1.00
C. Marot Townsend	5.00
H. B. Stevens	8.00
Irving Keck	1.00
J. Q. Adams	1.00
J. F. Farley	1.00
A. M. Henry	2.00
L. B. Skinner	10.00
Harry Player	1.00
Geo. L. Stanley	1.00
Chas G. Kresse	1.00
J. P. Mace	5.00
H. C. Birley	9.00
M. Dickinson	5.00
James A. Bear	1.00
F. W. Inman	3.00
H. Harold Hume	10.00
W. S. Hart	50.00
Model Land Co	50.00
Abe Simon	2.00
F. L. Wills	5.00
B. F. Holland	1.50
J. C. Greener	1.00
L. T. Dade	.50
Mrs. Emma J. Hildrup	2.00
J. B. Conrad	4.00
B. F. Watts	2.00
W. F. Colby	1.00
W. C. Bryan	1.00
J. B. Donnelly	2.00
C. D. Mills	5.00
G. W. Adams	5.00
Chas Pike	1.00
W. C. Temple	25.00
Mrs. W. C. Temple	25.00
M. Zimmerman	5.00
	$590.06

This is a remarkably good showing, and illustrates how generous and how quick to respond to a call for help the members of the Horticultural Society are.

After the close of our last meeting a good many new names came in, and throughout the year I have had frequent calls for the Report. The following is my report of cash receipts and disbursements:

RECEIPTS.

Reports for 1909	$157.00
Reports for 1908	3.00
Donation from Mr. John Kendig	2.00
Donation from Mrs. Cadliff	1.00
Donation from Mr. C. M. Griffin	5.00
Life Membership, W. J. Krome	10.00
Life Membership, H. Nehrling	10.00
Life Membership, Mrs. N. M. G. Prange	10.00
Life Membership, Mr. H. K. Miller	10.00
Life Membership, Peter Marine	10.00
	$218.00
1910 Members up to date of meeting	221.00
	$439.00

EXPENDITURES.

Kennedy-Brown Advertising Co., printing	$ 3.50
Dixie Seal & Stamp Co., seal	4.25
Joseph Richardson, Postal cards	4.00
Express on cards	1.15
Telegrams for cards	1.10

Telegram to Prof. Stubenrauch	.50
Telegram to Prof. Rolfs	.25
Postage and telegrams for entire year, May 1909 to April 30, 1910 (exclusive of amounts given above)	45.07
Postage from May 1, 1910 to May 16, 1910, inclusive	1.64
Secretary's salary	100.00
	$161.46

RECAPITULATION.

RECEIPTS.

Donation fund	$590.00	
Last year's account	218.00	
This year's members up to date of meeting	221.00 —	$929.00

EXPENSES.

As per report	$161.46	
Check paid to treasurer	717.25	
Cash paid to treasurer	50.29—	$929.00

It is hardly necessary for me to tell you that the meeting of the Pomological Society with us next year means that every member must be up and doing between now and the time of the meeting. We must keep up Florida's reputation for entertainment, and give the visitors no cause for regrets.

All of which is respectfully submitted.

E. O. PAINTER, *Sec'y.*
Florida State Horticultural Society.

ANNUAL REPORT OF THE TREASURER OF THE FLORIDA HORTICULTURAL SOCIETY

DR.

1909		
May 18	To balance in treasury	$ 74.46
July 7	To S. W. Green's membership fee	1.00
1910		
April 15	To Wm. Allen contribution	10.00
May 19	To Secretary Painter	767.54
		$853.00

CR.

1909		
May 20	By telegrams	$ 1.08
June 21	By Hall Printing Co	27.25
June 21	By E. O. Painter, stenographer's fee	43.50
June 21	By E. O. Painter Printing Co	17.25
Dec. 11	By E. O. Painter Printing Co	540.75
Dec. 11	By Miss Lillian Hamlin	12.06
1910		
April 22	By Sec. Painter, Allen donation	10.00
May 19	Balance in treasury	201.11
		$853.00

Necrology

DR. JOHN MILTON HAWKS

Died at his winter home in Hawks Park, Florida, on April 2nd, 1910, at the ripe age of 83 years and was laid to rest in the cemetary there which he himself laid out many years ago in the settlement bearing his name and of which he was the founder. Dr. Hawks was born on a farm in Bradford, New Hampshire, November 2nd, 1826, and was one of a family of five children of whom two sisters survive him. At the age of 16 he commenced teaching school and remained at this, in various parts of the country, for several years while continuing his own studies.

Later he returned to New Hampshire and studied medicine and graduated from a medical college in Vermont.

He then settled in Manchester, N. H,. where he built up a good practice in connection with a lucrative drug business.

Here in 1854 he met and married Miss Esther Willard and with her took a long honeymoon trip to St. Louis, down the Mississippi to New Orleans, across country to Florida and then back home.

No children were born to them.

At the outbreak of the Civil War he and his wife volunteered their assistance to the Freedman's Aid Society of New York and were sent to Hilton Head and Edisto Island, South Carolina. Here he was instrumental in forming the first colored regiment to enlist under the stars and stripes and became its surgeon.

The deeds of this regiment have been memorialized by its colonel, Thomas Wentworth Higginson, in a work entitled "Army Life in a Black Regiment."

Dr. Hawks and wife followed the fortunes of war until its close, the command being under General Saxton.

For a time the Doctor was collector of customs at Pensacola, Fla. He at this time traveled extensively throughout the State and about 1872 published the Florida Gazeteer devoted to the interests of the State.

About this time he purchased a large track of land just south of New Smyrna and has since added others to his holdings there.

Mrs. Hawks also studied medicine and built up a large and successful practice in Lynn, Mass. For the past forty years Dr. J. M. Hawks has spent most of his winters in Florida and his summers with his wife, sisters and friends in New England. He was very fond of his family and friends and was a most agreeable and entertaining companion.

His manners were quaintly sweet and courtly and he commanded the entire respect of all who knew him.

GEO. L. TABER,
W. S. HART.
Committee on Necrology.

Pecan Growers' Association

The pecan inlustry has grown to such an extent that those interested have formed a Pecan Growers Association of Florida and Georgia. As many of the members of the Florida Horticultural Society are interested in pecan culture it was deemed wise to ask the pecan growers to meet with the Horticulturists. The invitation presented by Prof. Hume was accepted and a place on the programme given for pecan papers and discussion. The following is the proceedings of the Pecan Growers Association:—SECRETARY.

Observations on Pecan Culture

H. K. Miller

Mr. President, Ladies and Gentlemen:

Only a few decades ago there existed vast area of native pecan groves in the bottom lands of the south-west, and even today this area is considerable, though the greater part of it has been cleared in order that the lands might be used for producing cotton. When these magnificent trees were thus ruthlessly destroyed, no adequate market existed for their products; but times have changed, and today, the nuts from the trees which remain, yield an income far in excess of that which can be derived from the cotton grown on a like acreage.

For a quarter of a century a few individuals, recognizing the growing importance of nuts for food and the constant diminution of the sources of supply of pecans, have attempted to establish pecan growing under cultural conditions, upon a commercial basis, in various sections of the south. It is a matter of common knowledge that in a large measure their efforts proved futile so long as seedling trees were used. It is true that a few seedling groves, under most favorable conditions, have proved remunerative, but in most cases, after years of waiting, adequate returns were not realized. In the main, this is due to the marked individuality of seedlings; many prove inferior, some grow very slowly, others require years to reach the fruiting age, some prove barren; and still others prove an easy prey to natural enemies. The introduction of grafted sorts has, to a great degree, eliminated these difficulties, and in recent years renewed interest has been manifested and much capital and energy are now being applied to the establishment of pecan orcharding on a sound and profitable basis.

The comparatively short period which has been devoted to growing pecans under cultural methods, coupled with the relatively long time required for trees to come into full bearing, necessarily renders our knowledge of this branch of horticulture incomplete; in fact, meagre. The observation of a few trees and orchards, the application of theory, and in a large measure hope constitute the foundation for the faith that has led to the establishment of most of the pecan orchards in the south; rather than any actual commercial plantings which have demonstrated a successful outcome. This has virtually been true of all new horticultural projects and it is only through experience that we master such enterprises.

Within very recent years much light has been thrown upon the subject; new obstacles have arisen to be obviated, new evidence is at hand for renewing our hopes; real progress has been made in a gratifying degree; today we are enabled to set an orchard with far more assurance of success than was the case five years ago. Who has not heard some old wise-acre remark as he pityingly watched an enthusiast planting pecan trees; "He'll never live long enough to see them fruit!" Thousands of trees set less than seven years ago have put a quietus on this old knocker, and there is scarcely a community where pecan planting has been in progress seven years in which he has not been discredited. There was reason in his remarks so long as seedlings were planted, as few of these fruit under fifteen years of age, besides there are many such trees twice as old which have yet to show their first crop of nuts. To have asserted that an eight year old tree produced two bushels of pecans in one season, would have relegated the claimant to a life membership in the Annanias Club, at so recent a date, as four years ago. The process of grafting alone induces early fruitage, but when scions are selected from choice trees having a tendency to prolificness and early fruitage, these characteristics are emphasized in the resulting trees, thus making it certain that such trees will, under favorable conditions, fruit early in life, and abundantly.

It is conceded that there are yet many problems to be solved. This is also true of the peach-grower, the apple-grower, the citrus-grower, and others; else there would be little occasion for the annual meetings of various horticultural organizations. For a time it was supposed the pecan growers were especially favored in having to deal with a tree free from enemies and diseases of all kinds; it being only necessary to set the trees and return for the harvest. A more intimate acquaintance with such troubles as borers, web-worms, case-bearers, bud-worms, winter-killing, scab, rosette have taken away the complacent feeling of immunity, and undoubtedly troubles that we know not of will require our respect in the future. Fortunately our troubles of this nature are not nearly so formidable as those which confront apple, peach or orange growers, and so long as these insist on supplying the world with peaches, apples and oranges in spite of difficulties, let the pecan growers take courage. Pecan culture has reached its present status largely through the efforts of the National Nut Growers' Association, our parent organization. The efforts and progress of this association will doubtless be dwelt upon in a paper at this session. We are safe in assuming that the essentials of successful pecan culture are sufficiently clear to warrant the present activity in this new field of endeavor. Still there is enough diversity of opinion regarding many phases of pecan growing to demand our serious consideration along with the unsolved problems.

I can but touch on a few lines of action with slight suggestions that should be taken up for our benefit.

The one of greatest importance is to determine what varieties are adapted to a given soil, locality, climate. Real information in this particular is quite limited, and only in a general way is it known that certain kinds have been apparently successful in a given locality. We do know that varieties which fail at one place succeed at another. Some varieties even do better than in the place where they originated. Because of these facts erroneous estimates have been made of varieties, being either praised or condemned on insufficient evidence. Even that old reprobate—Rome or Columbian has done well in a few instances. It seems that this question must be thrashed out in the south with the pecan in much the same fashion as it was with the walnut in the west, and indeed as has been the case with most fruits everywhere. Such a process is slow and costly but will eventually succeed. It is only within the last few years that varietal trees have fruited in any considerable localities but a compilation of results will in a few years add *much to our store* of information. It is just here that our association can be of great service in collecting information.

The Nut Growers' Association could engage in no more beneficial undertaking than securing the establishing of a comprehensive plan of experimentation with leading varieties of pecans in many localities within the pecan belt. To insure uniformity of treatment, this had best be under National control and I think we should use every effort to induce the Department of Agriculture to take the matter under consideration. Much time could be gained by securing as far as possible groves already planted and by top-working to varieties to be tested. From a theoretical view it has been thought varieties which remain dormant late in spring would do well in colder sections but we have instances of some of the very early starters doing well in rather northern sections, while slow starters have frequently been winter-killed in Fla.

It is certain that few trees are old enough to serve as definite examples of success or failure, that is we have as yet few criterions.

The question of fertilizing still offers opportunity for investigation, though the general principles are pretty well worked out. I am convinced that it makes a difference as to the sources from which the plant food elements are derived. The pecan in some respects behaves like the pineapple and it is my observation that rosette may be induced by improper fertilization of the pecan just as spike is induced when we use the wrong materials on pineapples. Two other matters which give opportunity for research are bud-variation and stock-influence. It is well known that grafted trees of the same variety under similar conditions will show appreciable differences. This may be due to bud-variation, which undoubtedly gives rise to some variation but on the whole I believe we underestimate the influence of the stock upon which we graft trees.

Such marked differences as we note in seedlings could hardly help imparting characteristics to the scion and this may account for some of our vexations, like winter-killing, delayed fruitage, shyness, susceptibility to scab, etc., manifesting itself in individual trees. Can we not by selection secure types of stock that will render the trees amenable to our requirements? The selection of varieties almost serve our purposes, cannot the deficiencies be made up from a combined selection of stock and scion? To my mind here lies a fruitful field for scientific research.

A question which thus far has given us little concern will soon demand our attention, that is the marketing of our crops. It is our good fortune to have this subject presented at this session. It has been repeatedly stated that there was no possibility of over-production and that the demand could never be fully met. Perhaps this is true, but it appears to me that if the trees already planted and those in prospect of being planted in the next few years will yield half as well as is expected of them, the present market will have to be greatly enlarged and new markets created. With the entire world awaiting conquest there are vast possibilities for marketing; however, this is one of the problems awaiting our efforts.

We can all remember the time when a few cars of pomelos would supply the entire market of the U. S., but a million boxes does not now appease our craving for this luscious fruit. When the general public is educated to the merits of the improved pecans, who can estimate what demands will be made upon the south for this incomparable nut?

The control of insects and diseases both known and unknown will require our best efforts and ever keep us on the alert. Any tiller of the soil must engage in a battle royal. Nature seems pitted against him, yet nature supplies the weapons for its own undoing; the master mind must order the battle and in proportion as it is wisely exercised will success crown the effort.

It has indeed required an abundance of nerve and faith to establish pecan orchards. The long period of waiting, unlooked for difficulties and unexpected items of cost, have dampened the ardor of many who began with enthusiasm. Some have fallen by the wayside, giving up the fight, others have pressed onward and are now coming into a deserved and just reward.

Ample evidence has been furnished the past two years to warrant the belief that orchards properly tended will come into satisfactory bearing at eight years from planting. New life has been put into the enterprise, and today this branch of horticulture is attracting unusual attention.

It is a noteworthy fact that many of the commercial orchard companies have taken hold of their properties with increased energy and are giving much better care to their trees than formerly. It appears that ample capital is available for extensive operations and we may confidently hope to see a vast source of wealth added to this southern section, already so abundantly blessed with natural resources. The present need is efficient help, young men properly equipped and willing to push forward the work.

It is safe to predict that pecan culture will prove similar to other forms of enterprise. It will not give something for nothing but we will get out of it in proportion as we invest capital, energy and brains.

Nature has been lavish in her gifts to man, but we of the south are face to face with an opportunity granted to few of earth's peoples. I believe we are waking to the facts and that the day is not distant when pecan culture will be one of the chief industries of the south, and in lieu of the wild groves that are gone forever with their inferior nuts will arise, as by magic, innumerable orchards showering down their annual contribution to humanities' needs.

How Shall We Market Pecans

H. Harold Hume.

Mr. President, Ladies and Gentlemen:

In reference to the subject which I am to discuss for you, I may say that until within a few days I was not aware that I should be called on, in connection with this part of the programme. Owing to the number of other things demanding attention, I have had but little time to make preparation.

For a number of years, I have been looking into the subject of pecan growing. My investigations began some ten or twelve years ago, and in this time, I have seen the quantity price of the common wild pecan nuts, small in size and of various shapes, increase from three or four cents per pound to fifteen or sixteen cents per pound. Although much attention has been given to orchard planting, there has been no material increase in the amount of the product just referred to as the later plantings have been made with budded and grafted trees of improved varieties. The increase in price has been brought about either by manipulation or by increased demand or both. While manipulation has had something to do with it, yet there is no reason to doubt that our increase in population, and the use of pecan kernels in new ways and in vastly larger amounts, have been largely responsible for this increase in price.

Texas supplies the bulk of the wild product and it is often a fact that the man who owns the trees and their crop is not the one who harvests the crop, sells the product and pockets the proceeds. Since the sellers are so often irresponsible and have no vital interest in the crop, it will frequently be noted that there is a wide difference between the first price and the price to the retailer. It has been noted for instance, that at times when the wholesale price is about fourteen cents per pound, the collector is getting four cents. There is a difference of ten cents in the transaction between the passing of the product out of the hands of him who first had it and its receipt by the man who wholesales it to the final distributor. This is quite a difference. It is a comparatively easy crop to corner and as a general rule, it soon passes into the hands of a very few soon after it is gathered.

A few years ago, it was predicted that the amount of the wild product would actually decrease, but owing to the increased prices and the interest now being taken in the culture of pecans, the wild trees are receiving more attention than formerly and it is a fact that in all pecan markets, there will always be a considerable quantity of the wild crop. Since the man who gathers this wild crop is not always the owner of the trees, the question naturally arises as to how the marketing of this crop can be handled. It is a phase of the problem that will require careful thought. It may be it will solve itself. As the crop increases in value, the product may be more carefully looked after by the owners.

This wild nut is today, the most important item in our pecan trade. Most people to whom the pecan is known, have never seen any other than the small wild nut, and could not even tell what its natural color is. They have never seen it in its natural color. It has been stained, polished and fixed up to improve (?) its looks before it gets into their hands. It is hard to make them believe that there are any larger and better nuts than those to which they have been accustomed.

PICKING AND HANDLING CROP.

Some people, who do not know, believe it entails no cost or trouble to gather a pecan crop. True the gathering of a crop from young trees is not a particularly difficult piece of work, but the securing of a crop from trees, four or five feet in diameter and one hundred and fifty feet high is another matter. In the case of large old trees, one must wait for the crop to come down or invest in a set of Wright Aeroplanes. Planted on the soils of our State, the trees are not likely to reach such large size and for many years after they come into bearing, the crop may be hand picked. Hand-picked! Some one holds up his hands in amazement. But the man who wants to get all that there is in his crop will have to hand pick it. One of the faults of some varieties is that their crop does not ripen uniformly. But the time to begin gathering is when the greater number of burrs are open and the points of the nuts are peeping out. Then strip the trees—taking open and closed burrs together. Some of the closed ones will open, those which do not are probably faulty. Based on an estimate made on trees, twenty-five to thirty years old, the picking and shucking of the crop, ready for drying, is from one and a half to two cents per pound.

PACKAGES.

Pecans shipped in sacks have a mysterious way of being lost or reduced in quantity. Just why this is, is hard to say, but if you try to ship nuts in a sack, you will find out. I have even known shipments that started out as a sack of pecans to arrive at destination a sack of cotton seed hulls. They had been transformed on the way. As interesting as the transmutation of metals!

To insure safety to the product wooden or heavy corrugated packages should be used. For large quantities, the barrel is best. It is a little unwieldy, weighing 100 to 125 pounds or thereabouts. Half barrels are good for smaller quantities while for still smaller shipments wooden or paper boxes are best. Care and neatness in putting the product up in attractive shape are well repaid, just as in the handling of any other fruit.

TIME TO MARKET.

We have heard that after we have harvested our crop, we can sit down and wait until conditions are just right before marketing it. In my humble opinion, while it is not wise policy to rush the product into the market, it is best to market it without waiting an undue length of time. There is such a thing as waiting too long. The active demand for the crop, the nut market season, begins a little before Thanksgiving and covers the period up to January first. It will probably be found that during this period the best prices can be secured. Some believe that the crop can be carried through into the following summer and marketed then. In the south generally, and under ordinary conditions, it is unwise to do so. We must not lose sight of the fact that the pecan kernel contains a very considerable amount of fat, sometimes as much as 70 per cent. and this fat or oil is likely to become rancid in our warm summer weather. In cooler regions it does not deteriorate so rapidly, of course, and cold storage would keep the nuts in good condition for a much longer period.

Rancidity is brought about by the action of the air. In this connection, I might call attention to an interesting experiment. February 2, 1905, the Beechnut Packing Company, put up pecan nuts and kernels in vacuum jars. The vacuum was, of course, not entirely absolute, the exhaustion being about 28 4-10. The last of these cans were opened in April, 1910, a little over five years after they were put up and found to be in good eating condition still. There was a little deterioration, but not much. In this, we have demonstrated that pecans and extracted kernels can be held for long periods without becoming rancid.

MARKETING METHODS.

At the present time, the bulk of the pecan crop of high quality is handled in the private trade. It is largely a mail order business, built up without resort to much publicity. No doubt this trade will continue to take large amounts from year to year. Crops of several thousand pounds are now marketed by single individuals in this way. This method is a good one.

Lately, the larger sized nuts are finding their way into the fancy grocery trade, in considerable quantities. This trade is good if properly and carefully handled.

But while these and similar methods answer for the present, the time is not far distant when other methods will have to be worked out. Those of us who have the best interests of the industry at heart need to think along these lines. The plans as outlined by Mr. Burton, now in operation in the handling of citrus fruits in our State, can, I believe be applied to the handling of the pecan crop. It will have to be handled through an exchange or a marketing association. The task will be a large one as a territory almost or quite as large as the cotton area will have to be covered. It stretches from Virginia to Texas. There is no need to enter into details at this time, but I am convinced that some of us here tonight will see the time when such an association is actually in charge of the pecan crop of the South. Some of us may take part in its formation. It will mean much to the industry.

DISCUSSION

Mr.———: What will the cultured product bring in the wholesale market?

Prof. Hume: I cannot answer that definitely. I remember trying this out when the wild nuts were selling at 4c. a pound. The cultivated ones were quoted me at 16c. a pound. I have tried it out when the wild nuts were 8c. a pound and the cultivated product was 20c. a pound in carload lots. I cannot tell you what the prices have been for the last year or two, but I have no doubt they run about the same. There is a wonderful demand for pecan nuts. Sometime ago, I took the matter up with Huyler's. While they were very diffident about giving out figures they stated the extract kernels entered into a very large percentage of their products. They use them by the ton and they are unable to get anywhere near what they require. I can remember the time when the only pecan we ever saw came with the shell on, but a large proportion of the product is now sold with the shell off, and you can buy pecan kernels by the pound, just as you buy any other grocery product. There is practically no limit to the market demand for the pecan.

Combinations Adapted to Pecan Production

W. W. Carroll.

Mr. President, Ladies and Gentlemen:

Mr. Charles M. Barnwell, musing thoughtfully on the bank of the river Flint, gazing into the opaque density of its flowing tide, would pause, if interrogated, to observe that the best combination adapted to pecan production is brains, experience and a fat bank account. Some have brains. They admit it. A few have experience, but rarely boast about it. I have heard of several persons possessing fat bank accounts, but have found it difficult to induce them to combine the same with my brains and experience.

The three component parts above named, combined in one and the same individual or company, would go far toward spelling success; but many of us who are growing and planting pecan trees will have to hire the brains, acquire the experience and accumulate by some means (which I am not at liberty to disclose) the necessary bank account.

Therefore it becomes necessary to discuss under the title of this paper combinations that will produce revenue to help the bank account, that will help build the soil, that will help to reduce the great burden of expense incidental to caring properly for a large acreage of pecan trees.

It is a grand and beautiful and uplifting thing to sit in the shade of one nine or ten year old pecan tree and reflect that it has a crop on it worth fifteen to twenty-five dollars. It is then highly entertaining to calculate what one hundred acres—five hundred acres—a thousand acres of land, with twenty such trees to the acre, will produce at twenty years of age. I always stop figuring on this when I get up into the millions. I am not very clever in mathematics.

I felt, however, that I was justified in figuring that one hundred or one thousand acres of pecan trees, treated like the thirty or more trees in my test grove, would yield as big returns as my trees are yielding if the problem could be solved of providing proper equipment and organization and means for the care of the trees.

This problem must be solved by making the land between the trees produce profitable crops and increase in fertility, by making lands not planted in trees produce revenue to assist in the work. Hence the answer, which is the shibboleth of the modern farmer—diversification.

It is impossible to outline any fixed system of diversification. One must be governed by the extent and character of the land to be used for the grove. A body of land, all clear, free from stumps, with no shade or running water, permits solid planting in trees, but there can be no combinations used here, except straight cultivation of the middles with crop rotation. This is the most expensive type of the pecan grove but it is very well suited to the large company plan of selling in blocks. The conservative man who buys ten acres and plants two hundred trees thereon, expecting to give them careful attention cannot combine stockraising with his venture. His field offers him poultry as a side line, or a rotation of farm or truck crops. He usually compromises by getting a darkey to plow and hoe (and skin up) his trees in exchange for the privilege of growing a sorry crop of corn or cotton in the middles. If the land is worked intelligently and is suited to cotton this crop, with its shallow, rapid, clean cultivation and nitrogen conserving shade, is a splendid setting for young growing pecan trees. This plan effects a saving, perhaps, but is often ineffective and rarely produces any revenue.

So the conclusion forces itself that, to take advantage of combinations to help in making a pecan orchard, rare discrimination should be exercised in selecting the land. Many acres more than are to be planted in trees should be secured in order that the land for the grove may be wisely chosen, in order that there may be room for tenant farmers who can furnish ready day labor, in order to furnish pastures for cattle and sheep and swine that will in turn consume forage and grain produced, yielding in return natural fertilizers that are best of all for growing trees when properly combined with commercial fertilizers. Water should be abundant; woodland, yielding acorns and other "mast" and furnishing shade and good rooting for pigs and grazing for cattle, should be desired. Where these things are absent the help for the soil must come, for the most part, from the fertilizer warehouse, and the price therefor from the bank account. I may be wrong but I figured things out that way; and our hogs have swamp and acorn range, our pure-bred and graded cattle have meadow and stream for support, and our negro tenants are near at hand to furnish labor when needed. From this old southern plantation of 3,400 acres, one-half woodland and pasturage, I select the sandy hammock land with deep clay subsoil for the pecan trees. Fields are devoted to raising corn for feeding mules and finishing hogs, sufficient hay is saved, peanuts are provided to be harvested by the hogs who have acorns as well to help flavor the pork, graded cattle, with only pure-bred males in the herd, furnish milk cows for sale, or offer opportunities for dairy products which may be utilized later, while all "culls" and surplus males are fattened for beef. Now this is my theory and if I am wrong I will find it out in time—but it is a success so far. I believe that animal fertilizer, when properly treated is the best for pecan trees. To secure it one must have work-stock, cows and hogs. To have these one must have pastures and a full bin and stack. To have them without undue outgo one must make them profitable. So I argue that only part of the farm should be given to the trees—for cows and hogs and young pecan trees will not live amicably together inside the same fence. I have tried it; the hogs and the cows tried it—but the trees didn't half try. They gave up without a struggle. It is not meant that solid bodies of land should never be planted to trees by men or companies with ample means. It is meant that farm made money and farm made fertilizer helps pecan trees grow—and it takes land and labor to make either or both of them.

One of the best combinations for the good of the whole pecan section is the one the thrifty farmer makes when he improves the value of his farm by putting out a few acres of standard varieties of pecans. There are farmers in my home county (Jefferson) who gather from a few seedling trees that were planted under an almost passing whim and matured under adverse conditions, nuts worth more money than the better class of negro tenant can get gross for the entire crop made behind a good mule.

I believe in the future of the pecan nut. It will add to the wealth and progress and fame of the south. It will make our laborers busier, our lands more valuable, our citizens more comfortable. The cotton states are offered another monopoly to share honors with king cotton, and the pecan is already a commercial factor in the south's affairs.

I am reminded suddenly of a mental picture that is not pleasing. It is the recollection of wide fields studded with trees, these crowded with briars and weeds and promising nothing but disappointment and failure to those whose money placed them there. Many an acre, planted to pecan trees that were carelessly dug, set out late and hurriedly and cared for not intelligently or not at all, stands today, as a warning to promoters and investors alike that they should not promise too much, that they should not undertake too much. Better a dozen good trees well set and thrifty than a thousand gnarled and knotty and yellow and worthless from failure of funds to furnish proper fertilizers and cultivation.

So it is wise and proper that one and all should set about the business of making pecan groves well guarded against the shocks of seasons and the demands on the bank roll; and the remedy for ills that I offer and believe in and practice is in the words of my text—"Combinations Adapted to Pecan Production." There are many combinations besides those I named, and it is for us to figure out the ones most suited to our several conditions.

DISCUSSION

Mr. Williams: I would like to ask if the pecans can be grafted on the common pignut hickory with any success?

Mr. Carroll: I am making an experiment in that line now, and I believe they can be worked on upland hickory. I have about 25 or 30 of the upland hickories cut back for budding. I tried only one last season and the buds took as readily as on any pecan stock I ever worked. I have about 1,000 of wild hickory on my place. There are about 400 or 500 in one body and I have decided to put them to some use. I am going to experiment with them and see if they will work. I budded the one with the Delmas pecan and the bud remained dormant until this spring. It now has shoots four feet long and has begun to branch out. I have not worked the pignut hickory.

Mr. Graves: I have tried the experiment, and while they have made splendid growth, they have never borne any amount of nuts.

Mr. Henderson: I was down in————————, where they have very good hammock land. A gentleman there showed me about 35 trees that were budded on this pignut. The trees were about 12 inches in diameter and had tops large enough to carry a barrel of nuts to the tree. He told me he had never seen a nut on them. They were the Van Deman and the Stuart varieties.

Mr. Smithwick: I have here in my hand a photograph of a hickory tree that was sixty feet high when I topped it. I grafted a great many different varieties of pecans into it and they are all growing. I call it my experiment for varieties. I have fourteen varieties in the top of that tree and the most of them are carrying fruit the second year from budding.

I would like to ask the gentleman from Gainesville if the trees around that section budded on the hickory, have matured any fruit yet?

Mr. Henderson: Not a very abundant crop. Mr. Moseley was budding trees twelve years ago and they bore some nuts every year, but never anything like a full crop. He budded trees twelve years ago that were twelve inches in diameter.

Mr. Williams: This pignut hickory is a little different from the regular hickory. The pignut is a more willowy growth and grows along the edge of swamp land. I have tried to destroy them, but would like to put them to some usefulness, if possible.

Prof. Hume: I have seen many hickories and some of considerable size with both top work and grafts, but I have never eaten the nuts. Some of them are good trees now, but whether they will produce any nuts or not, I do not know. However, there is no reason under the sun why, if the graft takes and makes a growth, it should not bear a crop.

Mr. Henderson: I think the ones around Gainesville are beechnut hickories. What they have produced so far is a small bitter nut of no value at all.

Mr. Miller: It will not do to judge a tree too soon. The pecan grafted on the hickory may take a longer time to come into bearing. We have so much better stocks as a rule, it is better to use the pecan for grafting on except where you have other trees growing naturally and want to convert them to a profitable purpose.

Report of Committee on Statistics

Chas. M. Barnwell.

Mr. President, Ladies and Gentlemen:

I find every one is planting larger and better trees, and not planting so many per day. They are using more and better fertilizers. They are not planting cotton and corn on the tree rows, and they are cultivating a strip on each side of the row of not less than three feet, and are endeavoring to get around at least once a week.

ACREAGE PLANTED FALL, AND WINTER 1909, AND 1910.

Albany District about	1,250
Hardaway District about	1,800
Baconton District about	1,400
DeWitt District about	125
Total number of acres	4,675

ACREAGE PLANTED WINTER 1909-10

Americus District	278
Plaines District	50
Ellaville District	30
Smithville District	303
Fort Valley District	100
Richland District	225
Montezuma District	50
Columbus District	50
Cobb District	50
Total No. acres	1,136

Some are planting small trees, some large and some medium sizes. Corn and cotton crops are planted on ground between trees, leaving 3 feet to trees first year, 4 feet second year, 5 feet 3rd year, 6 feet 4th and 5th years. All kinds of crops are planted between tree rows except small grain and in some places oats, wheat and rye, are planted in rows between trees and cultivated like other crops.

H. W. Smithwick.

Thomasville and Boston section have planted 805 acres to pecans. I do not know amount at Cairo. Probably 400 acres.

B. W. Stone.

Mr. Miller: Georgia is, perhaps, planting more acres in nuts than any other state, with the exception of Texas, and Florida is coming right along behind her.

Mr. Griffing: There has been to my knowledge no extensive planting from Madison east this present year in Florida. Last year, when we figured the planting up to that time, we did not include what could be termed South Florida; I mean by that south of Ocala. The planting up to that time was about 1600 acres. There have been a few plantings of ten up to fifty acres this year, which probably brings the total up to 1700 or 1800 acres; that is, what we have reports from, that I know of. The additional acreage of which I have no definite knowledge, would easily bring the acreage up to 2,500 acres in the territory from Ocala north and from Lake City, east. That is made up largely in Alachua, Baker, Duval and Bradford counties and in that territory. Figuring on 25 trees to the acre, would make something like about 60,000 trees.

Mr. Miller: We will now hear from West Florida, from Mr. R. C. Simpson.

Mr. Simpson: When I got these figures together, it was with the understanding that it was the total number of trees planted. I have rather accurate figures on Jefferson county, but on several of the other counties they are mere estimates and the accurate figures could not be obtained:

Jefferson County, 36,700 trees.
Leon County, 3,000 trees.
Gadsden County, 3,000 trees.
Madison County, 3,000 trees.
In other western counties of Florida, 10,000 to 15,000 trees.

Mr. Miller: You can see from these figures what the industry is doing and that it will not be so many years before the pecan crop will rival in importance that of the citrus and other fruit products. Its enormous acreage and yield is going to create a product that will need some such help to market as you are finding in the citrus exchange.

Mr. Rich: I would like to ask a question. It has been said in this discussion that there are at least a million trees now planted. We have a very accurate account of the planting in Georgia. I think you will bear me out when I say that the planting in Georgia last year was 1200 acres and this year 7,000 acres. 20 trees to the acre is putting it very mildly and is really below the average. Now, the point I am trying to get at is: counting your trees at $2.00 per tree, which is a very moderate price, you can see where there is an investment of about $300,000 in pecan trees in Georgia alone; just the actual trees. Take the report of Mr. Simpson, that in his territory there were about 25,000 trees. The trees he refers to are on an average of three or four years of age. Say there are twenty trees to the acre; they ought to be worth $8.00 apiece. See what that will bring the investment up to. It shows that lots of money is being put into this industry and there must be a reason for it. I would ask that some one give us practical, actual experience, the good and the bad alike.

Mr. Miller: I would like for Mr. Carroll to tell us something about his trees in the way of production.

Mr. Carroll: I experimented first on about one and a half acres of ground. So many people told me not to do it, saying I would never live to see any nuts on the trees and would get no benefit from them. I bought the best trees I could find, cultivated them and took good care of them and brought some of those trees to bearing in the course of three or four years. I found out that some of the nuts were very inferior. Then I sawed them off and top worked several of them. Now, I have 33 on an acre and a half of ground. About half a dozen trees were planted in 1901. I planted more trees in 1902, 1903 and 1904. I have trees from six years of age up to nine years. I am getting 40 to 70 pounds off of nine year old trees. None of them sell for less than 20c. per pound and some of them sell for 40c. and 50c. per pound. I have some of the best varieties; these are the VanDeman, Nelson, Frotscher, Stuart, Schley, Delmas, Dewey, Hall, Alley, Bolton, Moore and other varieties. I have no trees in this grove that are not growing well and bearing full, heavy crops. The nuts are well filled and of most excellent quality.

The best record I have made with any tree was a five year old tree from which I got $6.25 worth of nuts in one year, selling them at 25c. per pound. I got 70 pounds from a Moore tree in 1908, which was set in January, 1901. There is a six and a seven year old tree from which I got a total of 50 pounds last year, and sold the nuts at 50c. per pound. I have about a hundred acres planted, part of it set in 1906, part in 1907-08. Of the trees planted in 1906, about twelve or fifteen are already bearing. In fact, a few set in 1907 are bearing a little, and they are growing very thriftily.

The trees planted on the big plantation did not do so well. We have had about eighteen months of dry weather in our section, but the trees are doing fairly well, all things considered. They have a good color but are not making much growth.

The test grove I have at home is an interesting sight for those who are interested in pecans. If any of the gentlemen present come through Monticello, I will be very glad to show them around.

On my land I am planting heavily of the Moore. It is a good bearing variety; a small nut and a nut that no one pays much attention to, but it is of good quality and thin shell. The Schley is also good. I have many varieties on my lands, but if I had it to do over again I would select the Schley, the Delmas, the Moore, and possibly one to three other varieties, and plant exclusively of these.

A Member: Is the pecan a prolific grower in the southern part of Florida?

Prof. Hume: I have seen pecans growing well in Fort Myers; as far south as that. Now, it is a question of soil in Florida. You can stand on soil that is good for pecans, and take two or three steps and be on soil that is fit for nothing but raising disturbances on. I would look carefully into the matter of soil before I planted. On high pine land, you want to see what kind of subsoil there is, to be certain that the drainage is good.

Mr. Henderson: Do they bear regularly?

Prof. Hume: They will compare favorably with other crops in that respect. I don't think they bear as regularly as the citrus fruits. It depends entirely on where you are. As you go a little further south in the State, they do not bear as regularly as the citrus fruits in the same section. A great deal depends on the variety, also. With some varieties they will run, to my knowledge, for ten or twelve year and never fail to bring some crop. Other varieties only bear every other year. The matter of varieties adapted to the locality has to be very carefully considered, if you want to make a success of pecan raising.

Mr. Rich: Is the VanDeman a regular bearer ?

Prof. Hume: It is not. In some sections of the lower south it does not do well.

Mr. Campbell: I believe the varieties that would do well in the Manatee river section would be the Teche, which is a heavy and regular bearer; the Russell is another; the Curtis is another. The Curtis runs about seventy to the pound. It It is of very good size and one of the best quality nuts I know anything about.

Mr. Carroll: In mentioning the varieties I did, I do not recommend them to be planted anywhere except on soils similar to my own. They might be entirely unfitted to someone else's land or some other section. You can very easily find out or get a line on what is best for your soil before purchasing the stock. I would not venture to recommend to these gentlemen any one particular variety for their planting without knowing soil conditions.

Mr. Miller: It is growing late, ladies and gentlemen, and we thank you for your kind attention. This fall the National Nut Growers' Association will meet at Monticello, and we cordially invite you to be present and we assure you we will open your eyes to what we are doing. The association we have here is simply a sub-organization of the National Association.

Prof. Hume: I am sure we are very glad to have had this Nut Growers' Association with us. Tonight we succeeded in covering nut culture for the first time.

Mr. Hart: I know it is very late to call this matter up, but I want to speak of one thing. I, with others, was appointed a committee at the meeting last year to go to Washington and see what could be done to get assistance there in the matter of studying blight of the orange tree. I went to see quite a number of professors, but did not see Prof. Waite there. I saw him afterwards at St. Catherine's. Such work is in his hands. He is in the State at the present time, and I think he is here largely to see the importance of the work and become convinced of the need of giving us assistance, and I would ask that every one who is interested in the matter who may see him at any time during his stay, will try to give him all the information possible so that he may come to know the importance of the work and aid us in getting the help we so sorely need.

Report of Committee on Final Resolutions.

Adjourned.

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